Occupational Outlook Handbook

Employment information on major occupations for use in guidance

United States Department of Labor
in cooperation with
Veterans Administration
Occupational Outlook Handbook

Employment Information on Major Occupations for Use in Guidance

prepared in cooperation with
VETERANS ADMINISTRATION
OFFICE OF THE ASSISTANT ADMINISTRATOR FOR VOCATIONAL REHABILITATION AND EDUCATION

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UNITED STATES DEPARTMENT OF LABOR
Maurice J. Tobin, Secretary
BUREAU OF LABOR STATISTICS
Ewan Clague, Commissioner

Foreword

The prediction of occupational outlook is a matter of major concern to virtually every citizen of a free society. The relation of the present and probable supply of workers to the present and probable demand for their services affects the decisions of the student who is planning his professional education, the worker who is looking for a job, the business manager who contemplates expansion, the labor leader who seeks a better bargain, the educational administrator who contemplates the purchase of new equipment, and the taxpayer who foots the bill.

Before the tremendous task of assembling the pertinent information and venturing the predictions reported in this and earlier publications was begun, nearly everyone who needed such information was dependent upon inadequate data. Important decisions, sometimes affecting the entire lifetime of the person who had to make them, often were based upon hearsay or upon the deliberately biased pronouncements of recruiting officers.

Since the publication of the first Occupational Outlook Handbook, every informed person in the field of vocational guidance has come to regard it as one of his indispensable tools. No publication of this kind will ever be perfect. No collection of predictions will ever achieve complete accuracy. But the Occupational Outlook Handbook has brought us closer to the ideal than any previous publication in this area.

Not every expansion of Federal activity and expenditure in recent years has been endorsed with enthusiasm by all citizens. But it is a distinct pleasure for one frequent critic to commend the Occupational Outlook Handbook as a contribution of major importance to the public good, a function indisputably appropriate for a Federal agency, and an investment whose productive returns promise to delight both the economic royalist and the social planner.

ROBERT HOPPOCK,
President, National Vocational Guidance Association.
Letter of Transmittal

United States Department of Labor,
Bureau of Labor Statistics,

The Secretary of Labor:

I have the honor to transmit herewith the second edition of the Occupational Outlook Handbook, prepared in the Occupational Outlook Branch of the Bureau's Division of Manpower and Employment Statistics. Contributions have been made by the Bureau of Employment Security and the Women's Bureau of the United States Department of Labor, the Bureau of Agricultural Economics, United States Department of Agriculture, and the Office of Education, Federal Security Agency. This is a revision of Bulletin No. 940.

Young people, veterans, or older workers who are choosing a career or course of training need information on employment trends and outlook in the various occupations. Recognizing this need, the Congress, on a recommendation of the Advisory Committee on Education, provided for the establishment of an Occupational Outlook Service in the Bureau of Labor Statistics in 1940.

The need for this kind of information is attested by the wide use of the first edition of this handbook, which was issued in the spring of 1949. More than 40,000 copies had been sold by the time the second edition went to press. It was used in high schools, colleges and community agencies throughout the country, as well as in all Federal and State government agencies engaged in counseling, including the Veterans Administration, offices of State employment services affiliated with the United States Employment Service, and State vocational rehabilitation agencies affiliated with the Office of Vocational Rehabilitation.

For the second edition, employment trends and outlook in all the industries and occupations described in the first edition were reappraised on the basis of the latest available information, and the most recent data on earnings, training, and entrance requirements were added. In addition, the results of new studies on major industries were inserted, so that information is presented on more than 400 occupations.

The Bureau wishes to acknowledge with gratitude the cooperation of hundreds of industrial firms, unions, trade associations, and professional societies, whose officials gave freely of their time in discussing employment trends in their respective fields, in supplying information, and in reviewing and commenting upon drafts of the reports.

The research for this handbook has been carried on with the financial support of the Veterans Administration. In the selection of occupations to be studied and the preparation of the reports to meet the needs of veterans the Bureau wishes to acknowledge especially the guidance of the office of the Assistant Administrator for Vocational Rehabilitation and Education, Veterans Administration, and Donald H. Davenport, consultant to the Administrator of Veterans Affairs.

Ewan Clague, Commissioner.

Hon. Maurice J. Tobin,
Secretary of Labor.
Letter from the Veterans Administration


When the Congress authorized the Veterans Administration to inaugurate the vocational rehabilitation and education programs for World War II veterans it recognized the desirability of providing information on employment outlook to be used in the advisement and guidance of veterans designed to assist them in selecting and planning their courses of training. To accomplish this purpose the Veterans Administration, in 1945, initiated a program of cooperation with the Bureau of Labor Statistics, Department of Labor, and the Bureau of Agricultural Economics, Department of Agriculture, to provide information on employment opportunities.

First results of this cooperation were issued in the form of preliminary occupational outlook releases in the summer and fall of 1945 and spring of 1946 pending the release of full coverage reports. This was followed in August 1946 by VA Manual M7-1, “Occupational Outlook Information.” This Manual, augmented, revised, and brought up to date, was reissued in April 1949, by the Bureau of Labor Statistics as Bulletin No. 940, Occupational Outlook Handbook, 1st Edition. With the continuing support of the Veterans Administration this handbook is now being issued as a second edition revised and again brought up to date.

It is gratifying to know that the information on employment outlook provided by this joint effort has been of substantial benefit not only to veterans but also to other students and young people interested in the choice of a career or course of training.

H. V. Stirling,
Assistant Administrator for Vocational Rehabilitation and Education,
Veterans Administration.
Local Employment Offices as Sources and Users of Occupational Outlook Information

Occupational facts form the framework within which local employment offices perform most of their operating functions. Workers are registered, counseled, selected, and referred to jobs by occupation. Services to employers are rendered with respect to each firm's occupational requirements.

Because of the direct relationship between employment service activities and occupational data, a wide variety of occupational tools has been developed and made available for local office use. These are referred to in the section of this volume entitled "Guide to Organization and Use of Handbook." The Occupational Outlook Handbook is a valuable addition to this fund of information and will be welcomed in all local offices. Employment offices in turn, through their day-to-day operations, have acquired an intimate knowledge of specific local labor market conditions which are of great significance to individuals confronted with problems of vocational choice.

Counselors in local employment offices are faced with a wide variety of vocational guidance problems. The counselor in using occupational information must bring the picture into sharp focus in relation to the individual, the time, and the place. The counselor must learn to use occupational information not like a box camera, but as a flexible tool capable of many adjustments. He needs to study the handbook, looking for answers to questions which arise in the counseling process. What kind of person would be most suitable for this job? What interests, aptitudes, and abilities are desirable in this occupation? Depending upon the tools and techniques for individual analysis available to him, the counselor might secure evidence of these characteristics through the use of aptitude tests, evaluation of work experience, and school reports.

The individual who needs counseling has usually not made a vocational choice in any real sense. The counseling process will benefit the applicant most if it tries (1) to narrow down the alternatives, (2) to select pertinent occupational descriptions which may serve as representative of the individual's career goals, (3) to help the applicant weigh the alternatives in terms of their relative advantages, (4) to help him select the field of work which appears most suitable in relation to his needs and capacities, and realistic in terms of employment prospects, and (5) to provide help in planning toward entering into and progressing toward the desired goal. The counselor will perform a real service in helping an applicant to broaden his vocational horizons by directing his attention to the wide variety of occupations related to his fields of interest and aptitudes.

A discussion of the job of the all-round machinist will include facts about the lathe operator, the drill-press operator, and several semiskilled or other similar jobs in, for example, the related fields of wood-working occupations.

The information given in this handbook portrays national and long-run trends. In a particular time and place, however, the outlook may be radically different, changes may be more precipitate than Nation-wide trends, and conditions contrary to the general situation. The applicant who wishes to remain in the area in which he is now living has to start within the limits of the occupational structure of that area. Within this more limited span of occupations, the final choice would take into consideration national and long-range trends in order to take advantage of the wider range of related occupational opportunities. An employment-office counselor is necessarily concerned with immediate or near-term placement possibilities, and he needs job outlook information which is immediate, specific, and localized. This kind of information has been
available in local offices of the State employment services for several years, although it has not always been usefully assembled. More recently there have been attempts to digest the mass of information available and to arrive at better methods of organization and presentation. Some States and localities have achieved outstanding success in their occupational information programs. The 400 occupations treated in this handbook cover the most significant fields of work; it is hoped that employment offices will add to these descriptions from their rich accumulation of occupational analysis and labor market information and from their day-to-day experiences. Schools, employers, and other users of occupational information are invited to call upon their local employment service for job information relevant to their own community, as are all persons who seek help and information in the choice of an occupation.

Robert C. Goodwin, Director,
Bureau of Employment Security,
U. S. Department of Labor.
Contributors

This handbook was prepared in the Bureau’s Occupational Outlook Branch under the direction of Harold Goldstein, Branch Chief. Helen Wood, Richard H. Lewis and Calman R. Winegarden supervised the research on employment opportunities and the preparation of the occupational outlook reports. The following members of the staff contributed sections: Cora E. Taylor, Samuel Vernoff, Harold Wool, Alexander C. Findlay, Robert W. Cain, Raymond D. Larson, Sol Swerdloff, Frank Dischel, John S. McCauley, Chester F. Schimmel, Josephine C. Solomon, Cora S. Cronemeyer, Vincent H. Arkell, Sylvia K. Lawrence, and Muriel Navy.

The section on Agricultural Occupations was prepared in the Bureau of Agricultural Economics, United States Department of Agriculture, by Robert C. Tetro, with the assistance of A. B. Genung. The reports were reviewed by C. P. Heisig, N. W. Johnson, E. L. Langsford, H. L. Stewart, C. R. Crickman, K. L. Bachman, O. L. Mimms, W. S. Middaugh, Merton S. Parsons, and W. D. Goodsell of the Bureau’s staff.

The reports credited to the Women’s Bureau, United States Department of Labor were prepared by Marguerite W. Zapoleon, Agnes W. Mitchell and Grace E. Ostrander of the Employment Opportunities Branch.


The Occupational Analysis Branch, Division of Placement Methods, Bureau of Employment Security, United States Department of Labor, gave advice and assistance in the preparation of the handbook, particularly on matters of occupational classification and descriptions of occupations.


Photographs were also supplied by the Board of Education, City of New York; Mellon Institute of Industrial Research, Pittsburgh, Pa.; Trans World Airline; American Airlines; Reni News-photo Service; American Hotel Association; Mayflower Hotel, Washington, D. C.; Capital Airlines; American Aviation Associates, Inc.; Norfolk & Western Railway; Santa Fe Railway; Southern Pacific Co.; Central High School of Needle Trades, New York City; Commonwealth Edison Co., Chicago, Ill., U. S. Department of Defense; National Archives; U. S. Office of Education; Lynchburg Foundry Co., Lynchburg, Va.; Modern Equipment Co., Port Washington, Wis.; Foundry Educational Foundation; American Iron & Steel Institute; Standard Oil Company (New Jersey); Consolidated Edison Co., New York, N. Y.; National Education Association; American Veterinary Medical Association; American Chemical Society; National Broadcasting Co., Inc.; Association of American Railroads; Chicago and North Western Railway System; Chicago, Burlington, and Quincy Railroad; and Library of Congress.
NOTE

For the convenience of users of this handbook, the reports on each occupation or industry contain a list of organizations or publications which may be able to provide further information. A great many trade associations, professional societies, unions, and other organizations in industry are in a position to supply valuable information to counselors or young people seeking information about careers. While these references were assembled with care, the Bureau of Labor Statistics has no authority or facilities for investigating organizations. Also, since the Bureau has no way of knowing in advance what information or publications each organization may send in answer to a request, the Bureau cannot evaluate the accuracy of such information. The listing of an organization, therefore, does not in any way constitute an endorsement or recommendation by the Bureau or the Department of Labor, either of the organization and its activities or of the information it may supply. Such information as each organization may issue is, of course, sent out on its own responsibility.
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The counselor or teacher who examines this handbook for the first time may make enthusiastic plans for its use in his classroom or at his desk. Yet in employing the handbook primarily either as a text or as an immediate source of reference, the teacher, the counselor, or the counselor trainer may overlook its real value.

Perhaps the two points about the occupational field which most readily elude the counselor or teacher concern the extremely fluid character of occupational factors and the relative nature of all occupational data.

Many books detailing occupational facts are obsolete nearly from the time they appear in print. Individual occupations may be destroyed in the wake of a new invention. Whole areas may no longer offer certain types of opportunity because of such unpredictable matters as a change in freight rates or the invention and promotion of a substitute product. The ebb and flow of prosperity in 6 months can throw scores of thousands of persons engaged in a luxury trade out of work or can, on the other hand, create a demand for a skill heretofore perhaps not even known.

The relative nature of occupational information implies that no bald statement should be made about the characteristics of a particular job, or the opportunity presented by a group of occupations. Such statements are valid only when they have been related to geography, locale, and above all to the traits of the individual prospective worker. Mistakes arising from ignoring this principle have plagued the counselor and the counselee ever since counseling has been a profession.

For these reasons the handbook can be of unique assistance to the person who is teaching occupations or who is counseling on vocational problems. The fact that it describes 433 specific occupations under diverse headings reveals the special nature of its occupational treatment. The details of each occupation must be filled in by the teacher or counselor from other sources of information about employment conditions, the local scene, and the individual who is studying his personal problems. The 433 occupations are keys to nearly 30,000 descriptive terms which fill the “Dictionary of Occupational Titles” and which are representative of the great bulk of occupations in this country. The two factors of suggestiveness and comprehensiveness make the book valuable in helping to fill a known void.

The main value of this handbook for the teacher or counselor lies in its orientation. For such users the most important parts of this publication in many respects are the preliminary chapters and the introduction to each of its main and subordinate report sections. The brief statements on trends and interpretations contain the material most lacking in the background of many potential users of the book, especially those who have not had the benefit of a comprehensive course in occupational information. From these statements emerges a concept of the fluid nature of occupational data. These trends are dependent on many factors in American life that require hard study if they are to be understood. At the same time the reader realizes that certain trends may be traced, and that a reasonable amount of confidence in the prediction as to the future of specific occupational fields may be justified. Because these trends are stated in guarded terms the reader is constantly referred to a study of local and specific conditions as a corrective for jumping to conclusions.

For the counselee the value of the handbook lies in its contribution to his long-term planning. A common problem for the pupil in high school or the student in college is that of looking ahead from 3 to 10 years in order to map out a career in which he can take full advantage of his personal traits on the one hand and of occupational opportunities on the other. For this purpose an occupational brief or description has relatively little value. It is perspective which counts. If the individual,
Therefore, is trying to solve a vocational problem which includes such things as preliminary training, apprenticeship, college work, professional training, internship, an entry occupation, and perhaps migration, he must be concerned with trends. He must have an outlook which includes a reasonable prediction as to what the conditions of employment in a field of work may be 5 or 10 years ahead.

Whether the handbook may be used directly for study by the counselee is a question which depends a good deal upon his maturity and ability to understand abstract ideas. For the counselor who works with the individual, however, the handbook provides the basic material from which he can devise simpler means for presenting the facts. The comprehensive series of charts may help. Some restatement in terms of the interests of young people in a specific school or the industries found in their locality may be devised by the counselor on the basis of the sound principles of the handbook. At least it may be said that for career planning the ideas in the handbook are indispensable. Such ideas must enter into the counseling interview or into the study which the counselee may pursue at the suggestion of the counselor who is helping him.

The high-school class in occupations is another potential user of the handbook. Here again the teacher is limited by the range of ability in the class and the difficulty which abstract ideas present to perhaps the majority of high-school pupils. It is suggested that the principles contained in the study of trends may be taught best through the handbook. To the person teaching the class the handbook reveals the important aspects of outlook information which must be illustrated in the occupations class if the pupils are to view their problems with sufficient perspective to get away from the immediate job and the oversimplified facts of a job description.

All of the projects suggested above exemplify one phase or another of the problems treated in the handbook. For the counselor trainer the handbook provides an indispensable tool. The new stress in counselor training is on competencies. Competency in the occupational phase of the counselor’s work includes his ability to move from the general to the particular or vice versa. He must be concerned with trends which are Nation-wide in their significance and their relationship to any immediate problem of a counselee. He must on the other hand be able to help interpret the counselee’s ambitions in terms of the long view. Brief treatments of such matters as the ratio of openings in a field of occupations, the effect of population gain or loss on jobs available to young people, the ascertainable flow of migration suggest projects to the counselor trainer for individual study. In the field of occupational information it is important to encourage and develop the concepts that occupational data are always fluid and always relative in nature, concepts which have already been mentioned as among the important but too often missing knowledges in the counselor’s equipment. On page 4 the
handbook disclaims any treatment of a list of many topics commonly included in the general textbook on occupations. This fact alone calls attention to its concentration in the field of outlook and enables the counselor trainer to give more definition to his study of a neglected area.

Occupational data are composed of a fast changing stream of facts. Invention, production, migration, war, peace, the role of women, prosperity, depression, mechanization, obsolescence, legal enactments, management and labor agreements, advertising, birth rate, turn-over, and most of all, the ambitions, abilities, and the restless spirit of man—all those and more are among the elements in this ceaseless flow. The stream of facts must be expressed as trends, and the point of view of the observer as outlook. To these considerations this volume directs the attention of the professional guidance worker.

Harry A. Jager, Chief
Occupational Information and Guidance Service
Office of Education, Federal Security Agency
Guide to Use of the Handbook

This handbook is primarily a summary of the results and conclusions of recent studies of employment trends and long-range outlook in more than 400 occupations of interest in vocational guidance.

Before using the handbook one should read the section immediately after this one. That section tells how the information in the handbook was obtained, and explains a number of points which need to be borne in mind in interpreting the reports on the outlook in different occupations.

Following the introduction and a summary of trends in population, labor force, industries, and occupations, the major part of the book consists of chapters on the major occupation groups and industries and reports on each occupation. The reports are grouped into five sections; three of these sections cover occupations which are found in a wide variety of industries and which can best be discussed outside the context of an industry. They are grouped in these major occupation fields: Professional, semiprofessional, and administrative; clerical, sales, and service; and trades and industrial. The fourth and fifth sections describe the occupations in some of the major industries and in agriculture.

The 483 occupations included in this second edition of the handbook are largely those found to be of major interest to veterans and other young people requesting guidance. Most of these occupations require relatively long periods of training—either formal education or training on the job. To young people considering such careers the need for information on the outlook is most acute. The occupations were selected also for their relative importance as a source of employment opportunity. Some smaller fields are included, however, either because there was special interest in them, or because reports on them could readily be prepared in the course of the study of the larger occupations in the same industry.

These occupations represent about 82 percent of the employment opportunities in the professional and semiprofessional fields in the United States; 79 percent of those in skilled occupations; 40 percent in clerical occupations; 30 percent in service occupations; smaller proportions of those in administrative, sales, and semiskilled fields; and most of the major types of farming. Thus, although they represent only a small part of the total number of different occupations in the United States, they cover some of the major areas of interest to veterans or students who are planning to undertake long courses of training or apprenticeship. This handbook may therefore be of service as a guide to the bewildering array of occupations in the United States.

Inevitably, many significant occupations could not be included. The first edition gave information on 288 occupations; 145 more were added in this edition. In future editions, reports on other occupations will be incorporated as rapidly as studies can be made, and the original reports will be revised to keep them up to date.

Within these sections, the occupations are further grouped by industry or field, with a brief introduction to each which points out the major characteristics and significant trends in the industry. The chapters introducing each major group show the occupations in perspective and in relation to each other. The individual reports summarize recent trends and outlook, together with the latest available data on earnings, on the kind of training and preparation required, on the background of the occupation, on the nature of the work, and the chief locations at which members of the occupation are employed. The reports on agricultural occupations describe the major types of farms in 10 geographic regions, the kind of work involved, and the outlook.

Certain types of information are not included in this handbook because they are readily available from other sources in the United States Department of Labor or other agencies. There is a wealth of material on job descriptions, labor-market reports, occupational analysis, and relationships among occupations ("job families") in the publications of the United States Employment Service,
Bureau of Employment Security. Counselors will find a description of opportunities for women and problems of women workers in the publications of the Women’s Bureau. Information on employment problems of youth is published by the Division of Child Labor and Youth Employment, Bureau of Labor Standards. Information on opportunities and earnings in each locality may be obtained from regional offices of the Bureau of Labor Statistics, community occupational surveys, or from occupational and labor-market reports of local offices of the State employment services. Apprenticeship standards in different occupations are presented in publications of the Bureau of Apprenticeship. Directories and guides of schools or colleges are listed in a recent publication of the United States Office of Education, Federal Security Agency.

The United States Department of Agriculture and the various State departments of agriculture publish information on opportunities in farming. For those who are interested in opening a small business, the United States Department of Commerce has published a series of booklets describing the problems involved in establishing and operating various types of businesses.

**How the Employment Outlook Reports Were Prepared**

Anyone who is trying to provide information on which young people can make a decision about courses of training and lifetime careers must try to look forward at least several years, and if possible several decades. The emphasis in the handbook, as in the occupational outlook research program as a whole, is therefore on long-run changes in employment opportunities in each industry and occupation.

In appraising these long-run trends, the assumption has been made that there will be sustained high levels of general business activity, with continued partial mobilization of about the scope contemplated in the fall of 1950, and that there will be no major war. For practical purposes in vocational guidance, this is the most useful framework for analysis. A major war or full mobilization would create a great scarcity of workers in most occupations, would change employers’ hiring standards, and would otherwise alter the picture of employment opportunities presented in this book. The employment situation would, of course, be altered also by changing levels of business activity, as is indicated in the statements on the occupations that have suffered most severely during depressions. Even in such occupations, however, the long-term trend is more important than short-run fluctuations for appraising employment opportunities in connection with an individual’s choice of a life-time career.

When the Advisory Committee on Education recommended in 1938 that an Occupational Outlook Service be established, it was recognized that the analysis of occupational trends and outlook was a largely unexplored field. It was expected that it would be some years before results would be available; much basic work would first have to be done. Nevertheless, it was pointed out that the need for facts is great. Each year 1½ million young people enter the labor force. Many of them choose a vocation on the basis of no information or partial information or even seriously inaccurate information. If we can give these young people the best we have, even though it is not perfect, it will be of some help to them.

Though the problems of evaluating long-run employment outlook are far from solved, the Bureau believes that, as the result of the first decade of occupational outlook research, it is possible in most cases to discern the major trends. Conclusions as to the future are necessarily far from precise but often accurate enough to answer satisfactorily.

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2 Current Publications of the Women’s Bureau, mimeographed, may be obtained free of charge from the Women’s Bureau, U. S. Department of Labor, Washington 25, D. C.
3 Child Labor and Youth Employment publications, mimeographed, may be obtained free of charge from the Division of Child Labor and Youth Employment, Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C.
4 A copy of a list of available publications of current interest on apprenticeship may be obtained from the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.
6 See, for example, Suggestions to Prospective Farmers and Sources of Information, 22 pp., multilithed, which may be obtained free from the Bureau of Agricultural Economics, U. S. Department of Agriculture, Washington 25, D. C.
7 A copy of a list of available publications of current interest on farmers and other topics of interest to small business firms.
factorily the questions in the minds of those preparing for a career.

The methods of appraising future demand and supply in each occupation which have been worked out on the basis of present experience differ greatly among occupations, since the factors affecting the outlook for one are often quite different from those which affect another.

In general, a number of lines of research are followed. Analysis is made of the growth and changing composition of the population; trends in technology; shifts in marketing and in the public's demand for different goods and services; the changing occupational patterns of industries; trends in employment in the various industries; developments in industrial relations; provisions of collective bargaining agreements; wage rates in various occupations; and industrial hazards. Trends in the supply of workers in each occupation are determined by analysis of statistics on the number of young people in training in colleges or vocational schools or by apprenticeship for each occupation, and by study of the losses of workers to each occupation resulting from death, retirement, or transfer to other occupations.

In the course of each study, trends are discussed with officials of industry, unions, trade associations, and professional societies, and the reports are checked and reviewed by them before publication, to ensure accuracy and to obtain the benefit of their judgment and intimate knowledge of their fields.

The field of agricultural occupations is so broad that only a series of general statements about major types was prepared by the United States Department of Agriculture. The Department points out that even these statements are subject to wide variations within the areas discussed. Rapid changes in agricultural technology make it highly desirable for readers interested in agriculture to check further with county and township advisory committees, land-grant colleges, and farm associations.

The studies yielded much information of value in guidance in addition to the appraisal of the outlook for employment opportunities—such as trends in the type of training required by employers, the relative job security of the craftsman and the semiskilled worker, trends in licensure requirements, or the steps one must take to make sure that he can practice his profession in more than one State. This information is incorporated in the reports.

How can the results of such studies be interpreted in the guidance of individuals? Necessarily, conclusions must be stated in general terms: Employment opportunities will be relatively favorable or relatively poor. It is the task of the individual, aided by the counselor or teacher, to match his personal interests and abilities against the demands of the occupation and the competitive situation which may be expected.

**Grouping and Definition of Occupations**

Arranging information on a great many occupations for a handbook like this presents many dilemmas. From some points of view, it would be useful to group occupations according to the major occupational classes into which they are divided by the Bureau of the Census and the Dictionary of Occupational Titles; yet this would not be realistic in many cases, since in American industry there is often a close relationship in actual practice between occupations which fall into different broad groups. For example, railroad conductor is a managerial occupation according to standard classifications, but a man cannot become a conductor except by promotion from brakeman; it makes sense to discuss conductors in the chapter on railroad occupations rather than in the chapter on administrative occupations. If one attempts to group the occupations by industry, there is no convenient place for those occupations which are found in many different industries—occupations such as engineering or stenography. From other points of view, it would be useful for purposes of vocational guidance to have occupations grouped according to similarity of the work done or according to fields of interest; this might be consistent with a "client-centered approach." Still another method that has been suggested is to group occupations in such a way that those which offer employment opportunities to people with certain types of physical abilities or disabilities would be presented together. Those are but some of the possible approaches to occupational grouping. In despair, the editor of a publication of this type may throw up his hands and group the occupations alphabetically or in some other arbitrary way which removes from him the onus of having to make a decision.
In preparing this second edition of the Occupational Outlook Handbook it was decided to follow no single method, but to present the material in such a way as seemed most appropriate in view of the needs of the users and the realities of the industrial world. The largest proportion of the occupations described in this handbook are included in the chapters covering the major industries in which they are employed. Those occupations which are employed in a wide variety of industries are treated in separate sections under the major occupation groups in which they are classified by the Bureau of the Census and the Dictionary of Occupational Titles. In a few cases where there are reports on only one or two occupations in an industry, these were included in the sections for the major occupation groups into which the occupations fall, no industry chapter having been prepared. An example is "telephone installation and maintenance craftsmen" which is listed under Mechanics and Repairmen.

While the arrangement followed does not conform to any one system of classifying occupations, provision has been made for those who wish to approach the material through one or another of the classification systems. Those interested in classification according to major occupation groups will find that the Dictionary of Occupational Titles classification number has been given for every occupation discussed in the text of this handbook. The first digit of the "D. O. T." number shows the major occupation group, as follows:

0 Professional and managerial occupations:
  0-0 through 0-3 Professional occupations
  0-4 through 0-6 Semiprofessional occupations
  0-7 through 0-9 Managerial and official occupations

1 Clerical and sales occupations:
  1-0 through 1-4 Clerical and kindred occupations
  1-5 through 1-9 Sales and kindred occupations

2 Service occupations:
  2-0 Domestic service occupations
  2-2 through 2-5 Personal service occupations
  2-6 Protective service occupations
  2-8 through 2-9 Building service workers and porters

3 Agricultural, fishery, forestry, and kindred occupations:
  3-0 through 3-4 Agricultural, horticultural, and kindred occupations
  3-8 Fishery occupations

Those interested in occupations related to a field of work will be able to find what they are looking for by using the index to occupational reports classified by broad fields of work (see Use of the Index to Occupational Reports Classified by Broad Fields of Work, p. 9). Finally, an alphabetical index to occupations (beginning on p. 564) is provided for ready reference.

Interpreting Information on Number of Workers in Each Occupation

The handbook gives figures on employment in each field wherever possible, both in charts and text, because the most useful single clue to the prospective employment opportunities in each occupation is the number of workers employed in it. Some occupations are growing; but rarely does an occupation grow so rapidly that the number of new positions opening up each year is as great as the number of vacancies which arise as workers leave the occupation. Even occupations which are declining in size offer employment opportunities to many young people each year because of this turnover. The majority of the job openings are the result of deaths, retirements, and transfers of workers to other fields.

Death and retirement rates vary among occupations, depending on many factors, including the nature of the occupation and the ages of workers employed in it. Carpenters, for example, are an older group of workers than automobile mechanics, on the average, because carpentry is an occupation of long standing, in which few young men were apprenticed in the depression years, whereas automobile repair work has existed for only a few decades, and has grown rapidly, taking in many young men.

To make it possible to estimate the number of jobs which open up annually in each occupation because of deaths and retirements, the Bureau of
Labor Statistics has developed tables of working life expectancy (for discussion see page 17) similar to the actuarial life tables used by insurance companies as a basis for their premium and benefit rates. These tables have been used wherever possible in preparing the occupational reports in this handbook.

The use of these tables may be illustrated by their application to the two occupations cited above—carpenters and mechanics. Because of the difference in the workers' ages, the rate of death and retirement for carpenters (of whom there were 766,000 in 1940) is about 3 percent a year, as computed from the tables of working life expectancy, whereas that for the automobile and other mechanics (of whom there were 974,000 in 1940) is only half as much; and therefore the number of mechanics and repairmen who die or retire each year is less than two-thirds the number of carpenters.

For most occupations in which men are employed the death and retirement rate, as estimated in this way, varies from 1 to 4 percent a year. The rate is usually somewhat higher in women's occupations because so many women leave to get married; for example, as many as 6 percent a year leave the nursing profession, according to a study by the Women's Bureau.

Jobs in each occupation open up also as workers transfer to other types of work. Little is now known about the movement of workers among occupations, but research is continuing on the problems of measuring this significant aspect of replacement needs.

Interpreting Information on Earnings

Few people make an occupational choice solely on the basis of how much money they may be able to earn, but most people do want to have some idea of the earnings to be expected in the various occupations they are considering. For this reason, earnings information is given, insofar as possible, for each occupation in this handbook.

Most of the information on earnings comes from the surveys of the Bureau of Labor Statistics. In some chapters, other Government or private sources were used. The most recent information available on each occupation is reported, and the date of the survey is given.

Where the earnings given are on an hourly or weekly basis, the reader may want to estimate roughly what the amount would be on a yearly basis by considering the information given on seasonality or irregularity of work. Similarly, when the worker receives tips or wages in kind—such as meals or lodging—or has to pay for uniforms, these points are brought out.

The significant thing to remember about the earnings information that can be given in so brief a report is that it reflects only an average and that, like every average, it conceals many variations. Earnings in an occupation may vary according to skill level, industry in which the worker is employed, size of plant, section of the country, and many other factors. Often earnings are different for men and women in the same occupation, or for workers in union shops and shops which do not have contracts with unions.

It is important to bear in mind that for guidance purposes an individual will wish to know what the earnings in each occupation will be several years in the future, when he will have completed his training and is ready to enter the occupation. This cannot be predicted, of course. Wage rates, salaries, and earnings change rapidly and so does the level of prices, which determines what a pay check will buy. The earnings information we can give on each occupation is valuable, however, in suggesting the relative position of the occupation as compared to others: Is it a low-paying field or one which pays about the average, or is it a field in which earnings have been consistently high? Wherever possible, trends in earnings are reported, so that the steadiness or variability of earnings in the occupation is suggested.

How To Obtain Additional Information on Local Employment Opportunities

While many veterans or students who are interested in choosing an occupation do not necessarily expect to find one in which they can work in their home community, there are some to whom this is an important consideration. Workers in certain occupations expect to move occasionally from one city to another to find employment or to get a better job. This is true, for example, of engineers, chemists, business executives, workers in the construction trades and transportation industries, and many others. On the other hand, many workers
in other occupations are less attached to their field of work than to the city in which they live, and would choose an occupation only if they could be sure that there were local opportunities for employment.

The occupational reports in this handbook give information on employment trends and outlook in the United States as a whole, and also briefly suggest the geographical distribution of employment opportunities. To get information on current job opportunities and earnings for his own city or State the counselor should check with local sources.

Other important information also has to be checked locally. Throughout this handbook information is given on how a person qualifies for employment in each occupation—the necessary personal characteristics, education, specific training, experience, licenses, and other qualifications. In using this information one must remember that the individual employer who makes the decision as to whom he will hire usually has his own ideas as to the kind of worker he would like to have in his firm. Each employer will have his own hiring standards, based on his experience, on the particular needs of his firm, and on his personal preferences. The hiring standards of firms in the same line of business within a single community may differ. Moreover, employers' specifications may change from time to time as the supply and demand situation changes, as technological developments make it necessary to have workers with different qualifications, as industry or union practices change, or as attitudes toward employment of women, older workers, handicapped persons, and minority groups are altered. Anyone interested in finding a job in a particular locality has to look into the specific facts about employment opportunities for him in that community.

The local office of the State employment service regularly surveys employment opportunities in its area and often has available complete occupational briefs for important local jobs. Much additional unpublished information may usually be obtained from the local office. For professional occupations the local branches of the various national professional societies may be of help. Similarly, the local office of a union will usually have information on employment opportunities in its field. Through the chamber of commerce and the classified section of the telephone directory lists of specific firms in each type of business may be obtained.

Local information on the earnings and working conditions of workers in important occupations in many localities is issued by the Bureau of Labor Statistics. These reports, called Community Wage Surveys, provide the following kinds of information: employment in each of the important industries in a community, the number of workers in important occupations, their weekly and hourly earnings and hours of work, and the kind of work done by persons in each occupation. Wage rates and weekly working hours are reported for each industry for three main types of jobs (a) office-clerical workers, such as typists, machine operators, and bookkeepers (b) skilled maintenance workers, such as firemen, carpenters, and electricians (c) less skilled workers, such as janitors, truck drivers, and order fillers. The reports also give information on occupations which are found in important local industries (in furniture manufacturing in Grand Rapids, for example). The reports also show prevailing local practices in regard to pensions, vacations, holidays, and sick leave. This picture of the occupational and industrial patterns in local areas is extremely useful to counselors.

Surveys similar to those described, but covering only office workers, have been made in a number of cities. A list of the Community Wage Survey and Office Worker reports available is given on page 574 of this handbook.

Finally, a more comprehensive source of information on local opportunities would be a community occupational survey. Information on how such surveys have been conducted in a number of cities is contained in a publication of the United States Office of Education, and more recent developments are discussed in several articles.

Use of the Index to Occupational Reports Classified by Broad Fields of Work

A person choosing an occupational field needs full knowledge of the wide variety of occupations

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9 Occupations Magazine, Volume XXVI, Number 8, and Volume XXVIII, Number 3.
which may call into play his specific interests and abilities. To widen the range of choice, the counselor may want to call attention to a variety of occupations appropriate to his interests or abilities as shown in interest inventories, aptitude tests, hobbies, or school grades. For this purpose the counselor needs information on the occupations related to each broad type of work.

As an aid in the counseling and placement of young workers, the United States Employment Service devised an Entry Occupational Classification structure, published as part IV of the Dictionary of Occupational Titles. This classifies fields of work, rather than specific occupations. For example, there are such fields as musical work, literary work, child care, metal machining, mechanical repairing, graphic art work, machine tending, and so forth. Specific occupations related to each field of work are also shown. By using this information, it is possible to list a wide range of occupations which may be of interest to a person with a given set of interests or aptitudes.

The user of this handbook may identify the occupations described in the book which are related to each field by referring to the Index to Occupational Reports Classified by Broad Fields of Work, which begins on page 558. This index serves as a guide to the occupations included in the handbook, using the entry occupational classification found in Part IV of the Dictionary of Occupational Titles. For example, a person whose ability lies in the field of artistic work may be interested in information on the commercial artist, industrial designer, fur designer, furniture designer, interior decorator, or photographer. Since many of the occupations related to a field of work are not covered in this handbook, the counselor may wish to refer to part IV of the Dictionary for further suggestions.

Occupations in the Armed Forces

The Armed Forces of the United States offer careers in many of the fields discussed in this handbook. A great many of the jobs done by members of the various services involve training and skills similar to those required in certain civilian jobs. It will therefore be helpful to young people choosing a career or a course of training if they are given information on how service in the Armed Forces will fit in with their job plans.

Those now entering or already in the Armed Forces will be interested in knowing how skills acquired in the service can help them in civilian jobs; through experience in these fields during their period of service they may be able to gain some idea of their interest in and aptitude for the work, even though the nature of the work and the conditions under which it is carried on may be quite different from those in civilian life. On the other hand, people now in civilian jobs may be interested in the opportunities offered by the services to persons possessing their skills.

General information on the occupations in the Army, Navy, Air Force, Marine Corps, and Coast Guard may be obtained from their respective recruiting stations. At the same time, the Army, Navy, and Air Force have published detailed information concerning the career fields offered in each of these services.

Navy

The occupational structure of the Navy is explained in the “United States Navy Occupational Handbook,” Bureau of Naval Personnel, Washington 25, D. C., 1950. This handbook contains 62 vocational information briefs on Navy occupations classified into 12 major groups. Each brief explains the purpose of the job, duties and responsibilities, work assignment, qualifications and preparation, training given, paths of advancement, and related naval or civilian jobs. Promotions, pay rates, retirement provisions, and other aspects of careers in the Navy are explained in the introduction. These books are available in all high schools, colleges, public libraries, State employment service offices, and Navy recruiting stations. The Navy career fields are as follows:

- Boatswain's mate.
- Quartermaster.
- Sonarman.
- Radarman.
- Torpedoman's mate.
- Gunner's mate.
- Fire controlman.
- Fire control technician.
- Mineman.
- Electronics technician.
- Instrumentman.
- Opticalman.
- Teleman.
- Radioman.
- Communications technician.
- Yeoman.
GUIDE TO USE OF THE HANDBOOK

Personnel man.
Machine accountant.
Storekeeper.
Disbursing clerk.
Commissaryman.
Ship's serviceman.
Journalist.
Lithographer.
Printer.
Musician.
Draftsman.
Photographer's mate.
Machinist's mate.
Machinery repairman.
Boilerman.
Engineman.
Electrician's mate.
Interior communications electrician.
Metalsmith.
Pipefitter.
Damage controlman.
Patternmaker.
Molder.
Surveyor.
Construction electrician's mate.
Driver.
Mechanic.
Builder.
Steelworker.
Utilities man.
Aviation machinists mate.
Aviation electronics technician.
Aviation electronicsman.
Aviation ordnanceman.
Air controlman.
Aviation boatswain's mate.
Aviation structural mechanic.
Parachute rigger.
Aerographer's mate.
Aviation photographer.
Tradeoman (training devices).
Aviation storekeeper.
Hospital corpsman.
Dental technician.
Steward.

Air Force

The Air Force has published a series of booklets on each of 42 Airmen Career Fields. Each booklet includes a statement of the scope of the particular career field and a chart of organization which shows the relationships between the various jobs and indicates the paths of advancement. For each job in a field the booklet gives the following information: job summary, job description, job requirements, job progression, and related civilian jobs. Ranks of those holding jobs discussed in the booklets range from private to chief warrant officer. These booklets are printed as Air Force letters and are available at any Air Force recruiting station or Air Force Base. They can also be obtained by writing to the Director of Training, Headquarters, United States Air Force, Washington 25, D. C. These are the airmen career fields:

Intelligence.
Photomapping.
Photographic.
Weather.
Air traffic control and warning.
Communications operations.
Radio and radar maintenance.
Missile guidance systems.
Armament systems.
Training devices maintenance.
Wire maintenance.
Intricate equipment maintenance.
Aircraft accessories maintenance.
Aircraft and engine maintenance.
Rocket propulsion.
Munitions and weapons.
Vehicle maintenance.
Metal working.
Construction.
Utilities.
Fabric, leather, and rubber.
Transportation.
Food service.
Supply.
Procurement.
Administrative.
Printing.
Information.
Personnel.
Education.
Entertainment.
Chaplain.
Management methods.
Budgetary, accounting and disbursing.
Statistical and machine accounting.
Medical.
Rescue and survival.
Ground safety.
Marine.
Firefighting.
Security and law enforcement.
Special activities.

Army

The Army has divided its occupations into 31 career fields which are explained in “Enlisted Personnel—Military Occupational Specialties,” SR 615–25–15. Every job in each career field is presented under these headings: Summary, Duties, Qualifications, and Examples of Duty Positions.
for Which Qualified. The purpose of this book is to re-evaluate the occupational structure of the Army in order to simplify and improve administration. Though intended for Army use, this book is useful to a civilian because it explains what each job is and how it fits into a particular Army career field. Another book, "Enlisted Personnel—Career Fields," contains a job progression chart for each career field showing the paths of advancement from the lowest to the highest enlisted rating. These publications are available at any Army recruiting station or Army post personnel office. The 31 Army career fields are as follows:

- Food service.
- Artillery.
- Armored.
- Infantry.
- Machine accounting.
- Finance.
- Engineering and construction.
- Ammunition.
- Military police.
- Wire maintenance.
- Communications.
- Personnel and administration.
- Medical.
- Motor transport.
- Automobile maintenance.
- Quartermaster maintenance.
- Army aircraft maintenance.
- Electronics maintenance.
- Armament maintenance.
- Special services.
- Scientific services.
- Military intelligence.
- Communications intelligence.
- Railway.
- Information.

- Chemical.
- Marine operations.
- Photography.
- Mapping and reproduction.
- Engineer equipment maintenance.
- Supply.

How To Obtain Current Information

Revised editions of the handbook will be issued from time to time to bring the information up to date and will include additional occupational reports. Their publication will be announced by the Bureau of Labor Statistics. The Bureau will be glad to place any user of this handbook on its mailing list to receive announcements of these and other publications in the Occupational Outlook series, and current releases summarizing the results of new studies. Anyone wishing to receive these announcements should send the request to the Bureau of Labor Statistics, United States Department of Labor, Washington 25, D. C. Persons living in a city in which postal zone numbers are in use are requested to include the number in the address. The coupon on the last page of this handbook may be used for this purpose.

How You Can Help Make This Handbook More Useful

The Bureau of Labor Statistics needs your help in planning future editions of this handbook. How can we make it more useful to you? What additional information about occupations can we give? If you have any suggestions for future editions, please let us have them. The last page of this book contains a convenient form you can use.
Economic and Occupational Trends

To the student learning about occupations, to the counselor engaged in explaining their intricacies, or to the person seeking information on which to base his selection of a course of training or a career, it is important to understand one thing fully: the rapidly-changing nature of our economic life.

Constant change is the most significant aspect of the occupational and industrial world in which we live. Technological, industrial, and social changes increase the need for workers in some occupations, reduce the demand in others, sometimes create new occupations and throw old ones into the discard, and constantly alter the content and character of every line of work.

The rapidity with which the occupational picture changes is illustrated in chart 1. In 1870 a young man may have considered the choice between apprenticing himself to a cooper or to a barber. Both were skilled trades, with long historical traditions behind them. There were nearly twice as many coopers as barbers, indicating a somewhat broader choice of jobs and the need for more new workers each year. Yet, within the span of a man’s life, the number of people who made their living as barbers increased more than tenfold, while employment opportunities for coopers shrank to one-fifth of their previous number.

What happened? With growth in population, a shift of population to cities, increases in average income, and changes in styles, the occupation of barber grew. On the other hand, the occupation of cooper declined as wooden barrels were displaced for various uses by steel drums, aluminum kegs, paper sacks, paperboard boxes, and other types of containers, and because of the introduction of factory methods in making wooden barrels. Thus, because of population growth, technologi-
cal improvements, social change, and the vagaries of fashion, one occupation grew tremendously, and the other fell into the discard.

To the young person looking forward to a lifetime of work—and that means nearly half a century—the fact that these changes occur is significant. To the best of our ability, we must try to anticipate the changes and provide as much information on trends as is possible. Although we cannot foresee anywhere near all that may happen, a real service will have been performed if young people are made aware of the dynamic character of the economy, and if they are prepared to expect changes and to adjust to them. This means maintaining the utmost flexibility and taking the broadest kind of training consistent with adequate preparation for a particular occupation.

To emphasize the changing character of occupational life, as well as to provide background and context for the reports on trends and outlook in each occupation, the growth and changing composition of population and the labor force, the major trends in industry, and their effect on broad occupational trends will be reviewed in the next few pages.

It should be noted first, however, that far greater than the changes shown by the growth of population, the labor force, industries, and occupations are the changes in status of individuals. If the labor force increases by one-half million in a single year, it is because a million older workers died or retired and 1½ million young people left the schools and went to work. But this is only a beginning. The number of changes made by individual workers from job to job within an industry, between industries, from State to State, or from one occupation to another are much more numerous than the movements into and out of the labor force in any given year.

In 1949 an average of nearly one quarter of a million manufacturing workers quit their jobs each month.

In a 2\(\frac{1}{2}\)year period during the war, over 7 million civilian workers changed from one major occupation group to another.

Between 1935 and 1940—in a peacetime period—more than 3 million workers had moved from one State to another, and another 4 million had moved from one county to another within a State.

Taking into account the families of these workers, the number of people who move their place of residence is even greater. In 1947, 25,000,000 people were living in a different county from the one in which they had been living in 1940; half of them were living in another State.

We have just begun in recent years to be able to measure the movements of individuals, and to appreciate the extent and significance of this type of economic change. These movements represent the adjustments people make to a changing environment. Without them the labor market could not function.

It is likely that most young people in school now will want to make similar changes in the course of their working life, either to improve their position, or because the change is forced upon them by loss of a job, poor health, or similar cause. This suggests once more the importance of flexibility in preparing for an occupation.

Population and Labor Force Trends

Population

A basic factor underlying the occupational outlook is the trend in population growth. Changes in the size and characteristics of the population influence the amount and types of goods which will be demanded at various times. They also have a direct bearing on the size of the labor force and on the characteristics of the persons available for work.

Over the past century our history has been one of rapid population growth. This was particularly true in the decades prior to World War I, when the heavy influx of immigrants, the relatively high birth rate, and the constant reduction in mortality, all combined to increase our population. (See chart 2.)

Population growth in the past was closely associated with expanding economic opportunity. The rapidly growing size of our domestic market, combined with great gains in technology, provided the impetus for large-scale expansion of manufacturing, railroads, public utilities, construction, and other types of business. Employment oppor-
tunities grew apace. Although there were, of course, great differences in the rate of expansion among different occupations, there were very few trades or professions which did not record a substantial gain in number from one decade to the next.

Along with rising population, however, there has been a downward trend in the rate of population growth (the percentage increase from year to year). Restrictions on immigration as well as the long-term decline in the birth rate have tended to slow down population growth. During the depression years of the 1930's there were sharp declines in the rates of marriages and births, reflecting the effect of unemployment and economic insecurity. As a result, the average annual rate of population increase dropped from 1.5 percent between 1920 and 1930, to only 0.7 percent in the following decade.

The baby boom.—The outbreak of World War II interrupted this downtrend. There was a sharp spurt in births during the early war years. After a brief slackening during 1944 and 1945, when millions of young men were overseas, marriages and births mounted to extremely high levels. Nearly 4 million babies were born in 1947 as compared to an average of less than 2½ million in the period 1935–39. The “baby boom” continued in 1948 and 1949, with more than 3,700,000 births in each of these years (see chart 3).

A part of the recent increase of births has been viewed as temporary, resulting from the consumption of many marriages postponed by the depression and the war, or moved ahead by favorable economic conditions. However, the marriage and baby booms have already had a significant impact on employment trends, and will continue to influence the future occupational outlook. For example, the high level of demand for consumer goods of all sorts during the past several years has been due in no small part to the fact that many more families have had to be housed and more children fed and clothed.

In the coming years, too, there will be a record demand for additional school facilities and teachers, as the new generation moves through elementary schools, high schools, and colleges. Elementary school enrollments already have begun to climb and are expected to mount steadily to about 26½ million by the late 1950's, or more than 45 percent higher than in 1947. On the other hand, high school enrollments, reflecting the reduced number of births in the 1930's, are likely to remain under 1947–48 levels for a few years. Rapid growth in the number of high school students will begin around 1955 and enrollments will continue to rise into the early 1960's (see chart 3). After the peaks have been reached, enrollments—both elementary and high school—are likely to continue at very high levels for several years.

Long-term prospects.—Looking beyond the next few years, most population specialists have expected a resumption of the historical decline in the birth rate and a further decrease in the rate of population growth. In fact, until recently, they considered it likely that the United States population—in absolute numbers—might actually level off and begin to decline before the end of the present century.
The increase in the aged population.—One important population trend which is likely to continue for many years is the increase in the number of aged persons in the population (see chart 4). The great advances in medicine and public health have enabled more people to live to older ages. In 1900, for example, only about 4 out of every 10 babies could expect to survive until age 65; at present, this proportion is about 6 out of 10. As
a result of this and related population trends, the number of persons 65 or over has been rising rapidly. In 1900, only 3 million people (or about 1 out of 25) were 65 years or over; by 1950, more than 11½ million men and women (or about 1 out of 13) were in this age group. If recent trends continue, the number of aged will more than double before the end of this century and they will make up a significantly greater proportion of the population than at present.

As the aged population grows, we can expect increasing demands for medical services, for institutions to care for the aged, and for those types of goods and services which meet their needs. Problems of social security and old age pensions will come more and more to the forefront. And, at the same time, we can expect increasing efforts to provide more adequate employment opportunities for the older worker, with emphasis on those occupations which are less exacting in their physical demands.

The Labor Force

Although the growth of total population has great importance in occupational outlook, we are more directly concerned with those persons in the population who work or seek employment. The “labor force,” as we shall refer to it, includes not only employees who work for wages or salaries, but also farmers, businessmen, the Armed Forces, and the unemployed. In April 1950, there were over 63 million persons in the labor force—about 57 percent of the population 14 years of age and over.

In the past, the growth of the labor force, from decade to decade, largely paralleled the increase of population. It expanded rapidly during the past half-century from over 20 million in 1890 to 55 million in 1940. With the slowing down in population growth there were corresponding declines in the rate of increase of the labor force. Thus, during the decade 1920 to 1930, the average annual rate of increase of the Nation’s work force was about 1.7 percent; in the decade of the thirties, the rate had dropped to 1.1 percent. In the 1940’s, the downward trend was temporarily reversed. Between 1940 and 1945, the manpower needs of the Armed Forces and of industry brought into the labor force 8 million workers over and above the number indicated by long-term trends. Most of these “extra” workers left the labor force shortly after the end of the war, but in April 1950 the working population was still about 1½ million larger than expected on the basis of prewar trends.

Within the course of the next two decades, population trends will play a decisive role in labor force growth. Relatively small additions to the population of working age are expected until the late 1950’s because of the slump in marriages and births during the depressed thirties. In the following 10-year period, the very large generation of youths born during the war and early postwar years will join the working population; even so, the rate of labor force growth in that decade may be less than between 1930 and 1940.

The rising importance of replacement needs.—A slowing down in labor force growth results in a significant shift in the sources of jobs for new entrants into the labor market. In past periods of rapid labor force growth, the main source of opportunity for the relatively large numbers of new workers lay in the expanding manpower needs of the economy. With a declining rate of labor force growth, however, an increasingly large proportion of the new entrants will find jobs as replacements for workers leaving the labor force because of death, retirement, or other reasons. In order to appraise prospective job openings in different occupations, the study of the age distribution of persons at present in the occupation, and of other factors influencing the rate at which workers are likely to withdraw, will therefore become especially important. This is particularly true in many professional occupations and skilled trades, since relatively few experienced workers normally withdraw from these fields except when they die or retire. Clearly, if other factors are equal, occupations with the highest prospective separation rates will provide the greatest relative number of job openings.

In order to estimate the relative number of replacements owing to death or retirement, in different occupations, “tables of working life” have been developed by the Bureau of Labor Statistics.1

These tables, which resemble the conventional life tables used by insurance companies, include the rates of separation from the labor force at different ages. By applying these rates to a particular occupation for which an age distribution of the workers is available, it is often possible to estimate the number and percent of persons in the occupation who are expected to die or retire in a given period.

**Trends in labor force participation.**—Apart from over-all population trends, there have been significant changes in the extent to which men and women of different ages have participated in the labor force. Almost all able-bodied adult men between the ages of 25 and 55 normally work or seek work. Over the years there has, however, been a steady increase in the proportion of women working outside the home, while the proportion of workers among youth and among older persons has been declining. Chart 5 shows the proportions of different age and sex groups of the population in the labor force in April 1950.

The movement of women into gainful employment has resulted from a combination of forces. The shift of population to the cities and the increased importance of the white-collar occupations, for example, resulted in a great expansion of employment opportunities for women. At the same time, the decline in the size of families and the introduction of labor-saving household devices made it possible for growing numbers of women to accept jobs outside the home.

However, despite these gains in employment, we should note that only about a third of all women aged 20 to 64 were actually in the labor force in April 1950. The great majority of married women, particularly those with small children, still devote their full time to household work. With the increased application of science to household management and to child care, there is, in fact, a growing need for adequate training in home economics and related fields, as well as along strictly vocational lines.²

In contrast to the trend for adult women workers, the proportion of youth in the labor force has been declining. There has been a steady lengthening in the period of schooling, partly because of compulsory school-attendance laws, but mainly because our complex society has required a greater period of formal training. However, as a result of a high level of job opportunities, the postwar period has seen more teen-aged youth in the

POPULATIONS AND LABOR FORCE TRENDS

The labor force (including many students employed part time) than might be expected from prewar trends. On the other hand, considerable numbers of older veterans, who would normally be at work, have been attending schools and colleges under the provisions of the GI Bill of Rights (the Servicemen’s Readjustment Act of 1944, as amended). Most of the veterans still in school will complete their courses and will enter the labor market by 1952. The influx of trained veterans, plus the trend toward longer schooling among younger people, will make advanced education more important than ever before as a means of entry into the better paid occupational fields.

The proportion of older people, particularly those 65 and over, who were in the labor force, had also been declining before World War II. Modern industry, with its dilution of skills and emphasis on speed, offered very limited employment opportunities for the elderly. During periods of depression, older workers who had been laid off found it especially difficult to get other jobs. Public and private programs for old-age pensions and assistance also had the effect of encouraging the retirement of older workers. Although the number of older workers in the labor force was expected to increase with the aging of the population, the rise was expected to be proportionately much less than for the population as a whole.

The war, however, brought a sharp increase in employment opportunities for the older worker. Many elderly persons reentered the labor market, while others postponed their retirement. Even in the postwar period, the proportion of older workers continued somewhat higher than indicated by prewar trends. With jobs still available for them, many older men and women preferred work to retirement, particularly in view of the extremely low level of Federal old-age insurance benefits in relation to postwar wages and living costs. Two important factors in the prospective labor force trends for the older worker will therefore be, first, the general level of job opportunities and, second, the extent to which the recently increased scale of old-age benefits meets the needs of older people.

Movements into and out of the labor force.—Thus far, we have discussed the labor force in terms of its size and composition at a particular time, or in terms of net changes from year to year. Estimates of this type do not reveal how many different persons actually enter the labor force each year, or withdraw for various reasons. For example, during the past few years, the net increases in the size of the labor force have averaged close to 1 million a year. During this period about 2 million young persons (including veterans) entered on a work career each year after leaving school, while about 1 million older workers left the labor force because of death, retirement, or other reasons. The young men generally stay in the labor force most of their lives; most of the women remain only until they marry and begin rearing children. Many married women, however, return to work when their children are old enough to get along without full-time care at home.

In addition to these more or less permanent entries into or withdrawals from the labor force, there is a much larger volume of temporary shifting between worker and nonworker status, depending on the season and on changes in personal circumstances. During 1949, for example, an average of over 5½ million persons moved into or out of the labor force from one month to the next.

Most of these shifts are temporary in character and are largely accounted for by the intermittent work activity of groups such as students and housewives. These temporary movements tend to follow a seasonal pattern. The beginning of summer vacations brings large numbers of young people into the labor force; in the fall, there are heavy withdrawals as students return to school. In farm areas, many people enter and leave the labor force each year in response to the changing needs for labor in agriculture and related activities. In the city, the Christmas shopping season, with its expansion of employment in retail trade, brings many housewives and young people into the labor market for a few weeks in November and December. In addition, throughout the year, there is a considerable amount of temporary labor force entry and withdrawal arising from changes in local employment conditions and in the personal situation of individuals.

There are, therefore, many more persons in the population with some work experience than are likely to be in the labor force at any one time in the year. Although these persons are not available for work through the entire year under normal conditions, they are important as a reserve group who may be attracted into full-time jobs.
during periods of national emergency, or when employment opportunities are particularly favorable.

**Regional Differences**

National trends in population and labor force may not, of course, be indicative of changes in a particular region or locality. In a Nation as large and diversified as the United States, there are bound to be geographic variations in the rates of population and labor force growth.

The map (chart 6) shows the widely differing trends in population growth among the various States in recent years. In part, these divergent trends reflect great interstate variations in the natural rate of population growth (simply, the difference per year, relative to the size of the population, between the number of births and the number of deaths). A more important factor, however, has been the large volume of migration between States. In 1947, 1 person out of every 10 was residing in a State other than the one in which he had been living in 1940; this indicates the magnitude of the geographic shifts in population which occurred in the intervening years.

The most rapid population growth between 1940 and 1949 occurred on the Pacific Coast and in adjacent areas. Although this section has a relatively low rate of natural population growth, it has received a very heavy influx of migrants; between 1940 and 1948, net in-migration into the Pacific Coast States amounted to over $3\frac{1}{2}$ million persons. In contrast, most of the Southern and Great Plains States lagged behind the national rate of population increase. In fact, a few of these States showed net losses in population. Here, too, migration was the dominant factor. On the basis of natural increase, the South, with its high

**CHART 6**

**PERCENT CHANGE IN POPULATION**

**APRIL 1940 — JULY 1949**

- Decrease 7.6% - Increase 59%
- Increase 60% - 12.9%
- Increase 13.0% - 39.9%
- Increase 40% or more

United States Department of Labor
Bureau of Labor Statistics

Excluding persons in the Armed Forces
Source: U.S. Bureau of the Census
birth rates, would have had the fastest-growing population. However, this growth was largely offset by migration of southerners to other areas in search of better economic opportunity; net out-migration from the South from 1940 to 1948 totaled about 3 million. In the Great Plains States, the natural rate of growth has been about equal to the national average, but the movement of migrants out of this area has held down population gains and resulted in some net losses.

In the main, the recent shifts of population have conformed to long-run trends in population movement in the United States. During World War II, however, these movements were greatly accelerated, as workers and their families poured into the coastal shipbuilding and aircraft centers and into the war production areas of Michigan, Ohio, and other industrial States. Most of the migrants stayed on after the war ended. In fact, the flow of population into many of these areas has continued at a high rate in the postwar period.

Very closely related to the geographic differences in population growth are the regional variations in labor force growth. Between 1940 and 1947, the working population of the Nation as a whole increased by about 9 percent. In the West, however, the labor force grew by more than a fifth, reflecting mainly the large influx of population into the Pacific Coast States; in the South, the increase was less than 2 percent.

Although there are pronounced differences in regional population and labor force trends, which must be considered in vocational guidance, the great interchange of population among regions emphasizes the importance of national trends in the labor market. A significant proportion of young people growing up and going to school in a given area will move to other areas some time after they reach working age. This tendency to migrate is particularly marked among professional and semiprofessional workers, for whom something approaching a Nation-wide labor market exists. Thus, it is necessary, in making vocational plans, for young people to be aware of occupational trends throughout the Nation as well as in their own localities.

Industrial and Occupational Trends

Industrial Trends

Eighty years ago more than half the people who worked for a living were employed in agriculture. The United States was mainly a country of farmers; its ways of living and habits of thinking were influenced by this fact. Indeed, today, in any group of students in a city school, there will very likely be some whose grandparents, or even parents, lived and worked on a farm.

The significant change that occurred in the last 80 years—the rapid growth of industry, commerce, and other nonfarming employment—is shown in chart 7. The number of nonfarm workers grew from 6 million in 1870 to 51.5 million in April 1950, while the number of farmers and farm workers increased from about 7 million in 1870 to a peak of 11½ million around 1910, and since then has actually declined to about 7.2 million in April 1950.

On any farm today one can see some of the reasons why this happened. The farmer has machinery which makes it possible for him to cultivate many more acres than could the farmer years ago. With tractor and trucks both on the farm and in the city, much less feed is needed for horses and mules. About 50 million acres that once grew feed for work stock is now in food crops or in feed for cattle, hogs, and poultry. Moreover, farmers use fertilizer and better seed. Science and experience have taught them how to get more out of their farms. In 1944, the average farmer produced nearly twice as much as did the average farmer just before World War I.

With these improvements in farming and in storage and transportation of food—canning, refrigeration, and warehousing, for example—the farms of the United States were able to provide food and other farm products for more and more people. This made it possible for a larger proportion of the population to take jobs in industry.

Increasing Productivity

The industrialization of the country resulted in an increasing productivity of labor because of the wider use of machinery, better management of production, and a better-trained labor force. Output per man-hour—the usual measure of productivity change in industry—increased at an average rate of a little over 3 percent a year in
manufacturing industries between 1909 and 1939. At this rate, output per man-hour would double every 25 years.

As a result of increased productivity, incomes and the standard of living have been rising at the same time that the average workweek has been growing shorter. With more purchasing power at their disposal, people have bought more and more goods and services and many new industries have developed. Government and private services in such fields as education, medical care, public health, and welfare have also expanded. The greater expansion in services and in distribution in recent years reflects the major industrial trends of the past three decades. The basic extractive, commodity-producing and transportation industries have required a smaller proportion of the Nation’s work force; the industries which provide distributive and other services have given jobs to a growing proportion of the workers. This trend, interrupted during World War II by the great expansion of aircraft, shipbuilding, and munitions manufacturing, has been resumed since the war.

**Recent Employment Trends**

Recent trends in employment are shown in chart 9, which extends from 1929 through the depression, World War II, and the postwar period. In the top line is seen the gradual growth of the labor force and its rapid increase during the war, as students, women, and older workers came in to meet the demands of the Armed Forces and civilian industry for manpower.

The severe drop in employment in nonfarm industries that marked the onset of the depression—from 37 million in 1929 to a little less than 29 million in 1933—is also shown. As a result of the drop in employment and the growth of the labor force, the number of unemployed increased from about 13½ million in 1929 to nearly 13 million in 1933.

Then began a slow recovery, temporarily set back by a recession toward the end of 1937. By 1939, the year the war began in Europe, nonfarm employment had increased by 7½ million from the low in 1933, but was still a million below its average in 1929. Unemployment had been reduced by only...
3½ million from the peak of nearly 13 million, however, since the labor force had continued to grow. It was particularly difficult for younger workers and older workers to get jobs.

Those in school today may not remember the depression years; their attitudes are influenced more by the conditions of relative prosperity since 1940. Yet the thinking of their parents, of their teachers, of the employers for whom they may work, of the unions they may join, and of the leaders in public life is strongly affected by the experiences of the thirties. It will help in understanding much of the information on occupations given in the reports in this handbook if one has a realization of the difficulties of those years.

Among the general effects of the depression decade upon occupations were these:

1. Young people found it particularly hard to get jobs. The rate of unemployment was high among them, despite the fact that many continued in school and were not classified as unemployed. Older workers also found it difficult to get jobs.

2. Employers, faced with many job applicants and the necessity to save money by having only the most efficient workers, raised their hiring standards. The best-trained or experienced workers got the jobs. This hastened a long-term trend toward a preference for applicants who had more education. Where grade-school graduation had been considered adequate, employers began to specify that they wanted only high-school graduates; where high-school graduation had been a requirement employers began to give preference to the college-trained person.

3. People got jobs where they could, and so there was a great deal of occupational shifting down the scale of skills. Many a professionally trained and experienced worker took a clerical, sales, or semiskilled job. Many a craftsman worked in semiskilled or laborer jobs. Their skills grew rusty from disuse.

4. To preserve the employment security of their members, and to prevent poorly trained people from entering their fields, some unions and pro-
fessional societies took action to tighten up entrance requirements. Often this went hand in hand with the improvement of training. In the professional fields, particularly, it represented the continuation of a long-term trend toward raising the standards of education and training.

5. Earnings, of course, dropped in nearly every field of work.

6. In an effort to share what work there was among as many people as possible, the workweek in industry was shortened. This was again a continuation of a long-term trend. The Fair Labor Standards Act, which became law in 1938, required that workers covered by its provisions be paid time and a half for work in excess of 40 hours in 1 week. In a number of industries an even shorter workweek of 35 or 36 hours was agreed upon by unions and employers.

Changes During and Since World War II

Then came World War II. As industry swung into production of munitions, nonfarm employment rose rapidly from 36 million in 1939 to 45 million in 1944. The Armed Forces, which had averaged about 300,000 throughout the decade of the thirties, added 11 million more men and women within 4 years. As a result, the number of unemployed dropped from 9½ million in 1939 to about three-quarters of a million in 1944.

Hiring standards which had been stiffened during the depression were relaxed. Skilled jobs which had required a long period of training were broken down so that the work could be done by a number of quickly trained workers, often under the supervision of a skilled worker. Young people found it easy to get jobs, and often at pay that made their fathers wonder why they had spent 25 years learning and gaining experience in a trade. Older workers postponed their retirement because their skills were needed in industry and they could earn good pay. Women whose children no longer needed their care came into the labor market.

As World War II neared its end, many people, remembering the depression from which the war had pulled the country, were afraid of a postwar recession. They feared the number of unemployed would skyrocket when the millions of workers engaged in munitions production were laid off, and the more than 11 million men in the Armed Forces were demobilized, many of whom had had no experience in civilian occupations.

Although there was a sudden drop in employment when munitions production stopped, other industries quickly hired the workers. Stimulated by high consumer income and by rising demand for the products that had not been available during the war, such as new houses, automobiles, and washing machines, industry invested over 20 billion dollars a year in plant and equipment, and hired more and more workers. At the end of 1948, with the Armed Forces demobilized from over 11 million to less than 2 million, nearly 60 million people were employed. The number of unemployed did not rise above 3 million at any time in this period, and toward the end of 1948 was less than 2 million.
Thus, the country weathered the period of adjustment from war to peace better than many people had expected. For the time being, at least, the Nation had attained conditions close to a state of full employment. It was relatively easy to get a job, the "Help Wanted" signs were up, and most of the unemployed were persons who were out of work for only short periods between jobs. This did not mean that everyone could get the job he wanted, but the fear of complete unemployment for long periods was at least temporarily banished.

By 1949, some of the backlog of consumer demand had been worked through. Sales of such products as radios and washing machines slackened. Textiles became harder to sell. But other industries were still meeting heavy demand for their products; construction and automobile production were still booming. The economy as a whole worked along at high levels, but the number of people employed averaged about 700,000 less than in 1948. This was a drop of little more than 1 percent, but since the total labor force was rising by some 700,000 a year because of population growth, the number of unemployed persons increased to an average of 3.4 million in 1949—the highest for any year since 1941.

A new upturn in business activity and employment began in early 1950, however. Gains were accelerated in the middle of the year, owing to the outbreak of hostilities in Korea and plans for expanded defense production. Employment is expected to rise still higher in many industries as the Government's orders for aircraft and munitions go into mass production. At the same time, many young men will be withdrawn from civilian jobs for service in the expanding Armed Forces. Thus, jobs should generally be easy to get at least so long as the mobilization continues. However, opportunities will vary from one industry and occupation to another, as well as among local areas. In some occupations and areas, there will be labor shortages; in others there will be enough workers or, in some cases, possibly even a surplus of workers available.

The major industry fields and their relative importance as a source of employment are shown in chart 10. In studying this and the following charts, it would be well to bear in mind that the size of each industry or occupation is a clue to the number of employment opportunities.

**Manufacturing**

Manufacturing industries employ the largest number of people, and offer jobs to many different kinds of workers: the unskilled laborer, the machinist, the engineer, the stenographer, the pro-

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**CHART 11**

*MAJOR MANUFACTURING INDUSTRIES AVERAGE EMPLOYMENT 1949*

<table>
<thead>
<tr>
<th>Industry</th>
<th>Millions of Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>DURABLE GOODS</td>
<td></td>
</tr>
<tr>
<td>Machinery, except electrical</td>
<td></td>
</tr>
<tr>
<td>Transportation Equipment</td>
<td></td>
</tr>
<tr>
<td>Primary Metal Industries</td>
<td></td>
</tr>
<tr>
<td>Fabricated Metal Products</td>
<td></td>
</tr>
<tr>
<td>Electrical Machinery</td>
<td></td>
</tr>
<tr>
<td>Lumber</td>
<td></td>
</tr>
<tr>
<td>Stone, Clay and Glass</td>
<td></td>
</tr>
<tr>
<td>Furniture</td>
<td></td>
</tr>
<tr>
<td>Instruments and Allied Products</td>
<td></td>
</tr>
<tr>
<td>Ordnance and Accessories</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>NONDURABLE GOODS</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
</tr>
<tr>
<td>Textiles</td>
<td></td>
</tr>
<tr>
<td>Apparel</td>
<td></td>
</tr>
<tr>
<td>Printing and Publishing</td>
<td></td>
</tr>
<tr>
<td>Chemicals</td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td></td>
</tr>
<tr>
<td>Leather</td>
<td></td>
</tr>
<tr>
<td>Products of Petroleum and Coal</td>
<td></td>
</tr>
<tr>
<td>Rubber</td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td></td>
</tr>
</tbody>
</table>

United States Department of Labor
Bureau of Labor Statistics

Wage and Salaried Workers

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Federal Reserve Bank of St. Louis
duction manager, and—more than any other type of worker—the operative, or semiskilled worker. Four out of 10 employees of manufacturing industry were operatives in 1940.

The major manufacturing industries are shown in chart 11. A little more than half the workers are employed in the durable goods manufacturing industries, the others in the nondurable goods industries.

Largest among the durable goods industries are the metalworking group. These plants make a great variety of products, such as steel beams and pencil sharpeners, automobiles and hairpins, giant dynamos which generate electric power, and tiny lamp bulbs which put the electricity to work in our homes. During World War II, plants making consumer goods such as washing machines and lipstick holders shifted over to the manufacture of antiaircraft guns and cartridge cases, and the small aircraft and shipbuilding industries grew to enormous size. Though in early 1950 they had fewer workers than during the war, the metalworking industries were producing far above their pre-war levels, and by the middle of the year, their output and employment were mounting again. These industries and their workers will, of course, have the same central role in the new mobilization program as they did in armament production during World War II.

Employment in the lumber, furniture, and building materials industries follows closely that in the construction industry. More lumber, window glass, structural tile, and furniture are sold in years when a large volume of homes and other buildings are put up.

The major nondurable goods manufacturing industries are those which make textiles, clothing, and food. The chemical industries and the printing and publishing industries are also large.

Employment in manufacturing drops severely during depressions and rises sharply during periods of good business conditions, as can be seen in chart 12. It is the durable goods industries which have the greatest ups and downs, because when people have no money they can postpone buying homes, automobiles, and washing machines much longer than they can put off buying food and clothing. Similarly, businessmen can put off buying new machinery. Manufacturing employment dropped by about 35 percent from 1929 to the bottom of the depression, and then began to recover. During World War II, employment shot up by 7 million, mostly because of the expansion of metalworking industries.

More complete information on employment trends in some of the major manufacturing industries may be found in later sections of this handbook, particularly those on the iron and steel industry, page 243, aircraft, page 273, shipbuilding, page 259, machine shop occupations, page 186, furniture manufacturing, page 284, the printing trades, page 299, petroleum refining, page 331, plastics, page 293, and fur manufacturing, page 342. The largest industry groups not covered in the present edition are the food, textile, apparel (except fur), chemical and lumber industries.
Trade

Retail and wholesale trade have more than 9 million employees, and in addition provide a living to well over a million proprietors. Salesmen and sales women constitute the largest group of employees in trade, but there are also large numbers of clerical workers (who keep the records and send out the bills), truck drivers and delivery men, and service workers, such as elevator operators and porters.

Employment in trade fell during the depression but recovered quickly and by 1937 was higher than in 1929 (chart 13). In this can be seen the effect of the long-term upward trend in this field of work. Employment rose further before World War II, and after the war reached a level more than 8 million higher than the 1929 peak. One of the factors in the growth of this industry has been the increasing amount of services of all kinds provided for customers.

The only major industry in the field of trade covered in the present edition of this handbook is the restaurant industry, page 478. In addition are a number of occupations found primarily in one or another branch of trade, such as service-station attendants, page 147, pharmacists, page 57, automobile parts salesmen, page 145, and meat cutters, page 240.

Agriculture

Farming, although it has lost workers in recent years, is still one of the largest fields of work. In addition to nearly 6 million farmers who own and run their own farms, there are a large number of people who work as farm laborers. Their number fluctuates seasonally—about 2 million are employed in the winter, and well over 4 million farm laborers are employed in the summer. Many of those who work during the peak season are students and housewives or are in other occupations during the rest of the year.

Government

Government employment—local, State, and Federal—was 53 4/10 million in 1940. More than two-thirds of the workers were in local and State governments, employed in such occupations as teacher, nurse, engineer, typist, and policeman. In shipyards, arsenals, and printing plants the Federal Government employs many workers in industrial occupations. Although people often think of the clerical worker as the typical Government worker, only a fifth of the Government workers were in this category in 1940. One of the largest Federal occupations is that of mail carrier.

In line with a long-term trend, employment in government has been rising fairly steadily since 1929, dropping back only slightly from 1931 to 1933, increasing in the thirties and rising sharply during the war (see chart 14). Government is providing increased services through the schools, public health and sanitation, welfare work, and similar fields. A larger defense establishment, services to veterans, and a growing amount of research has also increased the number of Government employees.

In addition to the civilians employed by the Federal Government there were one and a half million men in the armed services in mid-1950. It was planned to raise this figure to 3 million by mid-summer of 1951, thus doubling the size of the Armed Forces within a year. The Armed Forces use men and women with many different kinds of skills, such as machinists, airplane mechanics, or electricians, and give courses of training in these fields (see p. 10).
service industry described in this edition of the handbook. There are also some occupations found primarily in service industries, such as most of the mechanics and repairmen, page 159, dry cleaners and spotter, page 238, and dental mechanics, page 236.

**Transportation and Public Utilities**

In the transportation and public utilities industries major fields are the railroads, trucking companies, bus and transit lines, telephone and electric-power companies, and the merchant marine. Air lines and radio and television broadcasting are smaller fields, but seem to be of considerable interest to young people. These industries employ about 4 million workers with many different kinds of skills, such as locomotive engineers, truck drivers, telephone operators, musicians, engineers, seamen, ticket agents, and pullman porters. The great majority of the workers are men. By far the greatest portion of the women employed in these industries are clerical workers.

Employment dropped sharply in the early thirties, and did not return to the 1929 level until after World War II (see chart 16). During the war, improvements in efficiency and longer hours of work made it possible for the railroads to carry a record amount of freight with fewer workers than in 1929. The public utilities were able to reduce employment by cutting down their installation and service work; since the war they have expanded a great deal.
The major transportation and public utility industries covered in the present edition of this handbook are railroads, page 404, electric light and power, page 457, and aviation, page 435. In addition are the following occupations found primarily in the transportation, communication and public utilities field: radio announcers, page 123, radio broadcasting technicians, page 103, telephone installers, page 175, and ship radio operators, page 105.

Construction

The construction industry had an average of over 2 million employees in 1949. This industry is noted for sharp variations in employment; between 1929 and 1933 employment dropped by nearly one-half (see chart 17). An unusually high proportion of this industry's workers are skilled men (carpenters, plumbers, etc.) ; however, there are large numbers of laborers and of semi-skilled workers such as truck drivers. The few women employed in this industry are mostly clerical workers. The industry is more fully described in the chapter beginning on page 348.

Finance

Finance, as a major field of work, includes principally banking, insurance, and real estate. The most common occupations are clerical. There has been a long-term upward trend in these industries (see chart 18). By 1941 employment had recovered to above the 1929 level, and, after dropping during the war, reached a new high in 1946 and advanced further through 1949. This increase reflects the activity in building and real estate, increases in the purchase of insurance, and the expanding use of banking facilities in the post-war period. The present edition of this handbook has a chapter on only one of the major branches of this industry—insurance, page 473.

Mining

In mining, which includes mainly coal mining, ore mining, quarrying, and oil and gas extraction, less than a million workers are employed. The largest occupational group is, of course, the miners who dig out the coal or ore by hand, or by machine, or blast it out by explosives. There are opportunities for large numbers of other workers in the industry, too.

The long-term employment trend has been downward as machine mining methods have increasingly supplanted pick-and-shovel mining (see chart 19). There are many mines, however, where hand methods are still in use because it does not pay to introduce mechanical cutting and loading equipment.

The only industry in the mining group described in this edition of the handbook is petroleum production (p. 331).
Occupational Trends

While the industrial picture of the United States shows where people work, the occupational picture in chart 20 shows the kinds of work they do.

It can be seen that by far the largest group is the semiskilled workers, of which machine operators in factories and truck drivers are typical examples. Clerical workers are the next largest group, and skilled workers the third largest.

Many young people considering the choice of an occupation single out one of the professions as their goal. Not many will be able to enter these fields, however, for they give employment to only 7 percent of all workers. The whole group of “white collar” occupations, which may be broadly interpreted to include the groups near the top of chart 20—professional and semiprofessional, administrative (proprietors, managers, and officials), clerical, and sales workers—consisted of only about 37 percent of all workers.

The principal occupations within each major group will be described in later sections of this handbook, together with the trends in each broad field. At this point, only the long-term trends in the size of each group relative to the others will be summarized.

Since 1910 the farm, farm laborer, and nonfarm laborer occupations have been claiming a smaller and smaller proportion of the workers (chart 21). As machinery has been introduced in industry and on the farm, the machine operator who is a semi-
INDUSTRIAL AND OCCUPATIONAL TRENDS

OCCUPATIONAL TRENDS, 1910-1940
PERCENT OF TOTAL WORKERS ENGAGED IN EACH FIELD

FARM AND UNSKILLED LABOR OCCUPATIONS DECLINED...

SKILLED WORKERS HELD THEIR OWN...

ALL OTHER FIELDS INCREASED...

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Source: U.S. Bureau of the Census

http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis
skilled or skilled worker has taken the place of the unskilled laborer. As a result, the semiskilled group has been growing rapidly while the laborer occupations declined. This trend has been further advanced by developments since 1940.

The skilled occupations just about held their own over the three decades 1910 to 1940, but since 1940 have increased their share of all workers.

The other fields—clerical, sales, administrative, professional, and service—have been increasing in relative size. However, this has not been true of domestic service (which is not shown separately in the chart).

These occupational trends arise in part from the basic industrial changes described above; namely, the growth of nonfarm industries, and the expansion of trade and service industries which employ large numbers of workers in clerical, professional, service, administrative, and sales occupations. Technological developments and changes in style or custom also affect the number of people employed in different occupations.
Professional, Semiprofessional, and Administrative Occupations

These three major groups of occupations have many attractions for young people considering the choice of a career. There is opportunity for interesting and responsible work; earnings are, as a rule, relatively high; and professional and administrative work is at the top of the ladder in prestige. Although manual skill is required in some of these occupations—for example, those of surgeon or draftsman—the outstanding requirements are knowledge of the field and responsible judgment. It should be remembered, of course, that these qualifications are needed also in other types of work. Many skilled trades and clerical and sales occupations are closely related to professions or administrative occupations, and also require ability, training, experience, and a high order of knowledge and judgment.

The occupational outlook reports included in this section are grouped by fields of work representing areas of interest in vocational guidance. Studies of additional occupations are under way and will be added to future editions of this publication.

PROFESSIONAL OCCUPATIONS

What is a profession? It is difficult to arrive at a satisfactory definition. Some professions such as those of engineer, architect, and physician are concerned with developing or applying well-organized fields of knowledge; others, such as editor and actor, do not always require a great deal of theoretical knowledge, although the work is considered professional. Generally, the professions require either education equivalent to college graduation (often, plus an advanced degree) or experience of such kind and amount as to provide a comparable background. Licenses are required for practice in many professions—medicine, dentistry, and pharmacy, for example; in these professions, the licensing authorities determine the qualifications which members must have. Professional societies also set up standards for membership, which tend to define their respective fields. In many areas of work, however, there is no clear-cut line between professional and other classes of workers.

Even though the professional field as a whole is growing in size, many more young people want to enter the professions than there is room for. This is partly because the professions have prestige and partly because many young people do not know enough about the opportunities for interesting jobs and good careers in nonprofessional occupations. Many a person has passed by the opportunity of becoming a top-notch artisan to become a mediocre professional worker.

It is not easy to prepare for and enter professional work. For some professions, one must complete a long period of training and grinding study in competition with the very brightest students. In many cases, difficult examinations must be passed in the colleges and professional schools and before State licensing boards. Often, applicants are not accepted for professional training unless their school grades are high, and employers frequently give preference to graduates whose grades in professional school put them in the highest fourth or half of their class. Furthermore, many professional workers have to continue their education in later life, to keep abreast of new developments in their fields.

Past Trends

The professions as a group have been expanding rapidly and probably will continue to grow. From less than half a million in 1870, professional and semiprofessional workers increased to over 4 million in early 1950—a tenfold increase within a life-
time. (See chart 23.) Just after the Civil War, the leading professions were the traditional ones of teaching, medicine, the ministry, and law. Three out of four professional workers were in these occupations. Many other occupations, which now have full status and recognition as professions, at that time included only a few hundreds or thousands of people, many of whom had training which, by present standards, was far from adequate.

Since that time, other professions have grown greatly. For example, by 1940, the number of engineers was nearly 40 times greater than in 1870. Of the “big four” of 1870, only teaching has kept pace with the growth of professions as a whole. By 1940, the legal profession had increased to
about 4\frac{1}{2} times its size in 1870, the ministry to about 3\frac{3}{2} times, the medical profession only about threefold. The number of women in the professions has grown even more rapidly than that of men; in April 1950, 1 out of every 9 working women was in a professional occupation (usually teaching or nursing), compared to only 1 out of 16 men.

The growth of the professions was fairly steady over the seven decades after 1870—especially rapid in the prosperous twenties; somewhat slower in the thirties. The supply of college graduates increased steadily to 1920, as shown in chart 24, and then rose sharply between 1920, as shown in chart 24, and then rose sharply between the two world wars.

Recent Developments and Future Prospects

During World War II many more engineers, physicians, nurses, chemists, and other professional workers were needed than ever before. Some training programs were stepped up—medical and dental training was accelerated, for example—but it was impossible to train as many people in these critical occupations as were needed by the Armed Forces and civilian industries. Furthermore, the number of new graduates in some fields, such as business administration, library science, and teaching, decreased sharply during the war years. There was a drop in the total number of college graduates in all fields combined, as shown in chart 24.

Employment of professional workers in civilian jobs decreased somewhat during World War II, as many thousands were inducted into the Armed Forces (chart 25). An increase in the number of women professional workers was not enough to offset the loss of the men. Shortages developed in almost every major professional field.

As the Armed Forces were demobilized, many physicians, engineers, lawyers, teachers, and others returned to civilian jobs; employment of professional workers increased. Nevertheless, shortages continued in many fields. The peacetime economy of high employment during the late 1940's demanded many more workers than were available. Workers continued to leave certain fields, such as teaching, because of relatively low pay or poor working conditions. In some fields, the number of new entrants was very small in the first postwar years, owing to the drop in college enrollments during the war.

Aided by the educational benefits provided for veterans, a record number of students enrolled in college in the fall of 1946. Still greater numbers enrolled in the fall of 1947 and of 1948; by the fall of 1949, college enrollments had risen to an all-time high of nearly 2.5 million. As a result of these large enrollments, record numbers of degrees have been awarded in the last few years. More than 270,000 bachelor's degrees were granted in the academic year 1947-48, compared to the prewar high of only 186,500 in 1939-40 (chart 24). In 1948-49, 367,000 bachelor's degrees were awarded. Unprecedented numbers of master's and doctor's degrees were also granted that year.

At the beginning of 1950, the shortages in many professions had been alleviated, and some graduates were having difficulty in obtaining jobs in their fields. However, by the fall of the year the
employment situation for many of the professional occupations had again changed. The expansion of the Armed Forces and other defense programs were rapidly increasing the demand in many fields, as is brought out in the reports on individual professions in this handbook.

Altogether, from 1940 to 1950, the growth in the number of professional workers was greater than in the previous decade, despite the effect of the draft upon college enrollments during World War II. (Part of the apparent increase in employment between 1949 and 1950 shown in chart 25 is due to an improvement in the Census sampling procedure, which gives more accurate data for professional and semiprofessional workers).

After reaching a peak of nearly 434,000 in the year ending June 1950, the number of bachelor's degrees is expected to decline somewhat, owing to the exhaustion of veterans' educational benefits and the decrease in the college-age population resulting from the low birth rate of the thirties. In addition, enrollments will be reduced to the extent that students enter the Armed Forces. By the late fifties, enrollments will probably begin to rise again, as the babies born in the early 1940's reach college age. Another factor which will tend to increase college enrollments over the long run is the trend for a larger proportion of young people to take post-high-school training (see chart 24).

Employment in the professions will probably continue its long-run upward trend throughout the fifties. The expected expansion of employment will be distributed among nearly all of the major professional fields; even those which are growing very slowly will require new entrants as replacements for members of the professions who die, retire, or leave for other reasons. The reports on individual professions should be examined to determine the employment outlook by occupation.

Increasing Training Requirements

Young people interested in entering a profession should also consider the trend toward requiring more and more educational preparation for professional jobs. In one occupation after another, training requirements have moved in the same direction over the years: From informal on-the-job training or apprenticeship with an experienced member of the profession to full-time institutional study (for a period of years which has grown longer and longer) followed by some form of on-the-job training.

This trend has been more pronounced in some occupations than in others. In chemistry, for example, graduate training is necessary for a higher proportion of the jobs than in engineering. Nevertheless, as one examines different fields, the efforts to raise standards and improve the quality of training become evident.
Charts 26 and 27 show the tremendous increase in graduate degrees awarded since 1920 in all fields taken together. The number receiving master's and doctor's degrees had reached unprecedented heights by 1950. They were expected to rise still further, in view of the peak number of bachelor's degrees granted in 1950 and the years immediately before. However, the level of graduate enrollments for the next few years at least, will depend largely upon Selective Service policies regarding deferments.

The extension of education requirements has been due partly to the growing complexity of each field of science. The desirability of a broad educational background as a preparation for work as well as for life is receiving greater emphasis. The increase in college graduations has also contributed to the trend; because so many workers with degrees are available, a degree has become necessary to compete for employment in many fields.

It is believed that these trends will continue: That employers will require college education as a minimum qualification for more and more different occupations or, at least, will give preference to people with such education; also that an increasing amount of education will be required by employers or State boards of licensure for occupations in which some college training is already a prerequisite.

SEMIPROFESSIONAL OCCUPATIONS

The line between professional and semiprofessional occupations has never been sharply drawn. In general, the word "semiprofessional" implies that an occupation is similar to a profession in that it requires rather extensive education or practical experience or both. Semiprofessional fields, however, usually demand less background or involve less need for initiative and judgment in dealing with complicated work situations than fields which are classed as "professional".

The professional engineer, for example, is given basic training in higher mathematics and
scientific principles, which he applies to each new problem, whereas the semiprofessional draftsman is required merely to have a practical knowledge of scientific methods and practices, so that he can translate the engineer's sketches into blueprints. In actual practice, the distinctions are not so clear-cut: many a draftsman is required to know more than this implies, and, also, many draftsmen have advanced to jobs as professional engineers because of personal ability and study. On the other hand, some firms start their new graduate engineers as draftsmen so that they can learn the work from the ground up, and many of these men do not advance beyond the draftsman's job, particularly during depressions.

The major semiprofessional occupations are shown in chart 28. Employment in some of these occupations—for example, airplane pilot—has increased substantially since 1940, but draftsmen and laboratory technicians are still the largest semiprofessional groups.

The semiprofessional field as a whole has grown rapidly in recent years. Scientific and technical work has become more highly organized, particularly in the laboratories and engineering departments of large firms, and more semiprofessional assistants have been provided for the professional workers. During World War II, with a shortage of engineers and chemists, it was discovered that men with less training could perform part of the work formerly done by engineers or chemists, freeing the latter for the more difficult tasks.

CHART 28

MAJOR SEMIPROFESSIONAL OCCUPATIONS

EMPLOYMENT IN 1940

- Draftsmen
- Laboratory Technicians
- Morticians
- Religious Workers
- Photographers
- Designers
- Sports Instructors
- Medical Service Workers, n.e.c.
- Surveyors
- Dancers
- Radio Operators
- Technicians, exc. lab.
- Athletes
- Airplane Pilots
- Showmen

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

*Number of women too few to show on chart

Source: U.S. Bureau of the Census
The number of semiprofessional workers employed in civilian jobs did not decrease during the war, as did the number of professional workers. Employment of semiprofessional personnel increased sharply in the first two years after World War II and then leveled off. (The increase in employment between 1949 and 1950 shown in chart 29 is accounted for, at least in part, by an improvement in the Census sampling procedure, which gives more accurate data for professional and semiprofessional workers). In the early 1950's, it is likely that the number of semiprofessional workers will again increase somewhat as the defense program expands.

**ADMINISTRATIVE AND MANAGERIAL OCCUPATIONS**

Administrative and managerial work offers many opportunities for employment. Considered broadly, the field of work covers a wide range of occupations, from the proprietor of a lunch counter, to the president of a giant corporation. The majority of the jobs are concerned with the management of business firms, but there are also many thousands of administrative workers employed in the Federal Government and in State and local governments.

Chart 30 shows the trend of employment between 1940 and 1950 in groups classified by the Bureau of Census as proprietors, managers and officials, except farm. Except for a drop in 1943, employment in this group rose steadily from 3,750,000 in 1940 to about 6,400,000 in 1948. The number of these workers fell off slightly in 1949, but by 1950, employment had almost regained the 1948 level. Proprietors of business firms, mainly retail stores, account for the largest share of the employment in this group, and employment declines in 1943 and 1949 at least partly reflect the drop in the number of business enterprises in these years.

Other occupations included in the proprietors, managers and officials group include postmasters, with 39,000 employed in 1940, other government officials, adding up to about 194,000 in 1940, and railroad conductors. Another large group is composed of managers and officials in specialized jobs, such as advertising agents, store buyers and department heads, building superintendents, and purchasing agents. This group accounted for a total employment of 335,000 in 1940.

**Types of Administrative Jobs**

Jobs in business management can be grouped in several broad classes. At the top are the general administrators, the persons who set broad policies and who have over-all responsibility for the operation of the company or a major segment of its activities. Included in this group are such top officials as presidents, vice presidents, general managers, division superintendents, and men with similar titles. Persons who run and operate their own businesses have the same general function but usually on a much smaller scale.

In the second level of administrative jobs are those who direct individual departments or special phases of a firm's operations, such as plant managers, personnel managers, comptrollers, sales managers, purchasing agents, branch office managers, and department store buyers. In very large corporations, those in charge of these functions have great responsibility and are often considered part of the top management.

In the third category of administrative jobs are those who specialize in particular business techniques. They include the accountants, advertising copy writers, market research analysts, salesmen, statisticians, insurance underwriters, and
personnel technicians. These workers are employed not primarily to supervise other workers but to carry on special business operations, such as auditing accounts, preparing advertisements, selling, and training new workers. Their duties are professional in nature rather than managerial. They involve mainly knowledge and skill in the application of particular techniques. Some of these men can, of course, advance to executive positions in their departments. For example, top-notch salesmen who demonstrate administrative ability may be able to become sales managers.

There are not a great many jobs at the top administrative level, except in the management of small business firms. Of the more than 3,000,000 persons who were reported in the miscellaneous group of proprietors, managers and officials, except farm, by the 1940 Census of Population, the great majority were the owners or managers of relatively small enterprises. For example, almost 2,000,000 were employed in wholesale or retail trade, mainly as the owners or managers of small stores. In many industries where there are a great number of fairly small owner-operated firms, knowledge of a particular trade or technical process counts more toward success than does managerial ability. Examples of such businesses are neighborhood bakeries, shoe repair shops, and small print shops. Nevertheless some knowledge of business administration methods is becoming increasingly necessary for the proprietors and managers of small businesses.

The duties and responsibilities of the managers of small firms are obviously quite different from those of the high officials of large corporations. The top executives of large companies usually make plans, set policies, and supervise and review the over-all operations of the company. Carrying on the more detailed and specialized managerial activities is entrusted to subordinates. Executive jobs, even at the lower levels of responsibility, are not open to newcomers, and years of experience are required for advancement to these positions.

The various executive and specialized jobs in business are essential in the operation of business firms and they require a high level of intelligence and considerable experience. However, they have not yet achieved recognition as professions, in the sense that law, medicine, engineering, and similar fields are regarded. Business jobs fall short of being professions in several ways. Their functions and duties have often not been clearly defined. In some cases there is no basic methodology established or standard procedure recognized. Although there are now definite formal college training programs for most business jobs, they have not been recognized to the extent that they are, by law or custom, a necessary qualification for the job. Business is still noted as a field in which many men with outstanding ability and energy are able to rise without the benefit of a college education.

**Increasing Complexity of Business Organization**

Most of the high-level administrative jobs and specialized jobs that now exist in business are a fairly recent development. It was only about 75 years ago that really large-scale industrial and commercial establishments such as we have today began to appear. The growth of modern large corporations with thousands of individual owners has brought about the employment of a large group of salaried managers and executives.
As business became larger there were more and more things that a single owner or manager could not supervise. At the same time, business operation was becoming much more complex, partly because of the large scale, and also because new techniques were being developed in the production and distribution of goods. In the past an individual businessman might act as his own factory manager, personnel manager, sales manager, and bookkeeper. He knew most of his workers directly, accounts were simple, and sales were made by bargaining with relatively few buyers. The manager of a small business must still carry on these functions himself, but even here the competitive pressure for efficiency means that he must often apply advanced managerial techniques.

Training for Administrative Jobs

To prepare students for both the specialized managerial jobs and top level administrative jobs in industry, colleges and universities have set up special courses of study in business subjects. Such training programs are a relatively recent development, with only a few in existence before 1900. Since 1920, as shown by chart 31, the number of students graduating from business administration courses has been increasing very rapidly—from 1,500 in 1920 to 19,000 in 1940. During World War II business enrollments and graduations declined substantially.

With the end of the war came a remarkable upsurge in business administration training. The tremendous flow of veterans and other students into business courses was reflected in the record figures of 38,000 graduates of business and commerce courses in June 1948 and 62,000 in 1949. The great rise in training in business has made business education the second largest field after teacher training, placing it ahead of such large fields as engineering, agriculture, law, and medicine.

The general trend toward higher educational requirements is likely to have an increased effect in the field of business, particularly since it is the most recent large field to become professionalized. Eventually it is probable that college graduation will be required for almost all positions at the administrative level. There will, of course, continue to be many thousands of opportunities for persons without college training to establish and manage their own business enterprises.

Employment Outlook

Whether there will be an increasing number of administrative and technical jobs in business in future years depends partly on the general trends in business activities. Over the long run there has been a steady expansion of business activity in general. It is likely that total business employment will continue to grow over the long run, causing a moderate increase in the number of executive jobs.

There also will be a continuation of the trend toward greater specialization and increased complexity in business. This trend has led to the wider use of such workers as accountants and others who have specialized training techniques. However, a large part of this development has already taken place and it is not likely that it will have as much effect in creating openings for managerial workers as in the past. Thus, the general outlook is for a continued but less rapid growth in the number of executive jobs.

The main source of new job opportunities in administrative and managerial work will be in the replacement of executives now employed as they die or retire from business. Newcomers will not, of course, obtain top jobs, but the dropping out of those holding responsible jobs results in promotions within the organization and vacancies.

CHART 31

<table>
<thead>
<tr>
<th>Year</th>
<th>Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>1,500</td>
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<tr>
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<td>1932</td>
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<td>1934</td>
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<td>1936</td>
<td></td>
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<td>1938</td>
<td></td>
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<td>1940</td>
<td>19,000</td>
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<tr>
<td>1942</td>
<td></td>
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<td>1944</td>
<td></td>
</tr>
<tr>
<td>1946</td>
<td></td>
</tr>
<tr>
<td>1948</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td></td>
</tr>
</tbody>
</table>

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Source: U.S. Office of Education. 1946 estimated on basis of Office of Education data.
in beginning jobs. In almost any stable field of employment such replacements create the largest number of job openings for new workers, but there are special factors which emphasize the importance of this replacement demand in the business field. A large proportion of the executives in the higher-ranking administrative and technical jobs in industry are in the upper-age brackets where many leave each year because of death or retirement. This means that a higher percentage than usual must be replaced during the next 10 to 15 years. Many industries are seriously concerned about this problem.

During 1947 and 1948 there was a strong demand for graduates of business administration courses by firms making up their wartime deficit of administrative and professional trainees. In 1949, a decline in business activity caused many companies to curtail their recruitment programs. As a result there was keen competition for available jobs among the record crop of more than 60,000 business graduates, and many were not immediately able to find jobs which matched their qualifications. It is too soon to tell definitely whether this situation means that the number trained has only temporarily outrun the long-run demand and immediate replacement needs, or whether business cannot normally absorb this many graduates in executive trainee jobs or in entry jobs in specialized fields.

A number of managerial jobs are included among the individual occupational reports in this handbook. Hotel managers, page 491, and restaurant managers, page 478, are managerial occupations related to specific industries. Accountants, page 116, personnel workers, page 107, and market research analysts, page 119, are examples of occupations which are important in the management of many types of business enterprises and which offer opportunities for advancement to high level administrative jobs. Many members of other professions, such as engineers, chemists, and lawyers, advance to administrative positions in industry and government.
TEACHING

Teaching is not only the largest single professional field, but it is also the parent field, in the sense that it is the teachers who educate and prepare workers for all the other professions. Teaching is also uniquely related in vocational terms to other professions and to nonprofessional occupations, since many persons who consider themselves members of a profession or a trade do part-time or full-time work as teachers. Many a leading chemist, engineer, or physician is a teacher in a college or university, and in many vocational schools the crafts are taught by practicing members of the trades. Teaching, then, is one of the types of work done by members of other professions, as well as being a profession in its own right. The great bulk of teachers, however, particularly those below the college level, are persons who prepared themselves primarily for the teaching profession.

The broad divisions of the field are college and university teaching, high school teaching, and kindergarten and elementary school teaching. Considerably more than half of all teachers are employed in elementary schools. The belief was once widespread that the level of ability required of the teacher increases with the age of the students; in many parts of the country both entrance requirements and salaries are greater for the high school than for the elementary school teacher. More recently, however, many educators have come to believe that teachers of young children should be as well prepared as those who teach older children, and to attract competent teachers to elementary schools salaries should be equalized and credit toward higher salaries given for advanced training.

The great majority of teachers are public employees. This is true of 9 out of 10 teachers below the college level, but about half the college teachers in 1940 were employed in private colleges and universities.

Employment in the profession has increased tenfold over the last 80 years. This great gain reflects the growth of population, the tendency for young people to stay in school longer, and the increasing enrichment of the curriculum, particularly in high schools and junior high schools. However, the rise in the number of teachers has not been steady at all levels, owing to fluctuations in enrollments caused by varying birth rates. Elementary school enrollments decreased by more than 3½ million between 1930 and 1946. This loss was offset in part by a gain of nearly 2½ million high school students between 1930 and 1940; however, enrollments in high schools dropped by about a million during the war.

Chart 32 shows the trend in school enrollments which is expected to 1960. The abrupt rise in enrollments in the first eight grades, resulting from the high birth rates of the 1940 decade, may require an increase of more than 260,000 elementary teaching positions by 1957. High school enrollments will begin to rise about 1952, but will not fully reflect the unusually high birth rates until about 1956; peak enrollments will be reached in 1961 or 1962.

The drop-out rate is higher in the teaching profession below the college level than in many other
occupations. The number of teachers required each year as replacements exceeds the number needed for new positions, even in a period of rapid expansion in school enrollments (see chart 33). The fact that many young women teach only a few years and then withdraw from the profession is one of the main reasons for the high attrition rate. This rate is usually higher among elementary than among secondary teachers.

The relationship of the supply of teachers to the demand may vary from year to year and among teaching levels. The shortage of teachers which was one of the consequences of World War II is comparable to that of World War I. The shortage during and following World War I gradually changed to a surplus of applicants for teaching positions which reached its height during the depression years of the 1930’s. In 1950, shortages of elementary teachers were acute, but for the first time since World War II there was an adequate supply of high school teachers in most subject fields (see chart 33). The other employment opportunities available and relative salaries offered will continue to be the most important factors affecting teacher supply.

College and University Teachers

(D. O. T. 0-11.50)

Outlook Summary

Openings for new entrants in the early fifties will be limited largely to replacement needs. Considerable increase in the number of positions is expected in the long run.

Nature of Work

In 1949–50, the more than 1,800 colleges and other institutions of higher education in the country had about 155,000 faculty members for 2,457,000 students. Besides teaching, these faculty members frequently do research. Some devote all or part of their time to administrative work. Most have specialized in a particular subject field.

Where Employed

The great majority of faculty members are in 4-year colleges, universities, and professional schools; in 1948, 84 percent were employed by such institutions, about 8 percent by teachers’ colleges and normal schools, and 8 percent by junior colleges. Largely because of differences in population, the distribution of these institutions among the States is extremely uneven. Some Western States have but one or two colleges, with staffs totaling only a few hundred, while a few thickly populated States have over 100, with more than 10,000 staff members.

Training and Other Qualifications

In general, a doctor’s degree is required for the better college teaching positions, but requirements vary considerably according to institution and type of appointment. Inexperienced persons may obtain instructorships directly from graduate training, especially when their academic records are outstanding, or they may assist in teaching undergraduates while still taking advanced work.
Assistant and associate professorships are usually attained only after college-teaching experience or extensive graduate training. To reach the position of professor usually requires either 10 to 15 years of experience or outstanding achievement.

**Outlook**

Opportunities for new entrants to college teaching in the first half of the 1950 decade will be created mainly by retirements or other withdrawals from the profession. College-age population will decrease somewhat until the mid-fifties; at the same time there will be a sharp drop in the number of World War II veterans enrolled at the college level. In the event of the withdrawal of many young men for the Armed Forces, college enrollments would be further reduced. Therefore, it is unlikely that many new teaching positions will be established. On the other hand, the need for new entrants to replace teachers leaving the field may be considerable. During the period of high enrollments following World War II, many faculty members served beyond retirement age, but will leave their posts in the near future. In addition, withdrawals to the Armed Forces and other defense-connected activities will create openings for newcomers. Though the supply of potential teachers is great because of unprecedented enrollments in graduate schools, it is possible that this supply will be quickly dissipated in many specialties by defense program demands. A few subject fields, particularly those related to medicine, will no doubt continue to suffer shortages.

In the long run, there will probably be a considerable increase in the number of college level teaching positions. There is a trend for a larger proportion of young people to complete high school and enter college; higher education is becoming more and more important both in meeting competition in the labor market and in social relationships. Growing interest in extending higher education, particularly at the junior college level, is expected to result in a greater number of institutions, more widely distributed throughout the country. This will not only encourage enrollments but make it possible to have smaller classes than at present. Furthermore, the high birth rates of the 1940 decade will begin to affect college-age population in the late fifties. All these factors, plus the trend toward lengthening the period of college training, will tend to increase the number of teachers needed.

**Earnings**

Members of teaching staffs in 147 selected institutions showed the following average annual salaries in 1947-48: Full professors, $5,750; associate professors, $4,590; assistant professors, $3,890; instructors, $2,950; lecturers, $2,780. Salaries of full professors averaged $4,800 for those with 2 to 5 years of experience and $5,770 for those with 20 years or more experience. However, salaries of teachers at lower ranks increased but little with added experience.

A survey of 12,500 teachers in 5 types of professional schools disclosed the following median annual salaries in 1948-49:

<table>
<thead>
<tr>
<th>Type of school</th>
<th>Professors</th>
<th>Associate professors</th>
<th>Assistant professors</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>$5,800</td>
<td>$4,600</td>
<td>$3,800</td>
<td>$3,200</td>
</tr>
<tr>
<td>Business</td>
<td>$6,500</td>
<td>$5,000</td>
<td>$4,000</td>
<td>$3,100</td>
</tr>
<tr>
<td>Dentistry</td>
<td>$6,600</td>
<td>$5,300</td>
<td>$4,300</td>
<td>$3,100</td>
</tr>
<tr>
<td>Engineering</td>
<td>$5,800</td>
<td>$4,400</td>
<td>$3,800</td>
<td>$3,000</td>
</tr>
<tr>
<td>Law</td>
<td>$7,100</td>
<td>$5,000</td>
<td>$4,200</td>
<td>$3,600</td>
</tr>
</tbody>
</table>

1 Including department heads.

In general, salaries are highest in large universities and men's colleges; lower in women's, teachers', and junior colleges, and in church related schools.

**Where To Go for More Information**

General information on colleges and universities and special surveys, such as that on faculty salaries (Circular No. 254), are available from:

Federal Security Agency,
Office of Education
Washington 25, D.C.

Information on a study of college teacher supply and demand is available from:

National Commission on Teacher Education and Professional Standards
National Education Association
1201 16th St., NW.
Washington 6, D.C.
OCCUPATIONAL OUTLOOK HANDBOOK

High School Teachers

(D. O. T. 0–31.81 and .16)

Outlook Summary

Competition for positions which existed in most subject fields in mid-1950 expected to be quickly reduced as mobilization program progresses.

Nature of Work

About 335,000 classroom teachers, principals and supervisors were employed in the public secondary schools in 1949–50 to teach about 6,500,000 pupils.

Besides classroom instruction, most of these teachers have other duties, including supervision of extracurricular activities, record keeping and preparation of reports. Maintenance of good relations with parents, the community, and fellow teachers is an important aspect of their jobs.

Inexperienced teachers often start in rural schools or small-town school systems. Opportunities for advancement are by way of moderate salary increases within the same system, by moving after a few years of experience to school systems paying higher salaries, or by promotion to supervisory, administrative, or specialized positions.

Training and Other Qualifications

Typical requirements for teacher certificates are a bachelor's degree, with the equivalent of about a half year of education courses including student teaching, and with specialization in one or more subjects commonly taught in high school. The requirements vary considerably from one State to another, however. A few States will grant certificates only to people with a year of graduate work. Many school systems, especially in large cities, have additional requirements—with respect to educational preparation or successful teaching experience—beyond those needed for State certification.

Satisfactory teacher-training curricula are offered at universities with schools of education; by colleges with strong education departments and adequate practice teaching facilities; and by teachers' colleges. A student who wishes to specialize in vocational agriculture, home economics, music, commercial work, or the like should choose an institution accredited for work in the specific field and should take enough hours of education and practice teaching to meet certification requirements. Although the trend is toward specialization, the greater the number of subjects a person can teach, the better are his chances for securing a position. Ability to handle extracurricular activities will also improve chances for employment.

Outlook

The strong competition for positions which was evident in mid-1950 will probably be much reduced as mobilization progresses. The supply of teachers in many fields, particularly in the social sciences, English, and men's physical education, greatly outnumbered the openings at the beginning of the 1950–51 school year. However, there were still shortages in some localities and in a few subject fields, such as home economics and commercial work. The number of students (nearly 85,000) completing training in June 1950 for high school teaching was greater than in any previous year, and nearly two and one-half times the number completing preparation for elementary teaching where the need for personnel is greater. It was estimated that around 20,000 new teachers would be placed in 1950–51. However, mobilization, involving more men in the Armed Forces and more production than in mid-1950, could quickly drain off any oversupply of high school teachers. Historically the profession has lost teachers when other better paid positions have been available.

Enrollments in grades 9 to 12 are expected to decline until about 1952, because of the decrease in high school age population. During that period the demand for high school teachers will be limited largely to replacements for those who die, retire, or otherwise leave the profession. This replacement rate is conservatively estimated at 5 percent annually for the country as a whole, but there are great variations by State. Assuming a 5 percent withdrawal rate there should be a demand for around 17,000 teachers annually during the next 2 or 3 years. However, an extensive program of defense production or mobilization for the
Armed Forces would greatly increase the withdrawal rate of teachers from the profession. From about 1952 to 1962, the high school age population will increase greatly and additional teachers will be required for new classes. Assuming a ratio of 25 pupils per teacher, close to 85,000 new teachers will probably be needed between 1952 and 1960 to handle added enrollments. In addition, the number of teachers required for replacement purposes, based on a 5 percent rate, may be over 20,000 a year by the end of the 1950 decade.

Long-run forecasts of population indicate that employment of secondary teachers should be higher throughout the 40-year period 1960 to 2000 than in 1950. The long-term trend for a rising proportion of young people to attend high school is expected to continue. Greatly increased Federal and State aid to education might expand enrollments considerably. The trend toward enriching the curriculum, offering special subjects and extending instruction to adult classes may also further increase the demand for secondary school teachers.

Earnings

In 1948-49, high school classroom teachers had a median salary of about $4,690 in cities of over 500,000 population; $3,790 in cities of 100,000 to 500,000; $3,445 in cities of 30,000 to 100,000; $3,370 in cities of 10,000 to 30,000; $3,015 in towns of 5,000 to 10,000 and $2,875 in those of 2,500 to 5,000. Median salaries of principals in communities of the above sizes were about $7,320, $6,075, $5,470, $4,795, $4,230 and $3,950, respectively. Median salaries of superintendents ranged from $16,000 to $8,100, depending on size of city. These figures are based on a survey covering more than 2,000 school systems.

Salaries vary greatly from one State to another and among school systems in the same State. Estimated average salaries of classroom teachers in secondary schools in 1949-50, ranged from less than $2,500 in some southern or predominantly rural States to $4,000 or more in Arizona, California, Massachusetts, and New York. Salaries in rural schools and those in small towns are usually considerably below those in cities. Teachers in special fields such as vocational education and physical education sometimes receive higher pay than classroom teachers of other subjects.

Where To Go for More Information


General information on teaching may be obtained from:

- Federal Security Agency
  Office of Education
  Washington 25, D. C.
- National Education Association
  1201 16th St., NW.
  Washington 6, D. C.

Information on schools and requirements in a particular State may be obtained from the department of education at the State capital.

See also Kindergarten and Elementary School Teachers, page 48; College and University Teachers, page 44; Health and Physical Education Instructors, page 50.
Kindergarten and Elementary School Teachers
(D. O. T. 0-30.02 and .11)

Outlook Summary

Shortages of qualified teachers are expected to continue in the early 1950’s at least. Rising employment till late in the 1950 decade. Thousands of new entrants needed annually as replacements for teachers who leave the profession.

Nature of Work

Kindergarten and elementary school teachers make up nearly two-thirds of the entire teaching profession below the college level. In the school year 1949-50, about 600,000 of them were employed in public schools to teach approximately 18,500,000 pupils.

Teaching in the elementary grades usually involves working with one group of pupils during the entire day, thus covering a wide range of subjects and activities. Some schools have departmentalized instruction in the upper elementary grades, and teachers usually handle two or three subjects with several different groups of pupils during the school day. Teachers in rural schools may have to teach all subjects in several grades.

Inexperienced teachers often start in rural schools or small town systems. Opportunities for advancement are by way of small salary increases in the same position, shifting to a school system with a higher salary scale, or by appointment to a supervisory, administrative, or specialized position.

Training and Other Qualifications

In every State except Massachusetts, a State certificate is required for teaching in public schools. The educational qualifications needed for certificates vary considerably from one State to another. About a third of the States and the District of Columbia require 4 years of college as minimum for the lowest regular elementary certificate; half the States require 2 or 3 years of college training; other States have even lower minimum requirements. In most States, candidates must have completed several elementary education courses, including practice teaching.

There are about 1,200 institutions approved by different State departments of education from which graduates are granted State certificates without examination. However, some local districts have their own standards and examinations, in addition to the State requirements. Prerequisite for training is usually graduation from an accredited high school. Most States have a minimum age of 18 years, but appointing officials usually prefer somewhat older teachers. Some school systems do not employ married women; over half the States make proof of good health a requisite; some have citizenship and other special standards. A prospective teacher should acquaint himself with the specific requirements in the State in which he plans to teach.

During and since World War II, many thousands of emergency or temporary certificates have been issued to persons unable to meet the regular requirements. As the supply of fully qualified teachers increases, such certificates will be discontinued. Furthermore, the general trend is toward raising requirements; all prospective elementary teachers should therefore plan to secure the bachelor’s degree.

Outlook

The serious shortage of elementary teachers in mid-1950 is expected to continue during the early fifties, at least. Only about 35,000 new teachers qualified for regular elementary certificates in June 1950, when the estimated demand was for more than 75,000 new teachers for the 1950-51 school year. The deficit will be met by issuing emergency certificates to teachers who cannot meet regular requirements. Only in Negro schools has the number of teachers approached the demand. Generally, throughout the Nation, shortages have been greatest in kindergartens and other primary grades in the cities and in rural elementary schools. The extent of the shortage varies considerably from one State to another and also within States; but it has tended to be most acute in areas where teachers’ salaries are lowest or where there are many better paying employment opportunities in other fields.
TEACHING

Shortages of teachers are greatest in kindergarten and primary grades.

The total number of teachers needed for grades below the high-school level will continue to mount until the late 1950's, owing to increasing enrollments resulting from the abrupt rise in the birth rate since 1940. Assuming that 1947 was the peak year for births, total enrollment in grades 1 to 8 will be greatest (about 26½ million) in 1957. However, the number of new teachers required in any one year will be greatest about 1953, when over 40,000 may be needed just to take care of the increase in enrollments (assuming a ratio of 30 pupils per teacher). Over the 10-year period (1949-50 through 1958-59), it is estimated that at least 800,000 new teachers will be required to handle additional enrollments and replace teachers who withdraw from the profession.

In the teaching profession many more teachers are required each year as replacements than for new jobs, even in a period of rapid growth of school population. The large number of young women who enter the profession and then withdraw because of marriage or for other reasons creates an attrition rate higher than for most other occupations. This rate varies greatly among States, but is conservatively estimated at 7 percent for the country as a whole. On the basis of this rate, about 575,000 elementary school teachers will probably be required in the 10 years beginning in 1950 to replace those who die, retire, or otherwise leave the classroom.

In the future as in the past, the other employment opportunities available and the relative salaries offered will be chief among the many factors affecting the supply of new teachers. A strong defense production program and shortages of workers in other fields would reduce the number seeking teaching positions. Because salaries usually increase less rapidly in the teaching field than in many others, the profession is considered less desirable in boom periods than in periods of economic depression.

Earnings

According to a survey covering about 2,200 city-school systems, median salaries for teachers and principals in elementary schools in 1948-49 were as follows:

<table>
<thead>
<tr>
<th>Population of city</th>
<th>Classroom teachers</th>
<th>Principals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kindergarten</td>
<td>Elementary</td>
</tr>
<tr>
<td>2,500-4,999</td>
<td>$3,006</td>
<td>$2,955</td>
</tr>
<tr>
<td>5,000-9,999</td>
<td>$3,087</td>
<td>3,265</td>
</tr>
<tr>
<td>10,000-29,999</td>
<td>$3,087</td>
<td>3,265</td>
</tr>
<tr>
<td>30,000-99,999</td>
<td>$3,087</td>
<td>3,265</td>
</tr>
<tr>
<td>100,000-499,999</td>
<td>$3,087</td>
<td>3,265</td>
</tr>
<tr>
<td>500,000 and over</td>
<td>$3,087</td>
<td>3,265</td>
</tr>
</tbody>
</table>

1 Includes kindergarten teachers.
2 Assistant principals.

Rural school salaries, especially those in one-teacher schools, are considerably below those in small towns. There is a trend toward establishing the same salary scales for elementary teachers as for secondary teachers with comparable education and experience.

Estimated average salaries of classroom teachers in elementary schools in 1949-50 ranged from less than $2,000 in about 10 States to $3,400 or more for Arizona, California, Massachusetts, Michigan, and New York.

Where To Go for More Information

Information on the employment outlook, certification requirements, and earnings in the teaching profession in each State is given in: Employment Outlook for Elementary and Secondary...
Health and Physical Education Instructors

(D. O. T. 6-57.21 AND .41)

Outlook Summary

Supply of male instructors in this field more than adequate in 1950, but surplus expected to be quickly reduced by defense activities. Good opportunities for women. Employment expected to expand over the long run.

Nature of Work

Health and physical education instructors give individual or group instruction in a great variety of physical activities and games, and coach teams in various sports. They also teach classes in health education, supervise school health-education programs, and direct school and community recreational activities. In small high schools, the teaching of physical education is often combined with the teaching of other subjects. In elementary schools, it is usually done by the regular classroom teacher.

It is estimated that about 60,000 professional workers were employed in this field in late 1949.

How To Enter

In most States, the minimum requirement for a high school teaching certificate is a 4-year college course, including 15 to 24 semester hours in health and physical education and 15 to 20 hours in general professional education, including teaching methods. The employment requirements of individual schools may be somewhat higher. Courses in biological sciences, social sciences, and health education are helpful. Educational requirements for teaching in colleges or universities vary considerably, but graduate training is generally preferred. Experience in physical education with the Armed Forces is valuable when combined with formal education.

The usual method of entry for people with undergraduate training is by way of a small school, though successful athletes sometimes start as assistant coaches in colleges or universities. Positions in colleges or large high schools usually require several years' experience or graduate training, or both. Experienced instructors may advance to physical or health education supervisor for a city school system or State department of education or transfer to related recreational or health activities.

Outlook

Instructors of physical education for men were in oversupply in most areas for the 1950-51 school year, but there were indications that the competition would be quickly reduced owing to the mobilization program. The shortage of male instructors which existed in the early postwar years was relieved by the unusually large graduating classes in 1948, 1949, and 1950; the number of men qualifying as high school teachers of health and physical education in 1950 was six times the number who qualified in 1941. In addition, more than twice as many women completed training for such teaching positions in 1950 as 9 years previously; however, at mid-1950, there were still moderately good employment opportunities for women in the profession.

The number of schools offering physical education training has risen considerably since World War II; enrollments have been high, owing largely to the many veterans who entered these schools. The great increase in supply of instructors has
TEACHING

come at a time when the number of high school students is beginning to decrease. Most job openings which arise in the next few years will occur as a result of turn-over. This is high among women instructors; it is also considerable among men, since older men often have to transfer to other occupations. In addition, many young men are likely to withdraw for military service or defense production jobs.

After the mid-fifties, high school enrollments are expected to increase rapidly for several years, and the demand for health and physical education instructors will rise. A number of other factors will also tend to expand employment over the long run. The public is becoming more aware of the need for health and physical education programs. Greater interest is being displayed in local communities in planning health, physical education, and recreation facilities. There is a trend toward establishing more year-round positions for health and physical education directors who can handle community recreation programs. With the exception of positions in large city schools, where specialization is preferred, there are increasing numbers of jobs combining health, safety, recreation, and physical education activities; new entrants will do well to consider obtaining the broad training for such combination jobs. There will also be increased employment in such related fields as employee-recreation programs conducted by private business or Government departments, and recreational activities and camps sponsored by churches and youth serving agencies. However, the popularity of the physical education field as a career for young men is likely to persist; hence, newcomers may expect to meet considerable competition in the long run and should therefore secure a year or two of graduate training.

Earnings

Starting salaries ranged from about $2,300 to about $3,300 for high-school instructors without experience in 1948-49, depending on individual qualifications, size of school, geographic location, and other factors. A man with a strong background in varsity athletics nearly always receives a larger beginning salary. Directors, assistant directors, and supervisors of health and physical education had median salaries of about $3,200 to $5,300, depending on the size of the city or town. In many school systems, athletic coaches receive additional amounts above their regular salaries because of extra duties. It is often possible to supplement earnings for the school year by taking a position in a summer camp.

Where To Go for More Information

American Association for Health, Physical Education and Recreation,
1201 16th St., N. W.
Washington 6, D. C.

Federal Security Agency,
Office of Education,
Washington 25, D. C.

See also High School Teachers, page 46; College and University Teachers, page 44.
HEALTH SERVICE OCCUPATIONS

Engaging more than a million persons in 1940, medical and other health service is not only vital to public welfare, but important as a source of employment opportunity. This broad group of occupations is second only to teaching as a field of employment for professional and semiprofessional workers. With its more than half a million women workers, it ranks as a major vocational field for women.

1 This introductory section is based on The Outlook for Women in Occupations in the Medical and Other Health Services: Trends and Their Effect Upon the Demand for Women Workers. Bulletin 203, No. 12 (1946), published by the Women’s Bureau, U. S. Department of Labor, Washington 25, D. C.

The major occupations in the field are shown in chart 34. Nursing, the largest of these occupations, is also the second largest profession for women. The occupation of physician ranks with engineering, teaching, and law as a major profession for men. There is close working relationship among the occupations in the health-service field; such semiprofessional persons as dental hygienists and medical X-ray technicians are often employed directly by the dentist and the physician.

Health services are given in a wide variety of places, including hospitals and sanitariums, clinics, laboratories, pharmacies, nursing homes.

CHART 34

MAJOR HEALTH SERVICE OCCUPATIONS
EMPLOYMENT IN 1949

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional and Student Nurses</td>
<td>400</td>
</tr>
<tr>
<td>Practical Nurses and Hospital Attendants, 1940</td>
<td>200</td>
</tr>
<tr>
<td>Physicians</td>
<td>100</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>50</td>
</tr>
<tr>
<td>Dentists</td>
<td>50</td>
</tr>
<tr>
<td>Medical Laboratory Technicians</td>
<td>50</td>
</tr>
<tr>
<td>Medical X-ray Technicians</td>
<td>50</td>
</tr>
<tr>
<td>Optometrists</td>
<td>50</td>
</tr>
<tr>
<td>Dietitians</td>
<td>50</td>
</tr>
<tr>
<td>Chiropractors</td>
<td>50</td>
</tr>
<tr>
<td>Veterinarians</td>
<td>50</td>
</tr>
<tr>
<td>Osteopaths</td>
<td>50</td>
</tr>
<tr>
<td>Dental Hygienists, 1945</td>
<td>50</td>
</tr>
<tr>
<td>Physical Therapists</td>
<td>50</td>
</tr>
<tr>
<td>Medical Record Librarians, 1946</td>
<td>50</td>
</tr>
<tr>
<td>Occupational Therapists</td>
<td>50</td>
</tr>
</tbody>
</table>

* Number of women too few to show on chart
† Number of men too few to show on chart

Source: U.S. WOMEN'S BUREAU AND BUREAU OF LABOR STATISTICS

52,055,000 additional nurses (professional and students) were inactive
2,100 were inactive
Health and hygiene agencies, industrial plants, offices of physicians, dentists, osteopathic physicians, chiropractors, veterinarians, and chiropodists, and in private homes. Work in these fields is to be found in every State, and in the smallest of towns—wherever there are people to be served—but employment is more concentrated in the populous and wealthy sections of the country.

Medicine, dentistry, and some of the other health service occupations present opportunities for independent professional practice and self-employment. Most members of certain other occupations, such as nursing, have salaried positions. In 1940, more than half of the men in the health service field were self-employed, compared with less than a tenth of the women. About a fifth of the workers were employed by local, State, or Federal Government agencies.

Health-service employment has an upward trend. The need for expansion in services is a result of an increasing population (particularly in the older age groups), rising income levels, better education in the need for medical care, the growth of preventive medicine, hospitalization and other medical insurance plans, progress in medical science itself, and the provision of medical and dental care for veterans. More hospitals are being built, and there is growing interest in plans to make health care more available to low-income groups. Also, additional health personnel will be needed because of the expansion of the Armed Forces.

Therefore, there will be increasing employment opportunities in this large field. Moreover, because of the large number of women in some of these occupations, the replacement rate is high, and many new workers will have to be trained each year.

Registered Professional Nurses ¹

(6. O. T. 6-33)

Outlook Summary

Excellent opportunities in the early fifties and in the long run, but openings vary considerably by locality. The emergency situation in 1950 also stimulated the demand for the professional nurse.

Nature of Work

Registered nurses (R. N.'s) are the second largest group of professional women in the country. In 1949, the American Nurses Association estimated that there were about 300,500 active registered professional nurses and a reservoir of about 205,500 inactive nurses. There were also 88,817 student nurses. According to an inventory in 1949, about 51 percent of the employed nurses were in hospitals, schools of nursing, or other institutions; about a fifth were in private practice; the remainder were public health, industrial, or office nurses. In 1949 less than 1 percent were men.

¹ Prepared by the Women's Bureau, U. S. Department of Labor.
offer collegiate programs in nursing leading to a degree. Nurses with the United States Public Health Service must have had at least a year of postgraduate study in public health nursing at a college or university approved by the National Organization for Public Health Nursing.

The opportunity to advance to posts of responsibility is especially good, because of the many administrative, teaching, and supervisory positions in this large expanding profession. Teaching and administrative positions, particularly in schools of nursing, usually go to those who have college degrees as well as the necessary professional preparation and who combine successful experience with aptitude for teaching or administrative work.

Outlook

A shortage of professional nurses existed in early 1950 despite the fact that there were more nurses than ever before. It was estimated that in 1950, 409,700 professional registered nurses would be required to meet ordinary needs, about 109,160 more than were employed in the first part of 1949.

The shortage of nurses has resulted from a demand for nursing service which has increased at a greater rate than the supply. Many factors have caused this accelerated demand; among them are: a growing number of hospital patients, increased membership in prepayment health plans, the effects of health education programs which emphasize early treatment, preventive medicine, the use of clinical facilities and periodic check-ups. In addition, a growing population, as well as a population with a larger number of older people, the use of new drugs and treatments, and the extension of nursing services in government service and the fields of industry, psychiatry, and public health, have added to the demand for professional nurses. The Army called up 650 reserve nurses in September 1950 and more were needed as a result of the expansion in the Armed Forces.

By 1948 admission of students to schools of nursing had reached the largest number in any peacetime year (43,373 students were admitted in 1948). However, admissions to schools of nursing must continue to grow to meet accelerated demand and to replace the large number who normally withdraw from the profession each year.

Factors which created the shortage of professional registered nurses will probably continue to operate for some years. By 1960 it has been estimated that about 500,000 professional registered nurses will be required to maintain current standards of nursing.

Earnings and Hours of Work

Up-to-date information on earnings of nurses is not available, but their income is believed to be higher than in 1946, the year of the latest comprehensive earnings study. In October 1946, median monthly earnings of registered nurses who were not provided with living quarters were between $170 and $175. About one in four earned less than $145; on the other hand, a fourth earned more than $195. Median earnings in different fields of nursing ranged from $153 a month for private-duty work to $207 for nurse educators. Because of differences in the number of days worked during the month, earnings of individual private-duty nurses varied widely; one out of four earned less than $95 and another fourth received
at least $200. There was also variation by regions, from a median of $144 in New England to $202 in the Pacific States. An 8-hour day and a workweek of 40 to 48 hours has become the generally accepted schedule in nursing, but there are many deviations, especially in private-duty nursing.

Where To Go for More Information

Additional information on the outlook for women as professional nurses is given in the following publication:


Additional information on earnings and working conditions is given in the following publication:


Information may also be obtained from:

- American Nurses' Association, 1790 Broadway, New York 19, N. Y.
- Committee on Careers in Nursing, 11th Floor, 1790 Broadway, New York 19, N. Y.
- National League of Nursing Education, 1790 Broadway, New York 19, N. Y.

Information on State registration requirements may be obtained from the board of nurse examiners from any State capital or from the Counselor of any State Nurses' Association (a directory of these counselors is available from the American Nurses' Association).

Physicians

(D. O. T. 0-26)

Outlook Summary

Excellent opportunities for those able to gain admission to medical school and complete requirements for practice. Keen competition for admission to medical school.

Nature of Work

Most physicians are engaged in private practice, either as individuals or in a group of doctors. Others have full-time positions on hospital staffs, with private firms, or in governmental agencies such as the United States Public Health Service, the Armed Forces, and the Veterans Administration—caring for patients or giving medical examinations. Some combine private practice with a part-time position in a hospital or industry. Physicians also teach in medical schools; do research on causes of disease and develop new methods of treatment; hold administrative positions in hospitals, clinics, laboratories, and other organizations; and write and edit medical books and magazines. A few devote their full time to these activities, but most care for patients as well.

As of 1950, there were over 200,000 physicians in the United States. However, a number of them were not available for service to the general public: about 5 percent were retired or not in practice; nearly one-quarter were employed by Government agencies (including the Armed Forces), had full-time research positions with private companies, or were in full-time hospital service (interns, residents, and staff positions). About half of the total number of physicians were general practitioners, and about a fourth limited their practice to their specialty; the remainder were general practitioners with an interest or training in a specialty. Only about 1 out of every 20 doctors are women. There are approximately 4,000 Negro physicians in the United States.

As of mid-1950, the medical specialties recognized by approved examining boards were: ophthalmology, otolaryngology, obstetrics and gynecology, dermatology and syphilology, pediatrics, orthopedic surgery, psychiatry and neurology, radiology, urology, internal medicine, pathology, anesthesiology, plastic surgery, surgery, neurological surgery, physical medicine and rehabilitation, preventive medicine and public health, thoracic surgery, and proctology.
Training and Qualifications

For practice as a physician in any State or the District of Columbia, one must be licensed by a State board of medical examiners and, in most cases, must register annually with this board. It generally takes at least 7 to 9 years after high school to complete the educational and experience requirements for licensure.

Candidates for licenses must be graduates of approved medical schools in practically all cases. In mid-1950 there were 79 approved medical schools and basic science schools in the United States (the latter give only the first 2 years of medical training). Most of these schools require students to have completed three or more years of premedical study in colleges. In the fall of 1949, only five required as little as 2 years of premedical study, while six required a bachelor's degree. At all schools a bachelor's degree is an advantage in competing for admission—an important consideration in view of the intense competition for entrance into most schools. Sixty-three percent of the freshman class of 1949–50 had baccalaureate degrees and another 8.8 percent had completed 4 years of college.

Most medical schools give 4-year courses; however, in 1950, six schools required an extra year of internship or research for the M.D. degree. After completing medical school, graduates generally serve at least a year's internship in a hospital; this is legally required for licensure in over half the States. Finally, candidates have to pass a licensing examination given by the State board of medical examiners.

To be recognized as a specialist, a doctor must meet standards established by one of the 19 specialty boards set up by the American medical profession. These standards include: Graduation from an approved medical school, licensure, completion of an approved internship, and generally 5 years of specialized training and practice in the selected field. Residencies of varying lengths in approved institutions are required as part of the training for most specialties. In addition, physicians intending to become general practitioners often serve as residents for a year or two after completing their internship, to obtain additional training and experience.

Outlook

The demand for physicians' services was much greater at the end of the 1940-50 decade than before World War II. The rise in national income and the development of prepayment plans for medical care and hospitalization made it possible for many more people to obtain doctor's services. Acceleration of training during the war made possible the graduation of more than 59,000 medical students from approved schools during the decade. However, the total number of physicians did not increase as fast as the demand for medical service in this period, and only slightly faster than the population itself. Moreover, the military demand for physicians was beginning to rise as a result of the increased mobilization which began in the last half of 1950. Thus, at the beginning of the 1950's there was need for additional personnel in the medical profession.

The demand for medical care will probably continue to rise in the future. Among the factors which will tend to increase the demand for physicians' services are the increase in population (particularly, the number of older persons), Government provision of medical care for veter-
ans and for members of the Armed Forces and their families; and the planned large-scale program for construction of hospitals in areas which have no modern facilities. Underlying these factors is the general trend toward higher standards of medical care and public health. In addition, as of 1949, nearly 4,000 new physicians were needed each year to meet replacement needs owing to deaths, retirements, and lowered service capacity among the many older physicians; these replacement needs will tend to become larger as the profession increases in size.

The number of freshmen enrolled in medical schools in the fall of 1949 was larger than ever before. With the expansion of existing schools under way by the end of that year and the several new schools already being organized, enrollments should be even higher by the mid-1950's. However, the net increase in the number of physicians will be moderate and is not expected to equal the increased demand for medical service. The level of medical and premedical school enrollments for the next several years at least, will be affected by Selective Service policies regarding deferments, as well as policies concerning expansion of training because of mobilization.

The outlook, then, is excellent for those persons who have the needed personal characteristics and genuine interest in the field and who are able to gain admission to medical school and complete requirements for practice. Despite the increased training facilities which will be available by the mid-1950's, it is expected that competition for admission to medical school will remain great for a number of years. Prospective medical students should remember that the training required for the profession is long and arduous. Preparation for a medical career should begin even before college. During the entire period of schooling a very high scholastic average must be maintained.

**Earnings**

The average net income (after business expenses) of independent physicians has more than doubled since 1939 and probably was about $11,000 yearly in 1947, according to several small surveys and other scattered reports. Incomes of salaried physicians were somewhat lower.

Generally speaking, incomes tend to be higher in large cities than in smaller communities. However, there is some evidence to indicate that average incomes do not rise continuously with size of community (particularly over 250,000 population). It should be emphasized that earnings of individual doctors vary widely—with length of professional experience, field of specialization and personal ability, as well as size of community and region of the country.

**Where To Get More Information**

General information on professional education, licensure, and other requirements for practice may be obtained from:

Council on Medical Education and Hospitals
American Medical Association
535 North Dearborn St.
Chicago 10, Ill.

This Council has published several excellent booklets on requirements for practice and, each year, prepares material for several special issues of the Journal of the American Medical Association—the Educational Number, the State Board Number (licensure statistics), and the Internship and Residency Number.

Persons wishing to practice in a given State should find out about the requirements for licensure directly from the board of medical examiners of that State. A list of the executive officers of the boards of the States and Territories can also be obtained from the Council.

**Pharmacists**

(D. O. T. 0–25.10)

**Outlook Summary**

Very good employment prospects for several years. Shortage of trained personnel is expected to continue during early fifties. Gradual expansion in employment expected over long run.

**Nature of Work**

Pharmacy is the science of drugs. A qualified pharmacist must understand the composition, chemical properties, manufacture, and uses of drugs, and be able to test them for purity and
strength. He must also be able to compound medicines as called for by physicians’ prescriptions and he may advise doctors concerning the use and availability of drugs.

About 90,000 or 90 percent of all registered pharmacists were employed in the Nation’s 50,000 drug stores in 1949. Most State laws require every pharmacy to have a registered pharmacist in attendance at all times. The essential function performed by the pharmacist in drug stores is filling prescriptions; particularly in small stores, however, he may perform a variety of sales and managerial duties—such as purchasing supplies and goods, arranging window displays, and hiring employees. Many retail pharmacists own and manage their own stores.

Drug manufacturing and wholesaling firms employed about 6,500 registered pharmacists in 1949. Not quite half of these men did research or supervised drug production or packaging. Others were sales representatives or detail men, who visited physicians and retail druggists to tell them about the merit of new medicinal preparations.

Only about 3,000 registered pharmacists were employed by the more than 6,300 hospitals in the Nation in 1949. A still smaller number taught in colleges of pharmacy, wrote for pharmaceutical publications, or were employed by State and Federal Government agencies.

How To Enter

Entrance into this profession is governed by State licensing requirements. Most State laws specify that applicants for licenses must be citizens of the United States and at least 21 years of age. In every State except Vermont, graduation from a college of pharmacy is a prerequisite for obtaining a license and most States require at least a year of practical experience under the supervision of a registered pharmacist. In a number of States, a specified amount of experience must be gained in retail pharmacy; however, most States allow full credit for hospital experience, and the number doing so may increase in the near future. All States except New York, Florida, and California will grant a license without examination to a pharmacist already registered in another State, provided that at the time of original licensure he had the qualifications required by the State in which he is presently seeking a license. A pharmacist who has graduated from a school accredited by the American Council on Pharmaceutical Education will generally find it easier to obtain a license.

Outlook

The outlook for the entire pharmaceutical profession is dominated by the prospects in retail drug stores, where a moderate upward trend in employment is expected over the long run. In view of the trend toward increasing drug sales and toward shorter working hours in the profession, many employers will probably seek to take on additional pharmacists. It is also expected that there will be a moderate increase over the long run in the number of drug stores in the country. In recent years the tendency in cities has been away from many small stores toward fewer and bigger ones, but some new stores will be needed, particularly in new residential areas.

The number of pharmacist positions in the Armed Forces and in hospitals is expected to increase rapidly during the next few years. There...
will also be increased opportunities in manufacturing and wholesaling, in the public health services, and as teachers, law-enforcement officials, and writers for pharmaceutical publications. It is roughly estimated that about 3,000 pharmacists will be needed yearly in the near future to replace those who die, retire, or transfer to other fields of work. The fact that a high proportion of the Nation’s active pharmacists are over 60 years of age will create relatively high replacement needs.

There was a shortage of registered personnel in many parts of the country in early 1950, because of the sharp drop in graduations during World War II and the expanding employment needs. Since World War II there has been a large increase in the number of students enrolled in pharmacy colleges (approximately 21,000 in the academic year 1949–50, compared with about 8,000 in the prewar years). The 1949–50 senior class almost reached the 6,000 mark—an all-time record. Nevertheless, the shortage will probably continue during the early 1950’s.

Earnings and Working Conditions

Pharmacists working for others usually earned around $80 a week in late 1949, according to reports from various parts of the country. Those in beginning positions with the Federal Government started at $3,825 a year, while chief pharmacists at larger installations had a base salary of $4,600 under the salary scale that went into effect in late 1949. In addition, “within-grade” increases are given periodically in these as in other Federal jobs. Owners of successful drug stores have considerably higher net incomes.

Despite the long-run trend toward shorter working hours, many pharmacists still worked more than 50 hours a week in early 1950. Drug stores are usually open in the evenings and on Sundays.

In drug manufacturing, teaching, publications work, and government service, hours tend to be shorter. Sales representatives spend much of their time going from one doctor’s office or retail drug store to another and many work irregular hours.

Where To Go for More Information

For general information on the profession, one may write to:

American Pharmaceutical Association
2215 Constitution Ave., NW.
Washington 7, D. C.

Information on schools and scholarships is available from the Dean of any college of pharmacy. Current regulations on education, training, and other requirements for licensure in a particular State may be obtained from the board of pharmacy at the State capital. Persons interested in entering the profession should find out about these regulations before enrolling in pharmacy colleges or arranging to obtain practical experience.

Dentists

(D. O. T. 0-13.10)

Outlook Summary

Outlook excellent for persons able to enter and complete dental training. Keen competition for admission to dental school.

Nature of Work

Most dentists are engaged in general practice. Fewer than 20 percent specialize in some particular branch of dentistry; and of this small group, only a fourth specialize on a full-time basis.

As of early 1950, six fields of dentistry specialization were recognized by the Council on Dental Education of the American Dental Association. These specialties, represented by Boards, were oral surgery, pedodontics (children’s dentistry), periodontics (treatment of disease), prosthodontics (making of artificial teeth or plates), orthodontics (teeth straightening), and oral pathology. Several other phases of practice have not as yet been recognized by the profession as full specialties.

The vast majority of dentists are independent practitioners. However, sizable numbers are employed by the United States Public Health Service, the Veterans Administration, the Armed Forces, and other Government agencies; some are
assistants to other dentists; and some work for industrial plants and other private organizations.

Training and Qualifications

For practice as a dentist in any State or the District of Columbia one must be licensed by the State board of dental examiners; in some States annual registration is required. The main requirement for admission to the examination for licensure is graduation from one of the 41 recognized schools of dentistry. These schools offer 4 years of professional dental training leading to the degree of doctor of dental surgery or doctor of dental medicine. One State, Delaware, requires a year's internship before a dental graduate may be admitted to the licensing examination. At least 2 years of predental study in college is required for admission to dental school. However, over half of the students in dental schools in the fall of 1949 had more than 2 years of predental training; more than a quarter of them had a bachelor's degree.

The prospective dentist needs to start preparing for his career even before he enters college. In high school, he must choose the college entrance course and include certain specified subjects such as chemistry, biology, and other sciences. Most important of all, he must have an exceptional scholastic record both in high school and in predental study. Competition for admission to dental school is very great; a survey in the fall of 1949 showed that, for all dental schools reporting, an average of six times as many people applied as could be admitted to freshman classes; in the preferred schools, the ratio was considerably higher.

Outlook

There was need for additional personnel in this profession at the beginning of the 1950's. The effective demand for dental service has been increasing at a rapid rate. Conditions during World War II helped to arouse a national interest in more and better dental care. In addition, the proportion of the population with an income level high enough to afford adequate dental service has increased greatly. The need for additional dentists will be increased in the near future as a result of the expansion of the Armed Forces.

Between 1940 and 1949, annual graduation from dental schools averaged nearly 2,100; this was only slightly more than the number needed to replace those who die or retire each year (about 1,900). Thus, the profession has not grown as rapidly as the demand for dental service.

The number of dentists graduating is expected to rise in the future. Two new dental schools have been added since 1946 and at least one more is planned; this means additional training facilities for prospective dentists. In 1950, about 2,600 dentists were graduated; the number of new graduates should be even higher in the early fifties. However, dental and predental enrollments for the next several years at least will be affected by Selective Service policies regarding deferments, as well as policies concerning the expansion of training because of mobilization.

At the same time the demand for dental services will continue to grow. There is a trend toward better oral health care for the Nation's growing population and particularly for school children. The Veterans Administration expects to need an increasing number of dentists for the care of ex-servicemen and women. The development of prepayment plans for dental care, coupled with continuing high levels of national income would also make it possible for more people to obtain dentists' services. In addition, replacement needs, owing to deaths and retirements, will rise and may reach 2,300 by 1960.

For all these reasons, the outlook over the long run is exceptionally bright for young persons who have the proper qualifications and interest in the work and are able to enter training. However, the competition for admission to dental schools will probably continue for a number of years. Prospective dental students will therefore need to get the best predental training possible.

Nearly all parts of the country will need dentists, but the need is less in some sections than in others. Nine States (New York, Illinois, Pennsylvania, California, Ohio, Massachusetts, New Jersey, Michigan, and Missouri) with less than half the Nation's population had more than three-fifths of all active dentists in 1949. In all States, dentists are concentrated to a great extent in and around highly populated sections, where earnings tend to be highest. Rural areas, therefore, have fewer dentists in relation to population than do urban ones.
Earnings

Civilian dentists had a median net income of about $5,888 in 1948, according to a survey recently completed by the United States Department of Commerce. Independent practitioners (about 90 percent of all dentists) had a middle earnings figure of $5,944, and salaried dentists, $5,295. Dentists with a specialty tended to make considerably more than those in general practice: 1948 median net income was $5,737 for general practitioners, compared with $6,942 for dentists with both general and specialized practice, and $8,391 for those whose practice was limited entirely to their specialty. Dentists in middle-sized cities earned more than those in either very small communities or large metropolitan centers. According to the 1948 survey, the median net income figures for dentists in communities of different sizes increased with the size of the community to a peak of $7,000 in cities of 25,000 to 250,000 population. Beyond that point, earnings tended to decrease, instead of rise, with size of city; in cities with 1 million population or more, the middle earnings figure was only about $5,000. Earnings of individual dentists also vary with length of experience and age, geographical location, number of employees, and other factors.

Where To Find Out More About Dentistry

Information on schools, requirements, and practice may be obtained from the Council on Dental Education of the American Dental Association, 222 East Superior St., Chicago, Ill. This Council has published an informative pamphlet, Dentistry as a Professional Career, which may be obtained from local libraries or by writing directly to the Association.

Information on earnings and other economic data may be obtained from the Association’s Bureau of Economic Research and Statistics at the above address.

Medical Laboratory Technicians

Outlook Summary

Expanding demand and good employment opportunity for graduates from approved schools and all-round experienced workers with college background. High school graduates with laboratory experience as helpers or routine workers will not have much chance in competition with well-trained personnel.

Nature of Work

About two-thirds of all medical laboratory technicians are employed in hospital laboratories where they make blood and urine analyses on all patients and, as directed by a physician, special analyses and laboratory tests (metabolism, sputum, serology) on certain patients. Others work in physicians’ laboratories, in public health laboratories, in clinics, and in medical schools.

1 Prepared by the Women’s Bureau, U. S. Department of Labor.
Training and Other Qualifications

One may qualify for registration with the Registry of Medical Technologists of the American Society of Clinical Pathologists by graduating from one of the 404 hospital schools for clinical laboratory technicians on the approved list of the American Medical Association in 1949. The length of the course at an approved school ranges upward from the required minimum of 12 months. For entrance, 2 years of accredited college work are required by 70 percent of the schools; the remaining require more. Certain credits in specified subjects, or graduation from a recognized school of nursing plus 30 semester hours of college work including chemistry and biology, are required. Painstaking accuracy, manual dexterity, dependability, and ability to follow directions are some of the most important personal traits for advancement. The advancement opportunity for even thoroughly trained medical technicians also depends on the size of the organization.

Outlook

The demand for registered technologists and for adequately trained technicians will continue to increase with the extension of hospitals for veterans and for the civilian population, and of public health services and clinics. The increased mobilization and the consequent expansion in military hospitals will add to the demand for such technicians. With the spread of hospitalization insurance, the number of patients served in hospitals will continue to rise. Laboratories in public health facilities are also gradually increasing in number.

Many practicing physicians are forming small groups, hiring a medical laboratory technician, and maintaining a laboratory to service the group. Most specialists in internal medicine employ a full-time technician because of the large number of routine and special laboratory tests involved in the diagnosis and treatment of diseases of the internal organs. Industrial medical laboratories are also growing in number with the emphasis on industrial hygiene. The growing use of powerful drugs such as the sulfa group, requiring laboratory checking, also tends to increase the need for the laboratory technician. Opportunities in research are usually limited to those who have degrees in science or medicine. Poorly or partially trained technicians who entered the field because of the World War II emergency will have difficulty in competing with well-trained personnel so long as high peacetime standards of skill and competence can be maintained.

In 1949 there were approximately 14,500 registered medical technologists and another group of about 14,000 without approved training who were working as technicians in medical laboratories. According to the American Society of Medical Technologists, from 1,000 to 2,000 newly trained medical technologists should be available yearly to keep abreast of the ordinary demand for the next 15 years. Over 1,700 were graduated in 1949 from approved schools. It is estimated that 45,000 will be needed by 1960. During World War II, approved hospitals employed nonregistered technicians, many of whom had been trained for only a few weeks or months in schools that offered substandard courses. But poorly trained persons cannot obtain jobs when well trained persons are available. About three-fourths of the medical technicians are women.

Earnings

In 1948, a study by the American Society of Medical Technologists covering 3,885 laboratories reported that lowest salaries in these laboratories averaged $2,700 and highest salaries, $4,272. The average salary was between $3,300 and $3,400. Medical laboratory technicians in hospital laboratories usually receive higher salaries than those in university laboratories and in physicians' offices, but their salaries are lower than those in public-health laboratories and commercial clinical laboratories. The beginning Federal civil service salary for medical laboratory technicians was $2,450 per annum in early 1950.

Where To Go for More Information

Additional information on the outlook for women and on the profession in general, may be obtained from:


American Society of Medical Technologists, 6544 Fannin St.
Houston 5, Tex.
Medical X-ray Technicians

(D. O. T. 0-50.04)

Outlook Summary

Good employment opportunities in fifties and in the long run for registered technicians or those with comparable training and experience; limited opportunities for those who have received only short, specialized training in the armed services.

Nature of Work

The medical X-ray technician operates X-ray equipment for the purpose of photographing parts of the body or treating patients by means of X-rays. He usually works under the direction of a physician. His job may include various related duties such as developing and drying the films, or office work of an unrelated nature. X-ray technicians employed in industry for the examination of materials are not included in this discussion.

Training and Other Qualifications

X-ray technicians are trained principally in approved courses offered at 224 hospitals in the United States. In general, high school graduation is required for entrance to a 12-month course of training. Preference is given to graduate nurses, those with some training in nursing, and those with college work in science. In order to become registered by the American Registry of X-ray Technicians, it is necessary to have completed high school or the equivalent, to have at least 2 years of experience and training under a recognized radiologist, and to pass an examination given by the board of trustees. There were about 7,000 registered X-ray technicians in 1949.

Good health is an important consideration in this occupation, since those who work with X-rays and radium are subject to the effects of radiation and may become anemic if ordinary precautions are not taken.

About half of all medical X-ray technicians are employed in hospitals; some work in the offices of radiologists and of dentists or in laboratories which serve physicians, dentists, and others using X-rays for medical purposes. The technician may specialize in X-rays of certain parts of the body, such as the chest, abdomen, or feet.

1 Prepared by the Women's Bureau, U. S. Department of Labor.

Outlook

The general trend in the medical services is toward an increasing need for X-ray technicians. The total number of X-ray technicians in 1949 was estimated at 25,000 as compared to about 15,000 before World War II. About three-fourths were women, but the number of male technicians was increasing. Hospitals graduate from 500 to 700 X-ray technicians each year. Many others are trained informally by the radiologists for whom they are working. Since X-ray work is still incidental in many medical services, there is often a preference for persons who have related training or experience in nursing, in medical laboratory work, or in secretarial work.

Originally used for diagnosis in bone work and in the location of foreign bodies, the X-ray is now employed widely in such fields as examination for detecting tuberculosis, and defects of the teeth and in the treatment of cancers, tumors, sinusitis, and certain skin conditions. Industrial establish-
ments, health departments, tuberculosis hospitals and associations in many parts of the country are organizing for the routine X-raying of large groups. Many insurance companies are beginning to include a chest X-ray as a part of the physical examination. Further expansion in the use of X-ray should create adequate opportunities for those who graduate from approved schools in the future. But those who received only partial training in the armed services may have difficulty in qualifying for positions in civilian medical services. It is estimated that 35,000 medical X-ray technicians will be needed by 1960 to fill anticipated needs. In 1950, the expansion of the Armed Forces and the accompanying increase in military and veterans' hospitals had already accelerated the demand for these workers.

Earnings

Annual earnings of X-ray technicians ranged from $2,200 to $3,600 in 1949. Civil service salaries for X-ray technicians began at $2,450 in late 1949. Opportunities for advancement are relatively few but there are some supervisory jobs in large hospitals, institutions, laboratories, or public health agencies where a number of technicians are employed.

Where To Go for More Information

Additional information on the outlook for women as medical X-ray technicians is given in the following publication:


Information may also be obtained from:

The American Registry of X-Ray Technicians, Alfred B. Greene, B. Sc., R. T.
2900 E. Minnehaha Parkway
Minneapolis 6, Minn.

Optometrists
(D.O.T. 0-39.92)

Outlook Summary

Good opportunities likely in the early fifties; however, large numbers of new entrants may create increasing competition for desirable locations. Some expansion in field expected in long run.

Nature of Work

Optometrists specialize in examining the eyes and conserving and improving the vision. They administer a series of tests to determine visual efficiency and prescribe lenses or corrective exercises when needed. They do not treat diseases of the eye but refer patients to doctors of medicine for such care. Some optometrists fill the prescriptions for eyeglasses in their own laboratories.

Optometrists use various instruments for eye measurement and examination. The opthalmometer or keratometer may be used to measure the degree of astigmatism; the retinoscope and refractometer, to determine the degree of near-sightedness or far-sightedness; the ophthalmoscope, to examine the interior of the eye. Optometrists also give subjective examinations, using a series of lenses and prisms to assist in determining the one or combination which gives the patient greatest clearness, comfort, and efficiency of vision.

Optometrists should not be confused with oculists or opticians. The oculist (or ophthalmologist) is a duly licensed doctor of medicine who is a specialist in the medical and surgical care of the eyes and is qualified to prescribe lenses or any other form of treatment. The optician fills prescriptions for eyeglasses written by oculists or optometrists; he does not examine eyes nor prescribe treatment.

Where Employed

Most optometrists are engaged in private practice and maintain offices in professional buildings or in their homes. Many, especially new entrants, are employed by established practitioners or are associated with clinics or industrial organizations.

The greatest number of optometrists are in urban areas. The ratio of practitioners to population varies greatly from one State to another.
For example, California, Oregon, and Illinois have 1 optometrist for about every 5,000 persons, while in some Southern States the ratio is 1 to every 20,000 persons.

Training and Other Qualifications

A license is required in all States and the District of Columbia for the practice of optometry. Graduation from a 5-year course in a college of optometry which has been approved by the American Optometric Association is necessary for admittance to a State board examination. The nine accredited schools and colleges of optometry, all of which require high school graduation for admittance, award the degree of doctor of optometry or the degree of bachelor of science in optometry.

The various colleges have somewhat different requirements for the courses which applicants must have completed in high school.

The graduate schools of two universities offer programs of study in optometry leading to the M. Sc. and Ph. D. degrees. These programs are designed especially to prepare career teachers of optometry and research workers in physiological optics.

Outlook

Optometrists who enter practice in the early years of the 1950 decade will probably find good opportunities. New entrants will be needed to replace persons dying and retiring—estimated at 400 to 500 annually—and to make up for the curtailment of training during World War II. In 1949, there were only about 17,000 registered optometrists and a relatively small number of physicians who were specialists in eye health, to provide eye care for the entire population. However, enrollments in schools of optometry have risen greatly since World War II; graduating classes in 1948 and 1949 were more than 4 times as large as in the immediate prewar years. If enrollments continue at such high levels for a few years, it may become increasingly difficult for new entrants to find desirable opportunities for practice. On the other hand, the increase in the size of the Armed Forces anticipated as of mid-1950 will drain off some students and a few trained optometrists, thus tending to reduce competition for desirable locations.

In the long run, there will be an increasing number of employment opportunities, owing to population increase and the extension of eye care. There is a growing awareness of the need for such care, brought about largely by school health examinations, expansion of health facilities in rural communities, emphasis on safety through proper vision, and the importance of vision in modern industry. Women may find increasing opportunities in the field of visual training of children. There is growing emphasis on the correction of crossed eyes and the development of visual skills as related to achievement in school.

The need for practitioners will continue to be greatest in rural communities and small towns. Those choosing a location should consider, however, that the demand for optometric services depends on the occupations in which people are employed as well as on the number of people in the locality and their income level. For example, the proportion of people using eyeglasses is less among farmers than office and factory workers.

Earnings

Self-employed optometrists had the following approximate median net incomes in 1944 according to a survey of members of the American Optometric Association: $1,720 for the first year of practice; $2,825 for the third year; $3,675 for the fifth year; $4,970 for the tenth year. The median net incomes of optometrists with the same amount of experience who were working for others were approximately $1,900, $2,510, $2,940, and $3,410, respectively. In general, incomes were highest in cities with populations of from 10,000 to 50,000.

Where To Go for Further Information

General information on optometry and a list of accredited colleges may be obtained from:

American Optometric Association,
518 Wilmac Bldg.,
Minneapolis 2, Minn.

Information on State requirements for optometric licenses is available from the State board of examiners in optometry in any State capital. The entrance requirements of the different colleges of optometry may be obtained directly from the schools.
**Dietitians**

(D. O. T. 0-39.93)

**Outlook Summary**

An urgent demand at the beginning of the 1950 decade. Continuing expansion of employment opportunities for those who have completed dietetic internships.

**Nature of Work**

Most dietitians work in hospitals where they may administer the food service for patients and staff; may supervise therapeutic diets for patients receiving treatment for certain diseases, either in the hospital or in the clinic; may teach student nurses, dietetic interns, and other groups the principles of good nutrition. Dietitians are also employed in public and private institutions for the aged and for children in corrective institutions and in camps operated by social agencies. Other dietitians supervise the food service in college residence halls, school lunch programs in private and public schools, child care centers, and nursery schools. Some are also employed in hotels, restaurants, and industrial cafeterias. Dietitians may also become consultants to food companies or institutions, to small hospitals or institutions which lack trained staff, or to a group of physicians, or establish themselves as self-employed consultants with offices and patients of their own.

**Training and Other Qualifications**

A person may qualify for membership in the American Dietetic Association by completing a 4-year course in an accredited school of home economics with a major in foods and nutrition or institution management, followed by an internship of approximately 1 year in one of the 70 hospitals or other training programs approved by the Association. For some positions, especially those involving teaching and research, additional graduate training may be required.

Membership in the Association is particularly valuable to hospital dietitians. The American College of Surgeons has a policy that the food service in all hospitals approved by it be administered by a person who meets the requirements of membership in the American Dietetic Association. Those who do not take formal internships must undergo a period of training on the job after graduation from college before they are capable of assuming supervisory work. Those specializing in consultation need a background of experience in therapeutic or clinic work. The advancement opportunity for trained dietitians is excellent after a few years of experience have been acquired. Many seek variety by moving from their own special field into other fields of dietetics after the first few years of employment in one phase of the work.

**Outlook**

A shortage of dietitians existed in 1949, and demand for trained hospital dietitians was expected to increase with the extension of hospital facilities for veterans and for the civilian population, the rising popularity of hospitalization insurance, and the lengthening of the life span of the population. The partial mobilization in 1950 and the expansion of the Armed Forces created an additional demand. More hospital dietitians with advanced training will be needed for clinical work for diabetics, sufferers from heart ailments, and other chronic diseases, and for teaching the principles of good nutrition to student nurses, dietetic interns, doctors, dentists, and social workers.

Further demand will be strong for trained dietitians to operate expanding school lunch programs and related food services in private schools, camps, and college residence halls. Women without training who were able to enter the field because of the shortage of trained personnel will find increasing competition from those with adequate preparation and may be denied promotions to better positions or be dropped entirely when trained persons are available.

In 1950, there were at least 15,000 trained dietitians in the country, of whom about 40 percent were members of the American Dietetic Association. The number without adequate training in the hospital field was large, especially in hospitals.

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1 Prepared by the Women's Bureau, U. S. Department of Labor.
with less than 100 beds. In some school cafeterias, men with business or statistical training were placed in charge of the administration of the food service, and trained women dietitians or those with training gained from experience were hired to supervise the food production. According to authorities in the field of dietetics, 1,000 or more new dietitians are needed yearly to fill normal replacements, and yet only 676 completed internships approved by the American Dietetic Association in 1948. The high marriage rate among dietitians reduces the number available and creates continuing opportunities for those seeking work. Few men enter this field from an internship, but some are taking postgraduate work in restaurant or hotel administration or management and enter the field from that source. They are much in demand as administrators and are considered excellent in purchasing, accounting, cost control, and the business phase of the work, as distinct from food production.

Earnings

The median annual salary of members of the American Dietetic Association working as hospital dietitians was $2,820 in May 1949, not including the cash equivalent of any part or full maintenance provided by the hospital, according to a study by the Bureau of Labor Statistics. For those living outside hospital quarters, the median was $2,970. In mental hospitals the median was $3,330. Salaries ranged from less than $2,000 (received by 1 out of 12) to more than $5,000 (received by fewer than 1 out of 20). Members working in college food service work averaged $3,000 annually; those working in industrial food service, $3,800. In 1948, the National Education Association reported that the salaries of heads of school cafeteria systems ranged from $2,650 to $5,125, depending on the size of the school system. In early 1950, Federal Government salaries for dietitians ranged from $3,100 to $7,400.

Where To Go for More Information

Additional information on the outlook for women as dietitians is given in the following publication:


General information on dietitians may be obtained from:

American Dietetic Association
620 N. Michigan Ave.,
Chicago 11, Ill.


See also Public health nutritionists, below.

Public Health Nutritionists

Outlook Summary

A shortage existed in early 1950 for well-trained nutritionists in the public health field, especially for those with graduate training in certain phases of human nutrition. The field is small as a whole, but promises gradual expansion to those interested in public health service.

Nature of Work

Most public health nutritionists are employed by the States in various capacities. These may include: improving the public understanding of the use of foods through conferences with local health groups; assisting in the training of nurses; advising patients in prenatal clinics; planning school nutrition projects; preparing food budgets for public welfare departments; assisting in nutrition meetings for school lunch workers, camp leaders, and industrial workers and their families; serving in a consulting capacity to small hospitals within the State which are in need of nutrition advice, for example, on maternity care. Others work for counties or larger cities which have programs within their jurisdiction similar to those of the States but on a smaller scale.

Public health nutritionists are also employed by the Federal Government to assist State and local governments to determine and correct malnutrition in communities; put into operation nutrition

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1 Prepared by the Women’s Bureau, U. S. Department of Labor.
programs in pediatric, diabetes, cardiac, and rheumatic fever clinics; or work on the nutritional problems of such groups as families, institutions, the aged, or crippled children. Those in the international field usually serve as consultants to officials in other countries working on the improvement of nutrition for their people. A few nutritionists are employed by industrial concerns to encourage better nutrition among the employees and their families. Others are employed by the Red Cross, local community funds, and other private organizations. The function of the public health nutritionist primarily is to impart the principles of good nutrition to groups in turn reach the public. Although they are comparatively few in number, their influence is very great.

**Training and Other Qualifications**

The basic training of a public health nutritionist consists of the completion of a 4-year course in an accredited school of home economics with a major in nutrition. Advanced training in the science of nutrition and in educational methods is also desirable. Graduate work in schools of public health or in colleges of home economics, offering training in the public health field, is necessary if the public health nutritionist is to advance to the higher levels of the profession.

**Outlook**

A shortage of public health nutritionists in State and Federal Governments existed in early 1950, as it had in the preceding decade. The supply of beginners was adequate, but some personnel was lacking for positions requiring highly specialized training. About 50 State positions and more than 10 positions for specialized personnel in the Federal Government were unfulfilled. With the general increase in social responsibility and food consciousness throughout the country, it was believed that the need for nutritionists would tend to expand gradually in the future. Expansion in the Armed Forces begun in 1950 and the accompanying increase in industrial activity will also lead to a need for the services of more trained nutritionists to safeguard the health of the Nation.

It was estimated that approximately 1,000 trained nutritionists including full-time teachers of nutrition were employed in the United States in 1949. The number graduating from home economics schools who became nutritionists was unknown because those who specialize in foods and nutrition may be employed in a number of related occupations. In 1948, the number of master’s theses in foods and nutrition was 145, and the number of doctor’s theses, 18. As in the case of undergraduates, this represented the supply for almost all types of professional foods and nutrition work and was not confined to the public health field alone. However, the supply of public health nutritionists came in part from teachers, scientists, and others in related fields. It was adequate only at the beginning levels in 1949 and 1950.

**Earnings**

The young home economics graduate entering this field in 1949 and working under supervision could expect a beginning salary of from $2,100 to $2,700. Following a satisfactory period of service she might receive a stipend from or through her agency for graduate training. After some training at the graduate level and 2 or 3 years of experience in the public health field she might earn $3,000 to $4,000 or more. The seasoned worker supervising a staff of workers in a large agency might receive from $5,000 to $6,000. In 1949, the salaries of State public health nutritionists, responsible for service in a large section of the State, usually ranged from $3,384 to $4,620, and for State directors, from $4,200 to $6,000.

**Where To Go for More Information**

Additional information on the outlook for women as public health nutritionists is given in the following publication:


Information may also be obtained from:

American Dietetic Association
620 No. Michigan Ave.,
Chicago 11, Ill.

Food and Nutrition Section
American Public Health Association
1790 Broadway,
New York 19, N. Y.
Chiropractors
(D.O.T. 0-39.90)

Outlook Summary

Employment opportunities vary widely from one part of the country to another. New entrants with the highest qualifications will have greatest opportunities.

Nature of Work

Chiropractic is a system of treatment based on the premise that the nerve system controls the physiological functions of the human body, and that interference with the nerve system impairs normal functions and induces disease by rendering the body less resistant to infection or other causes of disability. The chiropractor treats by specific adjustment and manipulation the structures of the body, especially those of the spinal column. He makes use of such supplementary measures as diet, rest, light, water, heat, and exercise. Most practitioners enter independent private practice, which is limited almost entirely to office calls.

The National Chiropractic Association reported 14,500 practitioners in 1949.

How To Enter

High school graduation or its equivalent is prerequisite for training in all States issuing licenses, and one or more years of preparatory college work is required in some States. Moreover, in all but a few States, 4 years of training in one of the 26 chiropractic colleges is necessary for admission to examinations; the degree of D. C. (doctor of chiropractic) is awarded upon completion of this course. The make-up of the examining boards differs among the States; some are composed of medical members only, chiropractic members only, or basic science members only, while other boards have combinations of these. As a result, examinations given by some boards are considered much more difficult than those given by others.

As of late 1949, chiropractic licenses were issued in 44 States, Hawaii, Alaska, and the District of Columbia, but chiropractic was not legalized in Louisiana, Massachusetts, Mississippi, and New York.

Outlook

The success of the new entrant will depend in large part on proper selection of a location; since the principles of healing by chiropractic are not as yet universally accepted, community attitudes and State regulations vary widely.

Employment opportunities will be greatest for new entrants who are able to meet the highest State licensing requirements, including graduation from a 4-year course of 4,000 or more hours. It will become increasingly important to be able to qualify for any State examination in order to have a wide choice of locations.

Opportunities for women appear to be good, as many women prefer to go to members of their own sex for treatment. In 1940, 18 percent of the chiropractors reported in the census were women.

There will continue to be some opportunities for chiropractors as teachers and in X-ray work (taking and interpreting X-ray pictures for other chiropractors).

Earnings

The National Chiropractic Association reported an average net income in 1949 of $2,100 for the first year of practice and a steady increase to around $7,500 at about the tenth year of practice. Average net incomes of $10,000 and over were reported for those with more than 15 years of experience.

As in other types of independent practice, income of chiropractors varies according to such factors as ability, personality, length of experience, location, and economic conditions.

Where To Find Out More About Chiropractic

National Chiropractic Association,
National Bldg.,
Webster City, Iowa
Veterinarians
(D. O. T. 0-34.10)

Outlook Summary

Very good opportunities in the early fifties. Moderate expansion in the field expected over the long run.

Nature of Work

Veterinarians study and treat diseases of animals, serve as advisors on matters relating to the care and breeding of animals, and inspect animal products intended for human consumption.

Most of the 14,000 veterinarians in the United States are general practitioners; among those who specialize, the majority work with cattle or small animals. About 65 percent are in private practice; most of the remainder are employed on a salary basis by Federal and State agencies for meat inspection, disease control, and research. During World War II, approximately 2,200 veterinarians served in the Army Veterinary Corps; in 1949 about 225 were on commissioned duty with the Army and Air Force. Other veterinarians are engaged in teaching and research at educational institutions, and a few work for manufacturers of products used in veterinary medicine.

Where Employed

Veterinarians are located chiefly in States where a large percentage of the Nation’s livestock is raised. States in which veterinary service is now in use on a large scale are New York, Illinois, Iowa, California, Ohio, Pennsylvania, Indiana, Michigan, Minnesota, Wisconsin, Texas, Missouri, and Kansas. Most of the private practice, except pet practice, is in rural areas.

Training and Other Qualifications

A license is required to practice in all States and the District of Columbia. Generally, applicants must be graduates of veterinary schools and must pass an examination to obtain a license. A few States accept diplomas from approved schools in lieu of the examination; some do not specify graduation, but few except graduates could pass the required examinations. At least 2 years of preveterinary work and 4 years of professional study in a veterinary college are required for the doctor of veterinary medicine degree. Further training can be taken in specialized fields such as pathology or bacteriology. In 1949, there were 11 accredited schools in the United States and 6 new schools which had not yet produced graduating classes. Only graduates of accredited veterinary colleges are admitted to examination for Federal civil service employment.

In 1949, the Bureau of Animal Industry inaugurated a plan whereby sophomore and junior students of schools of veterinary medicine could serve as trainees with the Bureau during the summer months. Such trainees will be given civil service credit for the time served if they later accept permanent employment with the Government.

Outlook

The shortage of veterinarians which developed during World War II is expected to continue into the early years of the 1950 decade at least. In mid-1950 veterinarians were in strong demand for private practice work, as a result of the high
value of livestock. There were also many openings in salaried positions, particularly with the Bureau of Animal Industry of the United States Department of Agriculture, as inspectors of meat products and for work in disease eradication and control. Veterinary medical colleges had openings for veterinarians in teaching and research, and there was a shortage of veterinarians trained for laboratory work, especially in pathology and bacteriology. Additional openings of these types are expected in the near future. Because many men in this profession are at or near the retirement age, there will also be above normal replacement needs in the early fifties. The planned increase in the size of the Armed Forces will require additional veterinarians to serve in the Veterinary Corps.

Though the number of schools of veterinary medicine have been increased from 10 to 17 since World War II, there was still considerable competition among applicants for admission to schools in 1950. As the number of veterans enrolled declines, the competition for entrance to the schools will probably be lessened. Residents of States with veterinary colleges are given preference in these schools over equally qualified non-resident applicants. Chances of admission to schools are best for those with farm backgrounds and with high scholastic averages.

Undergraduate enrollment in schools of veterinary medicine numbered about 3,150 in the academic year 1949-50, an increase of nearly 50 percent over the 1940 enrollment. The number of graduates was higher in 1950 (about 800) than the prewar average and an even larger class will be graduated in 1951. Nevertheless, it appears certain that this supply will not equal the combined civilian and military demand for veterinary services.

In the long run, some growth in the field is expected. Principal fields for future expansion are public-health work—concerned mainly with food inspection and control of disease transmissible to man—and research on livestock diseases. Some expansion in opportunities is expected also in private practice. The trend is toward more scientific attention to the raising of livestock and poultry—to produce more and better meat, milk, wool, and other products with the same amount of feed and care. However, in this field the demand for veterinary service depends largely upon economic conditions, as the market value of an animal usually determines the professional care that can be afforded. Any major economic recession would greatly affect incomes and employment opportunities in large animal practice. Practice with pet animals is less affected by changing economic conditions; this type of practice has grown considerably in recent years and can be expected to make further gains.

Earnings

Income from private practice varies greatly according to location and length of time in practice, ranging from about $2,500 to $10,000 or more a year. Only a small percentage had a net income of over $7,500 in 1949. However, most practitioners live in rural areas where living costs are comparatively low. The two fields which usually bring highest incomes are pet practice in metropolitan areas and specialized practice with thoroughbred horses and other purebred animals, such as fine dairy cattle. Veterinarians employed by the Federal Government had annual entrance salaries of $3,825 for most types of jobs, under the scale which went into effect in late 1949. Salaries of veterinarians employed by State and municipal governments are generally lower.

Where To Go for More Information

American Veterinary Medical Association,
600 S. Michigan Ave.,
Chicago 5, Ill.

Osteopathic Physicians

(D. O. T. 0-39.96)

Outlook Summary

Generally good outlook for those able to obtain training, though opportunities vary from area to area.

Nature of Work

Osteopathy is the school of medicine which emphasizes the mechanical phases of medicine; it includes operative surgery, obstetrics, and the other branches of the healing arts. Most osteopathic physicians engage in general practice (within the limitations set by the various State laws). However, a small but growing number specialize in one of the following fields: internal medicine, neurology and psychiatry, obstetrics and gynecology, ophthalmology, dermatology and syphilology, otorhinolaryngology, pathology, pediatrics, proctology, radiology, and surgery (several types). There is an osteopathic board of specialty certification for each of these fields.

The great majority are in private practice; however, a number have full-time positions with hospitals, private industry, or government agencies, such as the United States Public Health Service, and the Veterans Administration. Still others write or edit scientific books or journals.

Though doctors of osteopathy are licensed and practice in every State and the District of Columbia, about three-fifths of them were in the following nine States in 1949: California, Missouri, Pennsylvania, Michigan, Ohio, New York, Illinois, Texas, and Iowa.

As of mid-1949, there were about 11,000 osteopaths in the United States, including a small number who were retired, not in practice, or otherwise not available for service to the general public. Nearly 10 percent of all practitioners were women.

Training and Qualifications

For practice as an osteopathic physician in any State or the District of Columbia one must be licensed by a board of examiners; in some States annual registration is required. Licensing examinations are given in 29 States by boards of osteopathic examiners; in other States by medical examining boards. 15 of which include osteopathic members. While a number of States and the District of Columbia give licenses granting all practice rights of medicine and surgery to osteopathic physicians, five States do not include the use of surgery and five do not permit the prescription or administration of drugs (according to information as of early 1950). There are also certain other restrictions on practice in some States.

In all States candidates for licensure must be graduates of approved osteopathic colleges, which offer 4-year courses leading to degree of D.O.—Doctor of Osteopathy. There are six schools in the United States approved by the American Osteopathic Association. In 18 States and the District of Columbia, a certificate of proficiency (by examination) in the basic sciences is a prerequisite for admission to the professional examination. Some States also require a period of internship; most graduates complete at least a year's internship in approved training hospitals.

All osteopathic colleges require high school graduation and at least 2 years of pre-osteopathic college study for entrance. Most students have more than this minimum of preparation; in the fall of 1949, nearly 90 percent of the freshmen in osteopathic colleges had had 3 or more years of preprofessional study; over half had a bachelor's degree. The pre-osteopathic college courses required by the professional schools include chemistry, biology, physics, and other science courses; in addition, certain electives are recommended.

Outlook

As of early 1950, the osteopathic profession was not overcrowded; in nearly every State there were cities and towns without osteopathic physicians. The long-run trend toward more medical care for the general population was accentuated during the 1940's, owing in part to the rise in national income and the development of prepayment plans for medical care and hospitalization. These and other factors have made it possible for more people to obtain medical services. Furthermore, enrollments in osteopathic colleges decreased sharply during World War II. Annual graduations since
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1940 have averaged only slightly more than the number leaving the profession; 176 degrees were conferred in 1949 and about 300 were estimated for 1950.

The demand for all types of medical care will probably continue to grow in the future, owing to the increase in population (particularly older persons), Government provision of medical service for veterans and members of the Armed Forces, and the underlying trend toward higher standards of medical care and public health. In addition, a number of new osteopathic physicians will be needed each year to replace those who die or retire and to make up for lowered service capacity among the older personnel.

The number of osteopathic graduates is expected to rise in the 1950 decade. Enrollments in schools of osteopathy were high in the academic year 1949–50 and are expected to remain so for some time; the profession has plans under way to expand school facilities. However, osteopathic enrollments in the future will be affected by Selective Service policies regarding deferments and by the extent of mobilization. Competition for entrance to the professional schools is expected to continue for some time.

The outlook then, for persons who are able to enter and complete osteopathic training, is generally good, though it varies with the area in which the graduate wishes to practice. In view of the differences in the various State laws regulating the practice of osteopathy, the prospective entrant should study carefully the professional and legal requirements in his particular State.

Where To Go for More Information

General information on professional education, licensure, and other requirements for practice may be obtained from:

American Osteopathic Association,
212 E. Ohio St.,
Chicago 11, Ill.

Persons wishing to practice in a given State should find out about the requirements for licensure directly from the board of examiners of that State. A list of the boards and their officers of the States and territories can be obtained from the American Osteopathic Association.

Dental Hygienists

(D. O. T. 0-50.07)

Outlook Summary

Good employment opportunities expected for those trained in approved schools. There are increasing opportunities in public health work, where qualifications and requirements are comparatively high.

Nature of Work

The dental hygienist cleans teeth and performs other preventive services consistent with the respective State dental laws or promotes dental health through educational activities in schools, clinics, and institutions.

Most dental hygienists are employed in dentists’ offices, but in 1941 there were only 4.2 hygienists for every 100 dentists. A large number are employed in public health programs conducted by public school systems or by State or local health departments. Hospitals, clinics, and dental hygiene training schools constitute the other major employers in this field. This occupation should be distinguished from that of the dental assistant who performs X-ray and laboratory work and clerical duties. A dental hygienist may also be trained to perform these duties, but, for her, they are a secondary function. All persons in this occupation are women.

Training and Other Qualifications

A minimum requirement for entrance to a school for training dental hygienists is high school graduation in a college preparatory curriculum. Students must be 18 years of age and in good health. The length of the course in an approved school is 2 years. Graduation from an approved school of dental hygiene and the successful passing of an examination given by a State board of dental examiners are requirements for licensure in 45 States, the District of Columbia, and Hawaii.

1 Prepared by the Women’s Bureau, U. S. Department of Labor.
There is general agreement that the opportunities for dental hygienists in public health and institutional work are gradually increasing. There is a difference of opinion about the future demand for those who work in dentists' offices. This difference arises from the fact that both the dental hygienist and the dental assistant, who is essentially a clerical worker, are valuable to a dentist. In 1941 dental assistants outnumbered dental hygienists more than 10 to 1. There is a definite trend toward the employment by dentists of at least one person, since it increases the number of patients a dentist can serve. There also has been more and more emphasis placed upon group practice by several dentists which often results in their joint employment of one dental hygienist.

In 1945, the number of licensed dental hygienists in the United States totaled more than 7,000. In 1949, all schools were full and had to turn down applicants. Preference was given to those with previous college work. The number of dental hygienists graduating from the 14 approved schools was 350 in 1949. In 1950, with the opening of four additional approved schools, the output was about 450. It has been estimated that more than twice this number could be used annually.

Earnings

There is a wide range in salaries owing to differences in the income levels of the dentists and to the sizes of communities and, in part, to the wide variation in background and personal qualifications of those practicing dental hygiene. In 1949, most dental hygienists, however, were earning between $2,000 and $3,000 a year, $2,500 being a typical salary. The beginning yearly Federal civil service salary for dental hygienists in late 1949 was $2,650. Only a small proportion of the dental hygienists work for the Federal Government, however. There are very few opportunities for supervisory work except in very large institutions.

Where To Go for More Information

Additional information on the outlook for women as dental hygienists is given in the following publication:


Information may also be obtained from:

American Dental Hygienists Association,
1612 Eye St., N. W.,
Washington 6, D. C.
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Physical Therapists

(D. O. T. 0-52.22)

Outlook Summary

Excellent opportunities for persons already qualified. New entrants from approved schools should readily be absorbed within the foreseeable future.

Nature of Work

The physical therapist administers treatment only as prescribed by a physician. Physical therapy includes treatment by means of massage, exercise, heat, light, water and electricity, for poliomyelitis, orthopedic, neurological, arthritic, cerebral palsy, neuropsychiatric, and other patients.

Most physical therapists work in hospitals, but some are employed by orthopedic surgeons, by physiatrists (physicians specializing in physical medicine) or in public health or social service agencies serving crippled children, injured industrial workers, and others who need physical therapy treatments. Those employed in hospitals usually have access to a wider variety of equipment and tend to be less specialized than those working with a particular physician or agency.

Training and Other Qualifications

Graduation from an approved school of physical therapy is requisite for membership in the American Physical Therapy Association or registration with the American Registry; admission requires graduation from a school of nursing, a school of physical education, or 60 college semester hours, including courses in the physical and biological sciences. The American Physical Therapy Association reports that an increasing percentage of the 29 training schools in this field in the United States will soon require 3 years of college education. The length of the approved physical therapy course ranges upward from a minimum of 12 months. Good health is essential. More than 90 percent of physical therapists are women.

Outlook

The acute shortage of trained physical therapists during World War II has continued, and the demand was still greater than the supply in 1949. The international situation in 1950 further increased the need in military and veterans' hospitals. Although graduating classes increased from about 150 in 1941 to 425 in 1949, the need had not yet been met. There is a need for additional training centers. Applications in 1949 exceeded training capacity.

Veterans' hospitals will continue to need many of the physical therapists. A marked increase is expected in the number of veterans who need treatment but do not require hospitalization. They will be given physical therapy treatment as outpatients. Expanding civilian rehabilitation and crippled-children programs, in which States are aided by Federal funds, also have encouraged the use of physical therapy in the rehabilitation of both adults and children. The clinical and laboratory research of the National Foundation for Infantile Paralysis has found that prompt physical therapy treatment is of great value in poliomyelitis. As techniques and equipment continue their development, more physicians will recommend physical therapy for patients.

In 1949, there were about 4,500 qualified physical therapists, most of whom were employed. Approximately 1,200 additional workers were not qualified. The rate of withdrawal from the occupation may be high if many young women who trained during World War II marry and retire fully or partially from practice after only a few years of service. It is estimated by the American Physical Therapy Association that altogether 15,000 physical therapists will be needed by 1960.

Earnings

Before World War II, beginners received about $1,500 annually, but in 1949 graduates of approved schools started at $2,400 to $2,700. Except for small annual increases, advancement is mainly through the addition of supervisory or instructional duties at salaries ranging upward to $4,500.

1 Prepared by the Women's Bureau, U. S. Department of Labor.
The Federal civil service entrance salary for physical therapists was $3,100 in late 1949. Allowance for maintenance is sometimes given by hospitals.

Where To Go for More Information
The American Physical Therapy Association, 1790 Broadway, New York 19, N. Y.

Medical Record Librarians ¹
(D. O. T. 0-23.25)

Outlook Summary
Good employment opportunities expected for graduates of approved schools in this relatively small but growing occupation. New entrants will encounter considerable competition unless specially trained.

Nature of Work
The medical record librarian is in full charge of the medical or clinical reports of a hospital. Duties consist of planning, organizing, and managing the records department, as well as cataloging, filing, and compiling medical and surgical statistics, and assisting physicians in using them for research. The medical record librarian should not be confused with medical librarians who have charge of a library in a hospital or medical institution and have nothing whatever to do with the patients' records.

Medical record librarians are employed in hospitals or other medical institutions throughout the country. Both men and women are employed in this occupation, although women predominate.

Training and Other Qualifications
Only a small proportion of those engaged in this occupation in 1949 were graduates of the 17 schools in the United States approved by the Council on Education and Hospitals of the American Medical Association. Two years of college or graduation from a recognized school of nursing is usually required for entrance to an approved course, which lasts 12 months. Two schools whose 4-year courses lead to a degree require only a high school education; one school requires 3 years of college for entrance to its 1-year degree course. All students must be proficient in typing and shorthand. Regular courses include at least 208 hours on medical fundamentals and terminology.

Less than a third of the medical record librarians employed full time in registered hospitals in 1946 were registered by the Registry of the American Association of Medical Record Librarians. Requirements for registration include: Graduation from an approved school or high school graduation plus 3 to 5 years' experience in this work; minimum age of 21 years; active employment in this occupation; the passing of an examination covering pertinent subject matter.

Outlook
A steadily increasing need for medical record librarians is expected because of increases in the number of hospitals for veterans and civilians. More and more persons are seeking hospital care during illness. As the science of medicine progresses, as new treatments develop, the record-keeping function becomes more significant. Hospital records supply much of the raw material on which medical research and further progress depend. They also furnish a basis for evaluating the effectiveness of the hospital and its staff and the extent of their progress.

There were 3,819 persons employed in full-time work of this type in registered hospitals in 1946 and another group of more than 1,000 engaged in part-time work. The combined capacity enrollment in 1948 of the 13 schools approved by the American Medical Association was only 118. In 1948, 58 students were graduated from approved courses, and an additional 18 completed courses for experienced but untrained librarians.

The several thousand workers without approved training who are already employed should have no difficulty in retaining their posts, especially if they supplement their training by special short

¹ Prepared by the Women's Bureau, U. S. Department of Labor.
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courses in approved schools. However, untrained persons will find it increasingly difficult to enter this field.

Earnings

Annual salaries for medical record librarians throughout the United States in 1947, ranged from $2,400 to $5,000, according to the American Association of Medical Record Librarians. Advancement opportunities lie in supervisory work, especially in large hospitals.

Where To Go for More Information

Additional information on the outlook for women as medical record librarians is given in the following publication:


Information may also be obtained from:

American Association of Medical Record Librarians,
22 East Division Street, Chicago, Ill.

Occupational Therapists

(D. O. T. 0-32.04)

Outlook Summary

Good employment opportunities for persons already trained and for a steady flow of new entrants in this growing occupation.

Nature of Work

The occupational therapist conducts programs for patients in hospitals and other institutions to provide them with directed activity which will help in their rehabilitation; he supervises workers who teach such activities as arts and crafts. Occupational therapy is a type of treatment prescribed by a physician to hasten a patient's recovery from disease or injury or to help him adjust to hospitalization. Among the activities taught are: weaving, leatherwork, woodwork, photography, metalwork, ceramics, plastics, printing, and gardening.

Most occupational therapists work with mental or orthopedic patients; many are employed in tuberculosis or children's hospitals or wards; still others specialize in work with the blind or with patients who are chronically ill. Almost all the work was originally done in hospitals and institutions, but in recent years there has been a trend toward the development of community workshops to which those who need occupational therapy may come from their homes or places of employment. Since World War II a very large field has been in the rehabilitation of veterans. Most of the tuberculosis and neuropsychiatric veterans' hospitals, as well as some of the general veterans' hospitals

Training and Other Qualifications

Graduation from an accredited school of occupational therapy is generally required to qualify as an occupational therapist. There were 22 approved schools in the United States in 1949, and 3 additional ones which had developed courses based on approved standards but which had not been in existence long enough to obtain accreditation. Requirements for entrance vary with the course subsequently taken. A 5-year degree course is available to high school graduates. A 3-year diploma course is offered persons with one or more years of college, and a college graduate may complete training in 18 months. To become a registered occupational therapist, it is necessary to graduate from an accredited school and to pass the national registration examination given by the American Occupational Therapy Association.

Outlook

There is an increasing need for capable persons in this small, but growing field. The American Occupational Therapy Association believes that an additional 6,000 persons will be needed by 1960. In early 1950 there were shortages, especially of therapists qualified for administrative jobs. The partial mobilization under way later in that year emphasized the undersupply. There will continue to be good opportunities for new entrants

1 Prepared by the Women's Bureau, U. S. Department of Labor.
because of the expansion of veterans’ hospitals, and of civilian health programs, and the increasing use of occupational therapy for mental patients, crippled children, tuberculous patients, and convalescents. The retirement of the many young women who marry will create additional job openings.

Of the approximately 3,400 occupational therapists registered in 1949, only about 2,300 were active. The need was so great that no oversupply in this field was anticipated in the predictable future.

The greatest number of occupational therapists were formerly along the eastern seaboard and in the Midwest; however, future employment opportunities may tend to be more widespread, because veterans’ hospitals, where so many will be employed, are located throughout the country.

**Earnings**

Salaries for beginners in 1949 ranged from $2,000 to $3,000 a year, according to the American Occupational Therapy Association. In institutional work, $1,200 to $1,800 a year, plus maintenance, is the usual salary. Heads of departments or of schools earned as much as $3,500 to $6,000 a year, the average falling between $3,000 and $4,000. Under the Federal civil service $3,100 per annum was the entrance salary for qualified occupational therapists in late 1949.

**Where To Go for More Information**

A list of training centers may be obtained from:

American Occupational Therapy Association,
33 W. 42nd St.,
New York 18, N. Y.
Engineering is one of the largest professional occupations, outranked in size only by teaching and nursing; for men it is the largest profession. Perhaps more than any other occupation it is identified with our present-day technological civilization. The more than a third of a million engineers in the United States are largely responsible for planning the work of, or designing the machines and buildings used by, a majority of the Nation's 60 million employed.

Employment Trends and Outlook

Engineering is also one of the most rapidly growing professions in the United States. The number of engineers increased nearly tenfold between 1890 and 1940, rising from 27,000 to slightly over 260,000. (See chart 35.) It is estimated that, by the spring of 1948, the engineering profession numbered approximately 350,000—an increase of about 34 percent since 1940. Furthermore, very few members of the profession were unemployed in 1948, whereas about 16,000 were without work in 1940.

The profession's long-term growth has resulted in part from expansion in the industries which employ engineers. Between 1890 and 1940, there was nearly a threefold increase in the total number of workers attached to the basic commodity-producing and transporting industries (manufacturing, mining, construction, transportation and public utilities), which employ about three out of four members of the engineering profession.

After 1940, in the war and postwar periods, these industries had a large additional increase in employment, and they are expected to make further gains over the long run.

The engineering profession has grown even more rapidly than the total work force of the production and transportation industries mentioned above. In 1890, there were 290 workers attached to these industries for every engineer in the country; in 1940, the ratio was only 78 to 1; and in 1948 it was 69 to 1. The ratio dropped very rapidly up to 1930 and has since declined more slowly.

Examination of the trends in the use of engineers in each major industry leads to the conclusion that their employment should increase relative to the total number of workers in industry at least until 1960, although the rise may not be continuous. Some of the factors which underlie the extension of industry's use of engineers are the general advance of scientific knowledge and its practical application in industrial operations, the extension of research and development work in industry and government, and the new uses of engineering methods in administration, sales, and other types of work.

By 1960, if total employment in the major industries using engineers increases moderately in line with past trends, and if the number of workers employed per engineer decreases somewhat more slowly than in the past five decades, it may be estimated that total engineering employment would rise to roughly 450,000—some 100,000 more than in 1948. This estimate is presented, not as a
forecast, but only to suggest the large magnitude of the increase in engineering jobs which is indicated by past trends. Furthermore, the estimated expansion takes account only of the peacetime demand for engineers without any allowance for additional personnel needs arising out of the mobilization program.

Besides the engineers needed to fill new positions, thousands will have to be trained annually to replace those who die, retire, or transfer to other occupations. Such losses to the profession were estimated to be slightly over 10,000 a year at the end of the 1940's. Toward the end of the 1950 decade, losses from all factors are expected to rise to around 13,000 a year, owing to the increasing size of the profession.

In line with the general increase in college graduations, the number of engineering degrees awarded rose from an average of 7,000 a year in the 1920's to about 10,000 a year during the 1930's (see chart 36). After increasing further in the early 1940's and decreasing in the later years of World War II, graduations rose to new heights in the postwar period, the 1946–47 graduating class of 21,000 outnumbered that of any previous year. In 1947–48 and 1948–49 some 32,000 and 45,000 students were graduated; about 52,000 graduated during the year ending June 1950. On the basis of enrollments in the academic year 1950–51, graduations were expected to decline to about 38,000 in 1951, 26,000 in 1952, 20,000 in 1953, and 17,000 in 1954, owing to the graduation of most of the veterans and the decrease in college-age population. The decrease in enrollments in the next few years will be accentuated by the withdrawal of students for military service. The downward trend is expected to continue to the mid-fifties and then rise again, at least until 1965.

In late 1949, reports from industry indicated that hirings for 1950 would be 30 percent lower
than in 1949; hirings in 1949 were no better than in 1948. It was expected that during 1950 and the following couple of years, new engineering graduates would be likely to meet sharply increasing competition for employment.

By the fall of 1950, the employment situation had changed a great deal as a result of the increased mobilization of the Nation's resources. Information from placement offices and other sources indicated that soon after the outbreak of hostilities in Korea, hiring of engineers increased sharply. Despite the record 1950 graduating class, employers were, in the fall, seeking additional personnel. Any recent graduates who had taken nonengineering jobs could find opportunities to transfer to engineering work.

Persons now in engineering school or planning to enter in the near future are expected to have good employment prospects. The long-run increase in need for engineering graduates for engineering positions described above is likely to be augmented by the anticipated higher levels of defense production and expanded military force. At the same time, the supply of engineers may be greatly affected by the general decline in graduations and the withdrawal of both students and experienced graduates for military service.

The foregoing evaluation does not allow for the likelihood that some engineering jobs will be filled, as in the past, by men without engineering degrees. In the long run, nongraduates will probably have increasing difficulty getting engineering jobs. On the other hand, there is a long-run trend toward increased hiring of engineers for nonengineering work.

**Training, Qualifications, and Registration**

College freshmen and those who plan to enter engineering school in the future would be well advised to get the best possible training. The minimum educational requirements have been raised gradually and the would-be engineer should endeavor to maintain the best possible record of achievement in his studies and broaden his training as much as possible. Furthermore, many employers emphasize the extra-curricular college record of prospective employees.

Persons contemplating an engineering career should rate well above average in mathematics and science courses in high school. Graduation from a recognized engineering college is the minimum educational requirement for engineering work. Most engineers have a college education and the proportion with advanced degrees, though small, is increasing. It is also important for prospective engineering students to select a properly accredited school of engineering since persons trained at such schools generally have the best employment opportunities.

In addition to regular collegiate training, many industrial concerns have special testing and training programs in operation for engineering graduates. For the most part leaders in the professions realize that a person has not been completely prepared for a professional engineering job merely by finishing an undergraduate course. Also, many companies prefer to teach specific industry techniques in their own manner.

Laws providing for registration or licensing of engineers are in effect in all 48 States, the District of Columbia, and 5 Territories. In general, the purpose of the laws is to ensure that engineering work which involves the safeguarding of life, health, or property is done by registered engineers. The various laws have different provisions as to the types of work for which registration is required. In some States, for example, only civil or structural engineers have to register. In 1950, there were over 150,000 registered engineers in the country—nearly a third of the total number. The greatest number of these are civil engineers, but registration of other types of engineers is growing.

Registration laws are subject to frequent change and improvement; the major engineering societies have from time to time attempted to set up “model” laws and definitions. Generally, requirements for registration as a professional engineer are: Graduation from an approved engineering college, plus 4 years of experience and passing of a State examination. Examining boards may accept a longer period of experience as a substitute for a college degree.

**Earnings**

Earnings in engineering, as in other professions, vary considerably and are affected by many factors.
Length of experience is one of the most important factors influencing earnings. For most engineers, earning capacity increases with added years of experience. In general, the greatest rise in earnings occurs in the first 10 years of experience (chart 37).

The type of work performed by an engineer also has much to do with the amount of money he is able to earn. Top salaries in all the major fields are earned by engineers in administration-management jobs. These positions are usually attained only after many years of experience. When earnings are considered in relation to length of experience, it is found that jobs in research and sales, as well as administration, generally pay more than such work as inspection, analysis and testing, operation, and college teaching.

There are wide differences in the educational attainment of engineers among the major branches of engineering and also within each branch. Examination of salaries for men with comparable amounts of experience showed that, in general, earnings are highest for engineers with the greatest amount of formal education. In most fields, holders of the master's degree earn slightly more on the average than those with only the bachelor's degree. Men with the doctorate tend to earn considerably more than either of these groups.

Engineers employed by private firms and those employed by the Federal Government have com-
parable average salaries when length of experience is taken into account. Engineers employed by State and local governments generally had lower earnings. Employers and independent consultants had highest annual incomes in all fields of engineering; with large amounts being derived from fees and bonuses.

Data on average earnings in 1946 in the major branches of engineering are presented in the statements on individual branches which follow. These earnings data are from the 1946 Survey of the Economic Status of Engineers, made by the Bureau of Labor Statistics in cooperation with the Economic Survey Committee of the Engineers Joint Council and with the National Roster of Scientific and Specialized Personnel, United States Employment Service.

Average earnings in the profession as a whole have increased since 1946. A survey of the employment programs of industrial companies and governmental agencies made by the Engineers Joint Council showed that engineering graduates who had been out of school for 10 years in late 1948 were receiving 20 percent higher salaries than graduates with similar experience in 1946. A similar survey revealed that, in early 1950, median monthly starting rates were as follows: bachelor's degree—$255; master's degree—$320; doctor's degree—$445. However, median starting rates differed greatly by type of industry, engineer, and employer.

While earnings information, such as that from the Bureau's surveys, is useful in showing what the average person may expect by way of remuneration in the engineering profession, caution should be exercised in applying such findings to individual cases. Some engineers never advance beyond the earnings level of the average factory worker or clerk. It is possible to gain an engineering degree without having the capacity to advance far up the professional ladder; while experience tends to increase earning capacity, it does not do so for all people. Young people considering engineering as a career should weigh their own interests and abilities in relation to the competition which they will meet in this field. For those who can successfully meet the competition, the top of the profession is so well rewarded both in terms of remuneration and the inherent interest of the work that it is worth sacrifice to attain it.

Where To Get More Information

Additional information on employment trends and outlook, earnings, and occupational mobility is given in:


Employment opportunities for women in the engineering profession are described in:


Information on engineering schools and curricula, professional training and ethics, and on student selection and guidance may be obtained from the following organization:

Engineer's Council for Professional Development,
29 West 39th St.,
New York 18, N. Y.

Information on registration and on the professional, economic, social, and other nontechnical aspects of engineering may be obtained from the following organization:

National Society of Professional Engineers,
1121 15th St., NW.,
Washington, D. C.

Organizations which can furnish information on the respective branches of engineering are listed below:

American Ceramic Society,
2525 N. High St.,
Columbus, Ohio.

American Institute of Chemical Engineers,
50 E. 41st St.,
New York 17, N. Y.

American Institute of Electrical Engineers,
29 W. 39th St.,
New York 18, N. Y.

American Institute of Industrial Engineers,
214 Industrial Engineering Building,
Ohio State University,
Columbus 10, Ohio.

American Institute of Mining and Metallurgical Engineers,
29 W. 39th St.,
New York 18, N. Y.

Association of Consulting Management Engineers, Inc.,
347 Madison Ave.,
New York 17, N. Y.
Some of the other national organizations to which engineers belong are listed in the publication, Employment Outlook for Engineers, mentioned above.

Mechanical Engineers
(D. O. T. 0.19.01, .03, .05, .81, .91)

Outlook Summary

Employment in this largest branch of engineering will continue to expand over the long run. Good employment prospects for new graduates until middle of 1950 decade at least.

Nature of Work

Mechanical engineers are responsible for design, testing, construction, and operation of machinery that produces, transmits, or consumes power, or utilizes heat energy. These engineers also design machine tools and equipment, and plants or mills which require special construction to accommodate power-producing or transmitting machinery. Mechanical engineering covers several distinct areas of work, such as: aeronautical; marine engineering and naval architecture; automotive; railroad equipment; heating, ventilating, and air-conditioning; and general power production. Major functions are design, development, manufacturing and production, administration, and sales.

Where Employed

Many industries employ mechanical engineers, but more than half are in the metalworking industries—principally iron and steel, machinery, and transportation equipment. Though there are some mechanical engineers in all States, the large majority (about 70 percent in 1946) are employed in the following eight States: New York, Ohio, California, Pennsylvania, Illinois, New Jersey, Michigan, and Massachusetts.

Outlook

This was the second largest branch of engineering before World War II, with about 86,000 members in 1940. It has now become the largest branch with around 130,000 members in 1948. Large numbers of mechanical engineers have graduated since 1940, particularly since World War II. Also many engineers of other types transferred into the field during World War II and have remained there. In addition, many persons without engineering degrees were able to enter the field during the war. Mechanical engineers have been used in increasing numbers by a variety of industries. Research opportunities have been expanding. The mobilization program undertaken in mid-1950 has led to a further sharp increase in demand for personnel.

Employment in mechanical engineering will continue to expand over the long run, although at a slower rate than during the forties. On the basis of peacetime needs alone, more than 175,000 mechanical engineers may be employed by 1960. However, the number of new graduates who obtain positions will vary from year to year. As mentioned above, a large proportion of mechanical engineers are employed in metalworking industries; these industries will expand over the long run. Additional engineers will be needed to replace those dying or retiring (estimated at about 2,000 annually).

Graduations in mechanical engineering reached new highs of almost 11,000 in the academic year 1947–48, and nearly 15,000 in 1948–49, and 16,000
ENGINEERING

in 1949-50. The prewar peak was 6,000 in 1942-43. Though the number of graduates is expected to decline after 1949-50, it will still remain above prewar levels unless drastically affected by withdrawals for military service.

The sharp increase in hiring in the summer and fall of 1950 quickly reduced competition for jobs among the great number of graduates. A good outlook in the early and middle fifties is expected as a result of declining graduations and increased mobilization and industrial activity.

Earnings

In 1946, beginners had a median monthly salary of about $225; those with 5 years' experience, a middle earnings figure of $340. Median monthly salary was about $405 for those with 10 years' experience, and $495 for those with 20 years' experience.

See also Aircraft Manufacturing Occupations, p. 273; Iron and Steel Manufacturing Occupations, p. 243; and Shipbuilding Occupations, p. 259.

Civil Engineers

(D. O. T. 0-16.01)

Outlook Summary

Slow growth of employment over long run, though less than in most other branches of engineering. Employment opportunities were good in mid-1950 and are expected to remain so for a number of years. However, opportunities are greatly affected by changing levels of construction activity.

Nature of Work

A civil engineer plans, designs, and supervises the construction of roads, bridges, buildings, dams, tunnels, water-supply and sewage systems, transportation facilities, and other structures for public, industrial, or commercial use. Most civil engineers are engaged in technical administrative-management, design, or construction supervision. Others are employed as consulting engineers, college teachers, in research or development work, or in selling. The major specialized fields of civil engineering are: structural, highway, hydraulic, railroad, and sanitary and public health.

Where Employed

About half of all civil engineers are employed by local, State, and Federal government agencies. The second-largest group are in the private construction industry. Many are employed also by railroads and public utilities. Some are in the iron and steel industry, petroleum refining, and other branches of manufacturing.

Civil engineers are employed in all parts of the country; there are jobs in every State and city. Frequently the engineer is called upon to work at the construction site, which is sometimes in a remote location. Some civil engineers from the United States work in foreign countries. Members of this branch of the profession are often required to move from one place to another, although there are many jobs in civil engineering—such as city engineering positions—which involve virtually no traveling.

Outlook

Civil engineering has not expanded as rapidly as other major engineering fields in recent decades, partly because the construction industry has not grown as fast as some manufacturing industries which employ many chemical, mechanical, metallurgical, and other types of engineers. In 1940, civil engineers were the largest group of engineers, numbering over 89,000; nearly 10 percent were unemployed, and many men with civil engineering degrees were employed in subprofessional positions as draftsmen or surveyors. By the spring of 1948, the number of employed civil engineers had increased to slightly over 90,000, owing mainly to gains in construction activity since World War II. However, the number of mechanical engineers employed has risen so much faster that they have become the largest branch of the profession.

The number of openings for civil engineers should be higher in the early fifties. Though con-
Frequently, the civil engineer is called upon to supervise construction jobs on site—sometimes in remote locations.

Employment for at least the next few years will be affected by the impact of mobilization, it is expected to stay well above pre-World War II levels unless the mobilization program goes far beyond the point contemplated in late 1950. Over the long run, a slow expansion in civil engineering employment seems likely; by 1960, the branch may grow to around 105,000, some 15,000 more than in 1948. Additional engineers will be needed to replace those dying and retiring, estimated at 2,400 in 1949; this number should also rise slowly in the future. It should be noted, however, that in this occupation as in the construction industry as a whole, employment opportunities are greatly affected by changing levels of economic activity.

The number of civil engineering graduates reached a new peak of about 8,000 in the year 1949-50, after record numbers in earlier postwar years. However, graduations have not increased as much as in most other branches of the profession. Also, both during and since World War II, a number of civil engineering graduates have not taken civil engineering positions. Many jobs have remained unfilled, particularly in the public works field, partly because salaries paid under State and local government contracts have been lower than in other areas of work. The increasing demand for other types of engineers resulting from the mobilization program which began in mid-1950 will offer additional opportunities for civil engineers outside their own branch.

**Earnings**

In 1946, beginners had a median monthly salary of around $240; the median for those with 5 years' experience was nearly $300. The middle earnings figure for those in the profession for 10 years was around $350; for those with 20 years' experience, about $390. Salaries of $10,000 a year and over are not uncommon in this field, especially in positions involving managerial responsibilities.

**Electrical Engineers**

(D. O. T. 0–17.01 and .02)

**Outlook Summary**

Continued expansion in employment anticipated over long run. Good outlook for those now in school or planning to enter school in early fifties.

**Nature of Work**

The electrical engineer is concerned with the generation, transmission, and utilization of electricity. Among the major branches of electrical engineering are: Power generation, transmission, and distribution; illumination; wire communication; electronics (including radio, television, and other applications); transportation; and electrical machinery and equipment manufacturing. The most important fields of functional specialization are: Research and development, operation or application, design, teaching, and selling.
About two-thirds of all electrical engineers are employed in the following industries: Electrical machinery and equipment manufacturing, electric utilities (generation, transmission, or distribution), communications (telegraph, telephone, radio), or electronics manufacturing.

Most electrical engineers (over two-thirds in 1946) are in the States of New York, Pennsylvania, New Jersey, Ohio, Illinois, Massachusetts, and California. Employment in this branch of engineering is heavily concentrated in the industrial centers where electrical equipment is manufactured. However, jobs with electric light and power companies, telephone companies, and radio stations are located in every State, in small towns as well as large cities. Some American electrical engineers are employed in foreign countries.

Outlook

Electrical engineering, the third largest branch of the engineering profession, has grown rapidly over the last 30 or 40 years, although its growth was interrupted during the depression thirties. Between 1940 and 1948, the number of electrical engineers employed in the country rose from about 56,000 to nearly 75,000. Initial growth came as the result of the development of the electric utility industry, the telephone and telegraph, and electrical-machinery and equipment manufacturing. More recently, the growth of the radio industry and other developments in electronics have been a major factor in the expansion of this branch of engineering.

Employment of electrical engineers will increase further in the future because of the expanding use of electrical and electronic equipment in industry, by the Armed Forces, in homes, on farms, and in therapeutic work. Industry will need engineers to develop new products for both military and civilian uses. Over the long run, public and private power developments should provide opportunities for additional men, and there will also be some opportunities in the radio and television broadcasting industry, in teaching, and in other fields. From about 75,000 in 1948, the number of electrical engineers could well increase to around 95,000 by 1960, on the basis of peacetime demand alone. In addition, electrical engineers will be needed to replace those dying and retiring each year, estimated at slightly over 1,000 in 1949.

The number of degrees awarded in electrical engineering has been exceedingly high in the last few years. Large numbers were attracted to this field, owing to their experience in working with radar, radio, or other electronic or electrical equipment in the armed services. Graduations reached new highs in the postwar years: about 6,700 bachelors' degrees were awarded in 1947-48; over 11,000 in 1948-49; and about 13,000 in 1949-50. These figures may be compared to the prewar high of slightly under 3,000 bachelors’ degrees in 1939-40.

In late 1949, a number of electrical engineering graduates were still seeking employment in their field several months after graduation. At that time, it was expected that the overcrowding would continue for a few years. However, since the beginning of the defense mobilization, employers have hired many more electrical engineers than they had expected to need earlier. The mobilization will also contribute to the demand through the early fifties. At the same time, the supply of personnel entering the field is likely to decline owing to the general decrease in the number of college students and the withdrawal of students for military service. Therefore, the outlook for students now in school or planning to enter school in the near future is good.

Earnings

In 1946, beginners had a median monthly salary of about $235; those with 5 years’ experience made about $80 more. For men who had been in the profession 10 years, the median monthly salary was around $370, for those with 20 years’ experience, about $460. Salaries have increased generally since 1946. Salaries of $10,000 to $15,000 a year and over are not uncommon in electrical engineering.

See also Aircraft Manufacturing Occupations, p. 273; and Iron and Steel Manufacturing Occupations, p. 243.
Chemical Engineers

Outlook Summary

Continued increase in employment expected over long run. Employment prospects for new graduates have improved greatly as a result of the defense program and are expected to remain good at least until the middle of the decade.

Nature of Work

Chemical engineers are concerned with the application of chemistry and other basic sciences and of engineering principles to the design, construction, operation, control, and improvement of equipment for the utilization of chemical processes on an industrial scale. These processes are usually separated into individual operations or processes known as “unit operations.” The work of the chemical engineer involves the application of one or a series of these “unit operations” to the manufacture of a product.

The chemical engineer may specialize industrially (for example, in petroleum, plastics, rubber, food, or industrial chemicals); by type of operation (for example, in absorption and adsorption, heat transfer, disintegration, or distillation); or functionally (for example, in management, research, design, or operation).

Where Employed

A great many industries use chemical engineers. Approximately four out of five are employed in manufacturing industries, according to a 1946 survey. Over a third are in the chemical industries, while about a fifth work in the petroleum and coal products industries.

Chemical engineers are employed to some extent in all States, mainly in or around large industrial cities. However, three-fourths of them were employed in the following 11 States in 1946: New York, New Jersey, Pennsylvania, Ohio, Illinois, Texas, California, Massachusetts, Michigan, Delaware, and Indiana. Two out of every five were in the first four of these States.

Outlook

Chemical engineering is one of the youngest of the major fields of engineering; its growth in the past few decades has been very rapid. The number of chemical engineers (about 35,000 in 1948) has more than doubled since 1940. Major factors underlying this growth have been the expansion of chemical and allied industries, the increasing use of chemical engineers in other industries, and expanding research and teaching needs.

Employment in this branch of the engineering profession will probably continue to increase over the long run, although growth will probably slow down. Further expansion is expected in the industries in which most chemical engineers are employed—chemical, petroleum and coal products, and closely allied industries—particularly in view of the mobilization program which began in mid-1950. The large research programs with the development of atomic energy and the synthetic fuel program should also provide many opportunities. In addition, the number of engineers needed to replace those retiring or dying—small at present because of the low average age of chemical engineers—may be expected to increase.

Despite the postwar gains in employment, new entrants were faced with competition for jobs in early 1950. In the academic year 1949–50, about 4,500 chemical engineers received their bachelor’s degree, compared to some 2,500 in 1940–41, the pre-World War II peak figure. The number of bachelor’s degrees granted in the allied field of chemistry also has risen far above prewar levels. Graduations will decline in both chemistry and chemical engineering; however, they will probably remain above pre-World War II figures indefinitely, unless withdrawals for military service are very large. On the other hand, opportunities have increased greatly as a result of the defense mobilization, which began in mid-1950. Employment prospects should improve still more as the number of new graduates decline, particularly in view of the expected level of expenditures for defense.

Best opportunities will be for those with advanced training. The proportion of persons with graduate training is higher among chemical engineers than in most other branches.
Earnings

In 1946, beginners had a median monthly salary of about $240; those with 5 years' experience, a middle earnings figure of about $330. For those with 10 years in the profession, the median salary was around $400; for those with 20 years experience, about $500. Monthly salaries of $800 to $1,000 and over are not uncommon in this field.

See also Chemists, p. 93; and Petroleum Production and Refining Occupations, p. 331.

Industrial Engineers

(D. O. T. 0–18.01)

Outlook Summary

Continued growth in employment expected in this rapidly developing field. Employment prospects favorable at least through the early fifties.

Nature of Work

Industrial engineers are concerned primarily with the efficient use of labor, machines, and materials in industry. They often specialize in one or more types of work, such as factory design, location, and lay-out; time, motion, and incentive studies; job and wage evaluation; or safety engineering. Other specialties are: production and material control, production cost control, training of supervisory and production personnel, and quality control. The terms "industrial engineering" and "management engineering" are sometimes used interchangeably, but the tendency is to apply the former to positions concerned with production problems only, the latter to positions of broader responsibility or to independent consultants dealing with problems of company organization and policy, marketing, finance, and personnel, as well as production.

Outlook

Employment of industrial engineers is expected to rise in the early fifties and over the long run, because of the need to increase productivity and lower costs, growing recognition of the importance of scientific management and safety engineering and long-term expansion of industrial activity. Gains in employment of industrial engineers may not be as rapid in the future as in the last decade, however. During World War II and in the postwar years, many persons were trained in this field and many others with incomplete college education or with degrees in related fields were given some training in industrial engineering, to meet the shortage of qualified men. It is estimated that the number in the field has more than doubled since 1940, when about 9,300 industrial engineers were employed.

Graduations in industrial engineering, which have been rising since World War II, reached a peak in 1950. They are expected to decline somewhat in the next several years, but will probably remain above pre-World War II levels indefinitely, unless withdrawals for military service are very large. In addition, a record number of persons have received degrees in business administration in the postwar years and graduates in this field usually compete with industrial engineers for some of the available industry jobs. On the other hand, the increase in hiring in the latter part of 1950, which resulted from the increased expenditures for defense production, quickly reduced competition for jobs among new graduates. Employment prospects are likely to remain good at least in the early years of the decade, because of the expected decline in graduation and the anticipated high level of industrial activity.

Earnings

In 1946, beginners had a median monthly salary of between $220 and $240 per month; those with 5 years' experience had a median salary of around $350; those with 10 years' experience, a median of $410. Monthly salaries of $800 to $1,000 are not uncommon, particularly in consulting and executive positions.
Metallurgical Engineers

Outlook Summary

This small but rapidly expanding branch of engineering will probably continue to grow over long run. Employment opportunities likely to remain favorable at least until middle of decade.

Nature of Work

Metallurgical engineers direct the industrial processing of ores and the treatment and alloying of metals. They may also analyze ores or design processes to eliminate worthless minerals before the ore goes to the smelter; perform research in order to improve production methods or develop new products; assume responsibility for the design, construction, installation, and operation of pilot plants, and for coordination of research. Metallurgy is usually divided into two main branches—chemical or process metallurgy, and physical metallurgy or metallography.

Where Employed

Metallurgical engineers are employed in many industries—mostly in those dealing with metals and metal products. About half are in the iron and steel industry and over a fourth in the manufacture of nonferrous metals and their products, according to a 1946 survey. Metallurgical engineers are employed also in machinery and transportation-equipment manufacturing, mining, and many other industries.

Most metallurgical engineers are located in the large metalworking centers of the country, mainly in the Middle Atlantic States (New York, New Jersey, and Pennsylvania) and in the East North Central region (particularly Ohio, Illinois, and Michigan). Those employed in the extractive industries are located in mining regions.

Outlook

This branch of engineering has been expanding rapidly since the beginning of World War II. By 1949, over 10,000 metallurgical engineers were employed. The defense program, which began in mid-1950, has led to a further sharp increase in the demand for personnel.

Employment will probably continue to rise over the long run. Long-term growth in the metalworking industries and the development of new products will tend to increase the demand for metals or alloys to serve specific purposes. These developments require metallurgical work on problems concerning alloys and development of metals adaptable to various uses. Research in “fatigue” of metals is growing rapidly. Also the development of atomic energy has opened the door to a whole new field in the study of metals and their uses. There are also some opportunities in industries which make finished products from metals and require the special knowledge of metallurgists in solving manufacturing or marketing problems.

Opportunities for new entrants will be comparatively few since this branch of the profession is relatively small. The number of additional metallurgical engineers needed will be higher in the early fifties and over the long run than before World War II. However, graduations in this field, as in the related fields of chemistry and chemical engineering, have been high in the post-war years. After reaching a peak in 1950, the number of graduates is expected to decrease but will remain above pre-World War II levels indefinitely unless withdrawals for military service are very large. Competition for jobs was much reduced by late 1950. Employment prospects are likely to be even better for the remainder of the decade, because of the decline in graduations and the increased mobilization.

Earnings

In 1946, beginners in the fields of mining and metallurgical engineering had a median monthly salary of about $245. The middle earnings figure for those with 5 years’ experience was nearly $315; for those with 10 years, nearly $410; for those with 20 years, about $520. Monthly salaries of $800 to $1,000 and over are frequent in this field.

See also Iron and Steel Manufacturing Occupations, p. 243.
Mining Engineers
(D. O. T. 0-20.01 and .11)

Outlook Summary

Employment will expand more slowly than in most other branches of engineering. Opportunities for new graduates likely to improve through the early fifties.

Nature of Work

Mining engineers are responsible for locating and extracting coal, petroleum, metallic ores, and nonmetallic materials; planning construction of mine shafts, slopes, and tunnels; devising the means of extracting the minerals, the methods to be used in transporting them to the surface, and the methods to be used in separating ores from worthless or relatively unimportant earth, rock, or other minerals. Frequently they deal with the preliminary processing of ore. They may also be concerned with the design, construction, and installation of water supply, ventilation equipment, and electric light and power facilities at the mine. They are responsible for mine safety. Other major functions are: prospecting (search for deposits), development (opening the mine and extending it), and operations. Major specialties are: coal mining, natural gas and petroleum production, metal and mineral mining, and mine-safety engineering.

Where Employed

Mining engineers are usually employed at the location of mineral deposits. For this reason, they often work in out-of-the-way places—in mountains or deserts. The majority are employed in Pennsylvania, Texas, California, New York, Illinois, Ohio, West Virginia, Oklahoma, and Colorado.

Outlook

This branch of engineering has expanded less rapidly than most branches over the past decade. In 1949, employment was still less than 10,000, making this the smallest of the major branches of engineering.

Employment of mining engineers will continue to grow slowly over the long run. The exhaustion of easily mined deposits and growing industrial needs for metals place mining engineers at the forefront of a constant battle—devising ways of mining poorer deposits or those which are more difficult to work at a competitive cost. As new alloys are developed and new uses of metals are discovered, an increased demand for little known ores is created. The release of atomic energy has also led to growing activity in the search for and development of the ores used in this field of work. The petroleum industry has so far drawn upon only the richer and more accessible oil fields. Petroleum engineers and geologists are today constantly searching for new oil fields, both in the United States and overseas.

Opportunities for new entrants are comparatively few in any one year, both because this branch of engineering is small and because it is growing slowly. Graduations in mining engineering, as in other branches, have been relatively high in postwar years; however, the number will decline from the peak of 1950. Although the mobilization program initiated in mid-1950 has affected this branch of the profession less sharply than most others, it has rapidly improved the employment situation. Employment prospects for new graduates are likely to be even better by the mid-fifties.

Earnings

In 1946, beginners in the fields of mining and metallurgical engineering taken together had a median monthly salary of about $245. The middle earnings figure for those with 5 years’ experience was nearly $315; for those with 10 years, around $410; for those with 20 years’ experience, about $520. Monthly salaries of $800 to $1,000 and more are frequent in this field.

See also Petroleum Production and Refining Occupations, p. 331.
Ceramic Engineers

(D. O. T. 0-15.11)

Outlook Summary

Expanding employment in this small field over long run. Employment prospects likely to continue good for a number of years.

Nature of Work

Ceramic engineers are concerned with the mining and processing of clay, silicates, and other non-metallic minerals and the manufacture of products from these raw materials; also with the construction and design of plant equipment and structures. They may work in research or sales. Specialization is usually by type of product—for example, structural materials (such as brick, tile, and terracotta); pottery; glass; enameled metals; abrasives; refractories (fire and heat-resistant materials, such as fire brick); limes and plasters; cements; and many others.

Where Employed

More than half of all ceramic engineers are employed in the stone, clay, and glass industries, according to a 1947 survey of members of the Institute of Ceramic Engineers. Others are found in iron and steel, electrical machinery, chemical, and other industries. Also, some are employed by educational institutions and by other organizations.

More than four-fifths are employees of private firms or institutions; about an eighth work for a government agency—primarily for the Federal Government; and about 1 in 20 are self-employed. Nearly two-thirds of all ceramic engineers are employed in 5 States—Ohio, Pennsylvania, New York, New Jersey, and Illinois; nearly a quarter in the State of Ohio alone.

Outlook

Employment is expected to grow rapidly for several years following 1950 and more slowly thereafter. It is estimated that over three thousand ceramic engineers were employed in 1949. Many technological improvements are expected in the ceramics industries in future years; additional engineers will be needed to bring about those improvements. Other factors which will tend to raise the number employed are the new military and civilian uses of nonmetallic minerals and the growth of the industries using these materials. Increasing use of glass, enameled metals, abrasives, and other ceramic products will require research and design to adapt these products to various uses and thus will contribute to the growing demand for engineers. In addition, the increasing use of cement and structural clay products in construction—particularly in residential building projects—will provide greater opportunities for ceramic engineers. Since the field is so small, however, openings will be few in any one year.

A need for more personnel has existed in this branch of the profession since World War II. Then, the shortage of engineers was acute, though more people than usual entered the field with incomplete college training or with degrees in related fields. The shortage became less acute with the entrance of relatively large numbers of graduates in the postwar years. Also, there have been large graduating classes in other closely related fields of engineering. However, the number of graduates in ceramic engineering, as in other fields, is expected to decline in the early fifties. Also, the demand for ceramic engineers should continue to increase as a result of increased defense activity. Therefore, employment prospects for those entering or planning to enter the field in the near future are good.

Earnings

Ceramic engineers with 5 to 9 years' experience had a median monthly salary of $390 in 1947 according to the survey of members of the Institute of Ceramic Engineers. Those with 10 to 14 years' experience made about $440; those with 15 to 19 years, nearly $510; and those with 25 or more years, about $700. Many engineers in this field received considerably more—some making $1,000 a month or over.
OTHER PROFESSIONAL, SEMIPROFESSIONAL, AND ADMINISTRATIVE OCCUPATIONS

Chemists

(D. O. T. 0-07.02 through .85)

Outlook Summary

Good employment opportunities for chemists, particularly those with graduate training, in the early fifties. Expanding employment over the long run. Graduate training will continue to be important in competing for the higher grade jobs.

Nature of Work

Chemists are trained primarily for laboratory research and development work relating to chemical and physical changes in materials and products. They usually specialize in one of five main branches of chemistry and in some field within a branch. Organic chemistry is the branch employing most people in the profession; it is concerned with the broad field of the carbon compounds. Inorganic chemistry deals with compounds not containing carbon, such as most of the minerals and metals. Physical chemistry deals with quantitative relationships between chemical and physical properties in chemical compounds and mixtures and requires specific training in physics and mathematics. Biochemistry has to do chiefly with chemical compounds and processes occurring in plants and animals and with the influence of chemicals on vital processes. Analytical chemistry is concerned with determining the composition of substances and the exact percentage of each important constituent in a substance.

Chemistry is the largest of the natural sciences; there were over 80,000 chemists in the country in 1949 (about 4 percent were women). The types of work in which the greatest numbers are engaged are industrial research, technical administration, analysis and testing, and teaching. Other major fields are production, development, research in basic science, and technical service.

Where Employed

By far the largest number of chemists are employed in manufacturing, particularly in the chemical and petroleum industries. Many are employed also by Federal, State, and local governments, colleges and universities, research institutes, public utilities, consulting laboratories, and other types of employers. The State where the greatest number of chemists are located is New York; Pennsylvania and New Jersey are next.

Training

A bachelor's degree is usually the minimum requirement for new entrants. Over two-fifths of all employed chemists hold advanced degrees. Over half the chemists engaged in college teaching and research in basic science have the doctor's degree. Thorough training in a college or university of recognized standing is important in securing desirable employment.

Entrance jobs for persons with only a bachelor's degree are mainly in analysis, testing, and certain production positions in manufacturing, and as laboratory assistants in research. Those who take additional training or show unusual aptitude have good chances of advancement, but those without initiative often remain in routine jobs at low pay. There are some opportunities as graduate assistants in universities, where one may give part-time instruction to undergraduates at a monthly stipend of about $100, while taking graduate work.

Outlook

Employment opportunities for well trained chemists were good in late 1950. There has been a shortage of scientists (particularly of those with
The chemist usually qualifies for basic research only after specialized experience or graduate training.

advanced degrees) for basic and background research, developmental and applied research, and teaching. Factors underlying this shortage included the increased demand brought about by the backlog of research projects postponed during World War II, the increased enrollments in colleges and universities, and the shifting of the main center of basic research to this country from Europe. In industrial laboratories, where chemists represent nearly 40 percent of the total number of scientists and research engineers employed, opportunities have been good for those with advanced degrees or specialized experience. Since mid-1950, the mobilization program has further stimulated the demand for chemists.

Chemists with graduate training, particularly those with doctorates, will therefore continue to have excellent employment prospects in the early fifties, although the number of advanced degrees awarded has been increasing rapidly. In 1949-50, the number of doctorates granted in chemistry reached an all-time high of about 950, well above the previous high of 672 in 1940-41 and more than in any other field of study. A record number of master's degrees have also been awarded. The number of advanced degrees awarded should continue high for several years, unless many students are withdrawn for military service.

Employment prospects for new entrants with only a baccalaureate are good though less promising than for those with graduate training. A large number of young people have completed training at this level in chemistry since the end of World War II. After reaching new highs of nearly 7,500 in the academic year 1947-48, and over 9,000 in 1948-49, about 11,000 bachelor's degrees in chemistry were awarded in 1949-50 (more than double the number in 1941-42). However, in late 1950 the competition for jobs among chemists without graduate training was rapidly being reduced by the expansion in defense production, and opportunities are expected to improve further. Moreover, undergraduate enrollments in chemistry are expected to decline somewhat after the school year 1949-50, as the veterans complete their courses. The decline will be intensified to the extent that students are withdrawn for military service.

In the long run, there will be expanding opportunities in the profession, particularly for chemists with advanced degrees or successful experience. Many industrial concerns have plans for further expansion of research facilities. Total expenditures for research and development by private industry and government are expected to remain high indefinitely. Employment in the chemical manufacturing industries is also expected to remain well above pre-World War II levels over the long run. The likelihood is that there will be a number of openings in teaching, particularly for those qualified to teach at the graduate level. In all fields there will be some openings each year owing to deaths and retirements, though the number of such vacancies is not large in this profession—slightly over 1,000 a year.

Earnings

Chemists' income depends on the type of work in which they are engaged, the amount and quality of their educational background, and the amount of professional experience they have had, as well as their individual abilities. In general, administrative jobs pay the highest salaries; technical
service and industrial research pay more than analysis and testing or secondary school teaching. In 1943, holders of doctors' degrees typically earned 20 to 35 percent more than chemists with the same number of years in the profession who had only masters' or bachelors' degrees. Most beginners had monthly salaries of about $170 to $200 and earned about $30 to $50 extra for overtime work. Earnings of men with 10 to 12 years of experience averaged from $230 to $310 a month, depending on their educational background; earnings of those with 21 to 25 years in the field also varied widely with amount of education, averaging from $300 to $400 a month. There is evidence that salaries have increased markedly since 1943.

Where To Go for More Information

Information on schools, scholarships, and other subjects may be obtained from:

American Chemical Society,
1155 16th St., NW.,
Washington 6, D. C.

Information on earnings is given in the following publication:


Employment opportunities for women are discussed in the following publication:


See also Chemical Engineers, p. 88; Petroleum Production and Refining Occupations, p. 331.

Architects

(D. O. T. 0–03.10)

Outlook Summary

Profession expected to grow slowly over the long run; however, demand for architects' services depends largely on volume of construction activity, which is always subject to marked fluctuations, and during early fifties, is likely to be much affected by the mobilization program.

Nature of Work

Most architects plan and design all types of buildings. However, some specialize in one or more of the major fields of architecture: Domestic (private residences, apartments, group housing, farm buildings), industrial (factories, powerhouses), commercial (banks, hotels, office buildings, clubhouses), institutional and public, transportation buildings, and miscellaneous structures.

Architects who are in private practice serve their clients as professional advisers in a relationship similar to that of doctors and lawyers with their clients. Before designing a building, the architect first consults with the client on the purpose to be served, general style, size, location, cost range, materials criteria, and other characteristics desired. In planning the building he takes into consideration economy of lay-out and construction as well as appearance and efficiency. After preliminary drawings have been made and approved by the client, he prepares detailed working plans, specifications, and obtains estimates of cost. In addition, he usually arranges the contract between the owner and building contractor for the construction of the building, supervises the progress of the work, and certifies to the completion of the building.

Where Employed

Most architects are in business for themselves or are employed by architectural firms. A few work for government agencies, construction contractors, and engineering firms, and teach in colleges and universities.

Members of the profession are found in all regions of the country, mainly in large cities. In 1940, over half were employed in the following...

Training and Qualifications

A bachelor's degree from one of the recognized architectural schools is generally a minimum requirement for entrance into the profession. Most of these schools have 5-year courses. After obtaining a degree, the beginner usually starts as a draftsman in an architectural office and works up as his ability becomes recognized. A few people without formal training may enter the profession by acquiring many years of experience in architectural offices.

Licensure is required in practically all States for practice as an architect, where safety of life, health, and property is involved. Requirements for admission to the licensing examination vary among States but generally include graduation from a recognized professional school followed by 3 to 5 years of practical experience (most States accept a very long period of experience as a substitute for graduation from an architectural school).

Outlook

The demand for architects' services was much greater in mid-1950 than before World War II, owing to the great amount of residential building and other construction. By the end of the year, it was apparent that the defense mobilization would sharply reduce private residential building and several other types of construction. The level and type of construction activity and therefore the demand for architects' services in the early fifties will depend on how deep these cuts go and the extent to which they are offset by defense construction.

The shortage of architects existing during World War II and in the first postwar years had been almost made up by the end of 1949. Large numbers of architects were graduated in 1947–48, 1948–49, and 1949–50 and many persons who left the profession during the thirties re-entered the field. Enrollments in architectural schools were still high in 1949–50; however, graduations are expected to decline in the early fifties. The supply of qualified persons may be reduced further by transfers to other work and the withdrawal of persons for military service. Therefore, employment opportunities are likely to be fairly good in this profession for the next few years, unless the defense mobilization reduces construction activity more drastically than was anticipated in late 1950.

The long-run employment trend in the profession appears to be slowly upward, owing in part to the increasing use of architectural services in both residential and nonresidential construction. However, the demand for architects' services depends largely on the volume of building activity. In the thirties, when construction was at a low ebb, there was more unemployment among architects than in many other professional groups.

Where To Go for More Information

American Institute of Architects,
1741 New York Ave., NW.,
Washington, D. C.

See also Civil Engineers, p. 85; and Draftsmen, p. 99.

Industrial Designers

(D. O. T. 0–46.88)

Outlook Summary

Good opportunities for experienced and well qualified persons in this comparatively small occupation in the early fifties; some openings for well-trained beginners. Field likely to expand in long run, but competition for jobs may become keener, increasing the importance of well-rounded training in seeking employment.

Nature of Work

Workers in this occupation design the form or structure of a great variety of products, so that they will appeal to consumers and meet their needs. Products designed include automobiles, furniture, machinery, electrical appliances, ash trays, fountain pens, and many others. The design is usually submitted in the form of a drawing.
or model, which is made according to a specific order or request.

Industrial design service is rendered by independent design firms consisting of an individual or a group with their necessary staff doing work for several manufacturers, or by staff designers working full time for a single large manufacturing company. In either case one man may design widely different products, ranging from tooth brushes to locomotives. Competent persons transfer easily from one field or product to another and actually benefit from this diversity of experience.

Most industrial designers are employed in large metropolitan areas, where most designing firms and industrial plants are located. In 1940, the majority of industrial designers were employed in the Northeastern States.

Personal Qualifications and Training

The industrial designer must have artistic ability, a knowledge of merchandising, and the technical skill to create products suited to modern production methods. A proper educational background, including training in applied art, the main branches of factory technology, mathematics and other technical subjects, business economics, and consumer psychology, is extremely important. A few universities and technical schools have combined these courses into programs of study which may be completed in 3 or 4 years and lead to a degree or certificate in industrial designing. A number of industrial designers now in practice have had training in architecture, engineering, or one of the sciences.

A less frequent method of entry is through on-the-job training with established designers. Also some persons enter by transfer from drafting, commercial art, commercial designing, engineering, or other allied fields. However, in view of the variety of skills and knowledge essential for success, an integrated course of study at college level is recommended. Before the beginner can get recognition as a full-fledged designer, he must have created design ideas that have proved successful.

Outlook

The demand for the services of industrial designers will probably increase in the early fifties. Increased expenditures for defense production will create more designing jobs. Thus, opportunities will be good for experienced and well qualified persons, with some openings for well trained beginners. On the other hand, an oversupply of inadequately trained persons usually exists in this profession. The field is likely to expand over the long run. It has developed as a separate occupation only within the past 20 years and, despite rapid growth, is still rather small. Among the factors which indicate long-term growth in opportunities for industrial designers is the prospect that wartime technological advances will be adapted more and more to peacetime uses and that new products will also be developed as a result of regular research. Employment opportunities, however, vary considerably with changes in the level of business activity, and competition for jobs may eventually become keener if, as expected, more people take college training in industrial designing.

Earnings

Beginners, after training and some experience, generally received about $50 a week in early 1947; earnings were reported to be about the same in 1949. A wide range of earnings exists among established designers; some working on a freelance basis make upward of $25,000 yearly.

Where To Get More Information

Society of Industrial Designers,
48 E. 49th St.,
New York, N. Y.

See also Draftsmen, p. 99.
by draftsmen under the direction of the tool designer. The tool designer must have a practical and detailed knowledge of machine-shop practice, drafting, and the characteristics of the materials of which tools and fixtures are made. His duties include developing new tools as well as redesigning and improving tools currently in use. In the smaller shops, tool and die makers and machinists often design and make new accessories for machine tools as part of their regular duties. In larger establishments, where many complicated machine-tool accessories have to be designed, special tool designers are employed.

Training and Qualifications

One may qualify as a tool designer in several different ways. Usually, tool and die makers and machinists supplement their experience by special training in tool design, drafting, and mathematics, and then advance into tool design work. This move from machine-shop and tool-room work to tool design requires not only ability to conceive the idea for a new tool that will fill a definite need in the machining operations but also the knowledge of how to prepare a working design for its construction. Other new entrants qualify by serving a 4-year apprenticeship in tool designing, which should include at least 2 years of machine-shop training. Mechanical engineering graduates who have gained additional practical experience in machine-shop work may also enter the field; fewer persons have qualified by this method than by the other two. Occasionally, draftsmen acquire sufficient knowledge of machine-shop practice to advance to tool-design work.

Tool designers with engineering degrees are the ones likely to advance to broader and more responsible jobs in tool engineering, which includes the selection, planning, and production of tools as well as designing.

Where Employed

Most jobs for tool designers are in the engineering and designing departments of large manufacturing plants, especially in the automobile, machine-tool, machinery, electrical equipment, and aircraft industries. The engineering departments of many companies in these industries have sections engaged wholly in tool design. Another large field of employment for tool designers is with tool and product engineering companies which specialize in tool designing for other firms on a contract basis; these companies service mainly the automobile industry. A third and less important field of employment is with independent tool and die shops; however, many of these are relatively small and much of their designing is done by the tool and die makers or machinists. Tool designers are also employed in government arsenals and navy yards.

Outlook

The employment outlook for tool designers is related mainly to trends in metalworking industries using mass production methods and in the tool and die shops and engineering firms which serve these industries. A high level of machine-shop activity arising from increased expenditures for defense production and the general trend toward more extensive tooling in machining operations will provide new opportunities for tool designers both in the near future and over the long run. In addition to the long-range trend toward greater use of special tools, jigs, and fixtures in machining operations, more and more plants have recognized the value of specialized tool designers and are beginning to employ them. The introduction of new products, as well as modification of older ones, frequently requires extensive retooling. This operation will also contribute to the demand for tool designers in the coming years. However, the number of job openings will be limited, since the occupation is relatively small.

Earnings

Earnings of fully qualified tool designers usually start at about the rates for class-A tool and die makers (see p. 192), and range upward depending on the degree of skill and responsibility involved in the position.

See also Tool and Die Makers, page 192; Draftsmen, page 99; Mechanical Engineers, p. 84; and Aircraft Manufacturing Occupations, p. 273.
Draftsmen

(D. O. T. 0-48.)

Outlook Summary

Good employment prospects for well-trained draftsmen; however, increasing number of top jobs being filled by persons with engineering or architectural degrees.

Nature of Work

Draftsmen make working plans and detailed drawings for engineering, construction, or manufacturing purposes. They generally work from sketches, specifications, or field notes furnished by an engineer, architect, or designer. Many types of drafting instruments are used, including compasses, T-squares, triangles, scales, and special drafting pencils and lettering pens.

A new draftsman usually starts as a tracer or copyist. From there, he may advance to detailer, junior draftsman, senior draftsman, and possibly head or chief draftsman. Workers in the higher grade positions are required to make calculations concerning the strength, quality, or cost of materials; to use engineering handbooks and tables for computations; and to have still other skills.

From top drafting jobs, it is possible to advance to design and engineering positions, especially for men who obtain additional training in mathematics and science. Many graduates of engineering and architectural schools start their careers in the drafting room and may advance rapidly because of superior training. However, some of these graduates never achieve professional status.

Most draftsmen specialize in some particular field of work. The largest fields are architectural, structural, mechanical, aeronautical, electrical, marine, and topographical drafting.

Where Employed

In the main, draftsmen are employed in the construction, machinery, iron and steel, automobile, aircraft, and shipbuilding industries; by private engineering and architectural consulting firms; and in Federal, State, and local government agencies. Draftsmen are to be found in every State, even in small cities, but the greatest number work in the Northeastern and North Central States where most of the above mentioned industries are concentrated.

Qualifications and Training

Usually a person becomes a draftsman either by studying at a trade or vocational school and later acquiring practical experience, or by serving a 3- or 4-year apprenticeship, or by some other type of on-the-job training plus part-time schooling. In any case, the training received should include mathematics, physical sciences, mechanical drawing, standard methods of lettering, and tracing. Many of the higher grade jobs require knowledge of the techniques of the particular industry involved.

A draftsman must be neat and accurate. He must also have good eyesight, manual skill, and a talent and liking for drawing, in addition to technical knowledge.

Outlook

Employment of draftsmen was well above the pre-World War II level in mid-1950 and was expected to increase further in the near future.

Many of the top drafting jobs require knowledge of the techniques of the particular industry involved.
Prospects will probably continue to be good for well-trained and experienced draftsmen in the early fifties. Generally, the occupation tends to be overcrowded at the lower levels by inadequately trained workers. In addition, a large number of persons have been completing school training in recent postwar years (1947–49); a large number of veterans were still in training under the GI Bill of Rights in 1950. Graduations and enrollments in closely allied professional fields have also been high in the last few years. Furthermore, an increasing number of top drafting jobs are being filled by persons with college degrees in engineering or architecture. However, the defense mobilization which began in mid-1950 rapidly increased the demand for well-trained draftsmen and substantially reduced the competition for jobs among the less qualified workers.

Over the long run, activity in the “heavy” industries, where most draftsmen are employed, is expected to continue its long-term upward trend. However, the construction industry has in the past been subject to marked ups and downs. If repeated in the future, these fluctuations would mean periods of reduced employment for draftsmen connected with this industry. Employment of draftsmen in other industries, though affected by changes in business activity, does not fluctuate as much as the employment of regular production workers. A sizable number are employed in research, development, or planning departments whose work is not always directly affected by changes in production levels.

Where To Go for More Information

American Institute of Architects, 1741 New York Ave., NW., Washington, D. C.

International Federation of Technical Engineers, Architects, and Draftsmen’s Unions, A. F. of L., 900 F St., NW., Washington, D. C.

See also Architects, p. 95; Civil Engineers, p. 85; Mechanical Engineers, p. 84; Tool Designers, p. 97; and Industrial Designers, p. 96.

**Meteorologists**

(D. O. T. 0–35.68)

**Outlook Summary**

The oversupply of meteorologists which existed in early 1950 was being quickly reduced late in the year by defense activities. Employment in this small profession will expand slowly over the long run.

**Nature of the Work**

Meteorologists are concerned with the study of weather conditions. They make weather forecasts covering particular localities or regions, for the use of aviation and other transportation industries, manufacturers, and farmers, as well as the general public. They may also do research on weather conditions in a particular area over a long period of time and on such problems as causes of thunderstorms or hurricanes, ways of creating artificial rain or snow, long-range forecasting, or new types of recording instruments. In small stations, meteorologists must assume such duties as handling of the instruments, making observations, drawing and analyzing maps, as well as producing the final forecast. Meteorologists also play an important part in allied fields such as flood warning and control, soil conservation, irrigation, and insect control.

**Where Employed**

The United States Weather Bureau is the principal employer of meteorologists in this country; it employed about 1,300 of them in late 1949. These men are located at stations in most principal cities of the United States, in the Territories, and in a few foreign cities. About 500 additional civilian meteorologists are employed as private weather consultants by commercial air lines, as teachers in universities, operators of their own businesses, or are employees in other Government agencies. Some meteorologists are used in the Armed Forces. Very few women are employed in this profession.
Training

A college degree in meteorology is almost imperative for the new entrant, though many present meteorologists gained their skill mainly through experience. Graduate work is also becoming more and more helpful. Many universities give one or two courses in meteorology, but there are only about a dozen which offer the opportunity to major or obtain graduate degrees in meteorology. For workers already employed by the Weather Bureau, there is an in-service training program which offers every year a few scholarships at certain universities to help outstanding workers complete their professional education.

In addition to academic training, practical work experience as a weather observer (see p. 102) is valuable to the young meteorologist. Some promising meteorology students can obtain jobs with the United States Weather Bureau during the summer after their junior year under the student-aid program; those accepted under this program are eligible for professional jobs with the Weather Bureau upon graduation. Upon a more extensive work-and-study program now being considered, college students in meteorology would obtain 3 summers' work experience.

Outlook

The competition for meteorological positions which existed in early 1950 was being rapidly reduced late in the year, owing to the defense program. The armed services, chiefly the Air Force, will require some meteorologists. The Weather Bureau, the main source of employment for meteorologists, will need some new entrants particularly as replacements for retiring employees and those who enter the Armed Forces. However, there were, in early 1950, about 500 meteorologists on the civil service registers. Furthermore, the supply of trained people will continue to grow unless many students are withdrawn for the armed services. In addition to those graduating from schools with long-established meteorology departments, many new entrants are expected to complete training at schools which set up new departments in 1948 or 1949.

In the long run, employment will tend to rise slowly, though this will remain one of the smaller professions. The expected gradual expansion of civil aviation will tend to raise the number of meteorologists needed by the Weather Bureau. In addition, the airlines will probably employ a slowly increasing number of men with some meteorological training in dispatcher or other jobs. Private consultant services furnishing weather data to meet the client's particular business needs offer another new and growing field of opportunity for enterprising meteorologists. A small but increasing number of meteorologists will be required as teachers of meteorology, or of meteorology in combination with some allied field, as more and more institutions become interested in adding weather courses to the curriculum. Research meteorologists with extensive training and experience will undoubtedly continue to find good opportunities.

There will be some openings owing to deaths, retirements, or other withdrawals, but the main source of jobs for new entrants will result from expansion of the profession. Since meteorology is relatively new as a formalized science, the people in the field are predominantly younger men.

Opportunities for women in this work will probably continue to be rather limited. What few chances there are for their employment are likely to be at women's colleges, teaching courses in...
meteorology along with other scientific subjects. A few positions in the Weather Bureau are especially suited to women.

Earnings and Working Conditions

In late 1949, salaries of professional meteorologists in the Weather Bureau started at $3,100 a year. Most experienced men earned between $3,825 and $5,350 a year. Those with supervisory, administrative, or executive duties had higher salaries. Those who are stationed in the Territories receive a territorial differential which is 25 percent of their basic salaries. In foreign countries, allowances are made on the basis of cost-of-living, as authorized by the State Department.

With the commercial air lines, junior meteorologists had monthly rates ranging from $175 to $300 in late 1949; meteorologists made from $240 to $425; senior meteorologists, $250 to $485. Airline meteorologists working at overseas stations get special allowances.

Many Weather Bureau jobs involve night work, frequently on rotating shifts, since stations are operated on a 24-hour basis. Although most stations are located at airports or other places in or near large cities, there are some posts in very remote and isolated spots. Some civilian jobs are located outside continental United States in such places as Alaska, Wake Island, Canton Island, Hawaii, Puerto Rico, Iceland, and Ireland.

These people, like other government employees, have unusually steady employment and stable earnings, paid vacations, sick leave, pensions, and other benefits.

Where To Go for More Information

For general information on the profession, one may write to:

American Meteorological Society,
5 Joy St., Boston 8, Mass.

The United States Weather Bureau, Washington 25, D. C., should be consulted directly for information on positions with that agency, as well as on the student-aid program.


Weather Observers

(D. O. T. 0-66.55)

Outlook Summary

Opportunities expected to be limited in this small occupation. Persons with professional training in meteorology will have advantage over other job applicants.

Nature of Work

These workers’ main job is to make weather observations, using instruments which measure temperature, humidity, atmospheric pressure, wind direction, or wind velocity. They may also plot the data on weather maps, draw weather charts, and keep weather records. Often they answer inquiries as to the weather and handle other duties, under the direction of the professional meteorologists at the station.

Of the 2,700 weather observers employed at the end of 1949, about 2,300 were in the United States Weather Bureau. The others worked for universities and private forecasting services. A few employees of the Civil Aeronautics Administration make weather observations in addition to their other duties; these people must pass an examination in meteorology given by the Weather Bureau.

How To Enter

High school graduation, with courses in mathematics and science, or 1 year of experience in weather observing is the minimum requirement for jobs in the Weather Bureau. Some college training in the physical sciences is desirable. Some newly graduated persons with degrees in meteorology take weather observer jobs at first, to gain valuable practical experience. Veterans who have had weather observer training in the Armed Forces receive special preference for jobs. All weather-observing personnel with Government agencies must take written examinations.
The United States Weather Bureau operates an in-service training program for its employees and also offers a few meteorological scholarships each year at leading universities to improve the professional competence of outstanding employees.

**Outlook**

Opportunities for weather observers will be limited over the long run, as well as in the immediate future unless there is great expansion of the defense program. The Weather Bureau, which employs about 85 percent of all the observers, had no plans in mid-1950 for a significant increase of staff. Openings for weather observers outside the Weather Bureau will continue to be a relatively minor source of employment.

Personnel available for weather observing jobs may continue to exceed the few positions arising from normal turnover, although shortages of applicants may develop for positions in isolated areas. New entrants without specialized training may find it difficult to obtain employment in or near large cities. However, veterans with weather-observer training in the Armed Forces and civilians trained by the Weather Bureau during World War II may be able to find jobs, particularly if defense mobilization is accelerated.

**Earnings**

In the Weather Bureau, observers with minimum qualifications start at $2,650 a year. People with more training or experience may begin at somewhat higher rates. Jobs in the Territories carry a 25 percent territorial differential.

Many of the Weather Bureau jobs are located in or near large cities, often at the local airport. However, some of the weather observatories are in remote and isolated spots; a few are outside continental United States in such places as Alaska, Iceland, Puerto Rico, Hawaii, Wake Island, and Canton Island.

Since weather stations operate on a 24-hour basis, observers often have to do night work; frequently they are on rotating shifts. These people, like other government workers, have unusually steady employment and stable earnings, paid vacations, sick leave, pensions, and other benefits.

**Where To Go for More Information**

For general information write to:

American Meteorological Society,
5 Joy St.,
Boston 8, Mass.

People interested in employment with the United States Weather Bureau should get in touch with the nearest of the four Weather Bureau regional offices, which are located in New York, N. Y.; Kansas City, Mo.; Fort Worth, Tex.; and Salt Lake City, Utah. For employment outside continental United States, the Weather Bureau office in Washington, D. C., should be consulted. Information on employment opportunities for meteorology students, through the Student Aid Program, may also be obtained from the United States Weather Bureau in Washington.

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**Broadcasting Engineers and Technicians**

(D. O. T. 0-61.10, .16, .17, .30, .40, and .50)

**Outlook Summary**

Many jobs in new television stations by 1960 unless defense preparations restrict construction. Little further growth and eventual decline in number of sound stations. Big sound stations, networks, and TV stations generally hire men with experience.

**Nature of Work**

Groups covered are (1) transmitter operators, who operate and maintain transmitters and related equipment; (2) studio operators, master control operators, and field engineers, who are responsible for the arrangement and operation of studio and field equipment, including operation of
volume controls during broadcasts; (3) maintenance men; and (4) the various groups of technicians—such as video operators, cameramen, and projectionists—who work only at TV stations.

Training and Qualifications

Transmitter operators are required to have first-class radio-telephone licenses from the Federal Communications Commission. No license is needed for other types of work, but many men on these jobs have licenses. To obtain a license, one must be a citizen and must pass an examination requiring knowledge of mathematics, basic radio theory, advanced radio telephony, and FCC regulations. Employers often set up additional requirements with regard to experience, formal education, and practical skills. Men who can announce in addition to qualifying as engineers have an advantage in getting jobs.

Television engineers and technicians must have an unusually high degree of skill and technical knowledge and must undergo on-the-job training. Most trainees are selected from among the AM and FM men; a few come directly from the better radio and television schools. Sometimes graduate electrical or electronic engineers are taken on as trainees; many employers prefer men with a professional education.

Outlook

Between 11,000 and 12,000 engineers and technicians were employed at 2,300 AM, FM, and combination AM–FM stations in late 1949. The number of stations and of operators employed had both more than doubled since 1945. Employment at sound stations will increase at a much slower rate in the early 1950's and may eventually decline. Most jobs will result from turn-over at established stations. There is likely to be stiff competition for the better-paying jobs at big stations, which, as a rule, hire only experienced men. Competition for jobs at smaller stations, which pay lower wages, will continue to be less keen. Inexperienced men almost always start at these small stations.

New television stations probably will take on several thousand technicians in the next 10 years. Fewer than 100 such stations were operating in late 1949, but within a few years there will be several hundreds if defense preparations do not hinder construction. This will mean greatly expanded opportunities for engineers and technicians with TV training although the industry will still be a small one. Men without such experience probably will find it hard to get jobs in television unless they have exceptional qualifications.

Earnings and Working Conditions

Transmitter engineers working for the Nationwide networks and their key stations had average earnings of $118 in a survey week in October 1948. At other stations with 15 or more employees, these workers averaged $71. Studio engineers employed by the networks and their key stations averaged $120; those at the other sizable stations averaged $78. At stations with less than 15 employees, all technical personnel, including supervisors, averaged $59 for the survey week, much less than technicians employed at the bigger stations and networks. Working hours averaged from 42 to 44 a week.

Principal unions organizing radio operators are the International Brotherhood of Electrical Workers (AFL), the National Association of Broadcast Engineers and Technicians (independent), and the American Communications Association (CIO).
Ship Radio Operators

(D. O. T. 0-61.33)

Outlook Summary

Good employment prospects in the early fifties. Small occupation.

Nature of Work

Ship operators stand watch in the radio room, to receive incoming messages in telegraphic code and transmit any outgoing ones. They keep records of messages handled and must be familiar with code books and radio channels. They also make adjustments in the receiving and transmitting equipment to give the clearest possible reception, and take care of routine repairs. In addition, operators are responsible for other types of electronic equipment aboard, such as radio direction finders. On a minority of ships and for extra pay, they perform clerical tasks not related to their regular duties. Like other members of the crew, they take part in shipboard emergency drills.

Where Employed

Oceangoing vessels of more than 1,600 tons, including those engaged in coastwise traffic, all carry radio operators. The great majority of ship operators are on cargo vessels, but a hundred or so are on oceangoing passenger ships, which usually have at least three operators in order to maintain the required continuous radio watch. A much smaller number still are on Great Lakes passenger vessels. Cargo vessels operating exclusively on the Great Lakes seldom have radio operators; these ships have only radiotelephone equipment, which is usually operated by the captain or other ship’s officer.

Qualifications

Men serving as ship operators must hold first- or second-class radio telegraph licenses issued by the Federal Communications Commission. To qualify for a second-class license, an applicant must pass a written examination covering basic communications law and radiotelegraph theory and practice, and must demonstrate ability to transmit and receive Morse Code at the rate of 16 code groups a minute. For a first-class license, an applicant must have more advanced knowledge and be able to transmit and receive 20 code groups a minute and 25 plain language words a minute. In addition, to obtain a first-class license, one must be at least 21 years of age and have had at least 1 year’s experience. Ship operators are required to have a Radio Officer’s License issued by the U. S. Coast Guard.

Hiring is most often done through the American Radio Association (CIO) or the Radio Officers Union (AFL); a large majority of ship operators belong to one of these unions.

Outlook

Employment of operators expanded greatly during World War II and fell sharply after VJ-day. During World War II there were as many as 3,900 merchant ships with radiotelegraph, most of which had 2 operators and some had more. In the years following VJ-day the number of active ships declined to less than 1,500, and most of them had only one operator. As a result, many operators took other jobs, and there were long waiting lists for assignments to ships. The stepped-up defense program begun in mid-1950, however, will bring about rising employment of ship radio operators for several years at least, and it will be easier for them to find jobs than at any other time since World War II.

Earnings and Hours of Work

Operators on cargo ships, by far the largest group, received base pay of about $324 a month in 1949, plus overtime for holiday and Sunday work. Additional overtime work is common, so most operators earn considerably more than the base rate. Generally, operators on the relatively few passenger ships are paid higher base rates. Operators receive board and room free of charge aboard ship and are given paid vacations.

See also Flight Radio Operators, page 443; Ground Radio Operators and Teletypists, page 450; Broadcasting Engineers and Technicians, page 103; Radio Operators (Telephone and Telegraph Industry), page 106.

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http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis
Radio Operators (Telephone and Telegraph Industry)

(D. O. T. 0-61.25, .33, and .36)

Outlook Summary

Employment declining in this small field. Extremely few job openings expected.

Nature of Work

A few major companies which specialize in radiotelegraph and radiotelephone service and which operate shore stations for communicating with ships at sea employ most of the workers covered in this statement. There are also a number of smaller companies in this field. There are two main groups of workers, radio operators and radio operating technicians. The radio operators transmit and receive radiotelegraph messages in code, mostly to and from overseas points and ships at sea. They use both semi-automatic and manually operated equipment and must meet the company's minimum requirements with regard to speed in receiving and transmitting messages. They need little technical knowledge of radio. The Federal Communications Commission does not require licenses for this group.

The radio operating technicians adjust, maintain, and repair the actual transmitting and receiving equipment. Their jobs are similar to those of transmitter operators in the radio broadcasting industry. They must have first or second class radiotelephone or radiotelegraph licenses issued by the FCC. Requirements for licenses include United States citizenship; passing a written examination on communications law, radio theory, and related subjects; and, for radiotelegraph licenses, passing a speed test in receiving and sending code messages.

Outlook

This is a small field, offering extremely limited employment opportunities. Fewer than 1,000 radio operators and about 500 radio operating technicians were employed in late 1948, including those working outside continental United States. Employment of high-speed manual operators will continue to decline. The volume of overseas communications is increasing, but teletype, multiplex, and other automatic machines are gradually replacing manually operated equipment. With the shift to automatic equipment, fewer and less-skilled workers are needed. Opportunities for radio operating technicians will also be scarce.

Earnings and Working Conditions

The middle 50 percent of the senior radio operators working for the principal companies earned between $1.53 and $1.77 an hour in 1948. The corresponding figures for junior operators were $1.44 and $1.52; for marine coastal station operators, $1.52 and $1.82; and for radio operating technicians, $1.64 and $1.87.

Working hours averaged about 38 a week. The American Radio Association (CIO) is the principal union in this field.

See also Broadcasting Engineers and Technicians, page 103; and Ship Radio Operators, page 105.
OUTLOOK SUMMARY

Expanding employment in the early fifties owing to defense program. Profession also expected to grow slowly over long run.

NATURE OF WORK

Personnel workers plan for and assist in the recruitment, placement, training, rating, discipline, lay-off, and discharge of employes. They maintain personnel records and may also be responsible for job standardization and classification and wage setting; for employee counseling, welfare services, health, safety, and pension and retirement systems; for compliance with Federal and State labor laws; and for an employee information service. Labor relations is becoming one of the most important parts of their work. In a small company, one man may handle all this work; sometimes he may also have other duties of a non-personnel nature. In the largest organizations, the personnel manager is a top-ranking executive who advises in setting personnel policies and supervises as many as several hundred personnel department employees.

Professional personnel workers number in the tens of thousands. Directors or managers make up only a small proportion of the total. Personnel workers are employed in all industries and by Federal, State, and local governments. A few hundred are employed in universities as teachers of personnel administration. Men with long and varied experience may work independently as private consultants or labor-relations experts.

About three out of every four people in the profession are men. Very few women have top managerial positions, but many are in technical personnel jobs such as classification and placement, in interviewing and counseling, and in personnel research—particularly in government and in industries with large numbers of women workers.

HOW TO ENTER

Requirements for professional personnel positions usually include a bachelor’s degree, with courses in personnel and public administration, psychology, statistics, business management, economics, sociology, political science, English, and public speaking. Graduate study is becoming increasingly useful; in many universities technical personnel courses are offered only at the graduate level.

Experience in the type of work done by the employees with whom a prospective personnel man expects to deal is useful in providing insight into their problems. Such experience is particularly important for positions in private industry, which are usually filled from within. In a factory, the best place to start is in a production job. Other good places are subprofessional jobs in time study, job analysis, or wage setting, or, in the case of women, clerical positions in the personnel department. Many of the leading personnel executives in private industry today came into the field via production and supervisory work, which gave them the necessary first-hand contact with the operation of their company. Psychological testing is one of the few branches of industrial personnel work which can be entered directly from college; it usually requires a graduate degree.

OUTLOOK

Though keen competition for entry positions in personnel work existed in mid-1950, improvement in the employment situation was expected owing to increasing defense activities. College enrollments in personnel administration courses have been extremely high since World War II. Many of the people taking training had wartime experience in personnel work; those with relevant experience may have an advantage in competing for jobs over people with college training only. New graduates from personnel courses may continue to have some difficulty in finding jobs, unless enrollments are sharply reduced by withdrawals for military service or unless the expansion in the employment of personnel workers in defense plants and Government agencies is very great. Opportunities at top managerial levels, already

1 Excludes student personnel workers in schools and colleges.
good in early 1950, will improve in the immediate future.

Over the long run, the profession will probably grow slowly. Openings will not be many, however, because the field is relatively small and turnover low. Not only is the profession staffed mainly by younger men, but people who succeed in making headway seldom transfer to other occupations. Best opportunities for jobs will be with small and medium-sized companies. Fields in which increasing employment of personnel workers is expected in the long run include wholesale and retail trade, especially department stores; insurance and finance; and State and local governments.

It is expected that the profession will keep on rising in status in the managerial hierarchy, and that personnel officials will gain in prestige and responsibility. A small but increasing number of top-notch personnel executives are being appointed to high administrative posts in government and in private industry. A very few outstanding men will continue to find opportunities as labor arbitrators or independent personnel consultants. Over the long run, people with graduate degrees will also find openings to teach personnel administration; as the profession grows, teaching opportunities will tend to increase.

Most jobs, along with the keenest competition, will be in highly industrialized parts of the country, principally New York, New Jersey, Pennsylvania, Ohio, Illinois, and the West Coast.

**Earnings**

Annual starting salaries for most personnel clerks in the Federal Government were $2,875 in late 1949. Personnel specialists started at about $3,100 while personnel directors earned approximately $6,000 to $11,000. State and local governments paid salaries in late 1949 that were generally somewhat lower, although there were a few examples of salaries as high as $12,000.

In private industry starting rates are lower than in the Federal Government but top salaries are much higher; earnings depend on both the general salary level of the company and the degree of recognition given to personnel work. Beginning positions such as job analyst, time study man and interviewer generally paid from $1,500 to $3,600 a year in 1947. The most usual annual salary for a personnel manager was between $6,000 and $8,000. However, small companies may pay as little as $5,000 a year and giant corporations as high as $30,000 or more to a vice-president in charge of industrial relations.

**Where To Go for Additional Information**

Society for the Advancement of Management, 84 William St., New York 7, N. Y.

Information may also be obtained from the local chapters of this organization and from the deans of any of the major colleges of business administration. For a fairly comprehensive list of schools offering courses in personnel work, see The Personnel Journal, Volume 26, No. 8, February 1948.

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**Psychologists**

(D. O. T. 0-36.21 through .26)

**Outlook Summary**

Excellent prospects for qualified psychologists in early fifties. Long-run outlook very good for people with the doctorate; less favorable for those who get only a master's degree, owing to the trend toward more positions requiring a Ph.D.

**Nature of Work**

The psychologist does research in human behavior; teaches psychology; or applies psychological principles and procedures in such work as measuring aptitudes and other qualities, guiding and counseling people with personal problems, interviewing and classifying workers for jobs, doing clinical work, or acting as a consultant to other professional workers or executives.

A clinical psychologist usually collaborates with psychiatrists and social workers in dealing with maladjusted or disturbed people. His particular role is to contribute toward diagnosis and treatment by tests, interviews, and other techniques: to perform certain types of psychotherapy in collaboration with psychiatrists or other medical person-
nel; to conduct certain types of research; and to
train other clinical psychologists.

Where Employed

About 10,000 professional psychologists were
employed in the United States in mid-1950. Colleges and universities constitute the largest
single field of employment. In addition, sizable
numbers of psychologists work for government
agencies or privately supported community agen­
cies; others are in private industry; still others
are in independent practice.

Most clinical psychologists, of whom there were
roughly 1,500 in mid-1950, are employed in mental
hygiene clinics, child-guidance clinics, or hospitals,
though some are in private practice. Some clinics
are separate agencies; others are operated by
schools, courts, institutions for the insane or feeble­
minded, or government agencies of other types.
The Veterans Administration employed over 300
clinical psychologists in the summer of 1950.

Training and Other Qualifications

The trend is toward requiring the Ph. D. for
new entrants, especially in the teaching and clini­
cal fields, although the master's degree is still
accepted for many positions, chiefly in the field of
guidance and counseling. A bachelor's degree
qualifies only for psychological technician work,
and even for such work an internship or additional
specialized training may be required. A profes­
sional psychologist must have at least 1 to 4 years
of experience besides an advanced degree. Super­
vised experience, offered as part of graduate train­
ing, is acceptable as part of the experience require­
ment. Experience and training must be in a field
related to the branch of psychology which the
trainee expects to enter; for example, clinical psy­
chologists must usually have had 1 to 3 years' expe­
rience in applying psychological principles to
the aid of maladjusted individuals in cooperation
with psychiatrists. Requirements are occasionally
lowered where no qualified applicant is available.
Much emphasis is placed on emotional maturity.

Applicants for government positions must usu­
ally qualify through civil service. Private prac­
tioners in Kentucky must be certified; they must
have a Ph.D. and several years of experience and
pass a State examination. A few cities in other
States also require certification for private prac­
tice. The profession is urging the passage of cer­
tification laws in other States. The probable
requirements will be the Ph.D. plus at least 1 year
of full-time professional experience or, possibly,
the equivalent in education and experience.

Special training programs in clinical psychol­
yogy have been set up since World War II, under
the Veterans Administration, United States Pub­
lic Health Service, and the United States Army.
These programs all provide some remuneration
during the training period.

Outlook

The shortage of psychologists, especially of
Ph.D.'s, is expected to persist in most fields during
the early 1950's, although the supply of profes­
sionally trained personnel increased markedly
in 1948 and 1949, and may continue to do so
for the next few years at least. The shortage will
continue to be most acute in clinical work. In
mid-1950, the Veterans Administration was seeking
600 clinical psychologists in addition to those
already employed. The Army Clinical Psychol­
yology Branch, already inadequately staffed, was
faced with the problem of finding trained person­
nel to handle an increasing number of servicemen.
The expanding program of State-supported clinics
subsidized by the Public Health Service was expected to require 100 to 200 new clinical psy­
chologists each year. In addition, at the begin­
ing of 1950 many vacancies existed in privately
supported clinics. Many hospitals were adding
clinical psychologists to their staffs. Training
centers still needed highly experienced people to
train new personnel.

Needs will continue to be great also in other
branches of the profession. Progressive educa­
tional systems will create new openings for school psychologists. Many business concerns are adding
psychologists to their personnel departments or,
for the first time, using the services of psychologi­
cal consulting firms. While the Veterans Admin­
istration was reducing its staff of vocational
advisors in early 1950, the program had stimulated
colleages and other organizations to supply guid­
ance services. Aside from the Veterans Admin­
istration, the greatest number of vacancies for
various types of psychologists in Federal employment will probably be with the defense agencies. Vacancies are also anticipated in the State Department, Civil Service Commission, and the Federal Security Agency. Government programs offer opportunities in every field of psychology, but two fields in which the Government's needs are growing rapidly in comparison to the supply are the fields of social psychology and psychological measurement.

Graduate schools are filled to capacity, but the facilities for training psychologists in some fields are inadequate to produce sufficient personnel to meet the needs. This is especially true of facilities for training clinical psychologists; fewer than 200 fully qualified workers in this branch of the profession completed their training in the academic year 1949-50. There is keen competition among new graduates with bachelor's degrees in psychology (over 9,500 in 1950) for admission to graduate training. However, training facilities are gradually being increased. This increase, plus the trend toward raising employment requirements to the Ph. D. level, may lead to increasing competition for jobs among new entrants with only a master's degree in some fields. The competition among vocational advisors was already considerable in early 1950. The withdrawal of many students for the Armed Forces would, of course, lessen competition among new entrants.

The long-term trend in the use of psychologists appears to be upward, although there is a possibility that the rapid rate of growth of the late 1940's may slacken somewhat. Teachers, particularly at the graduate level, will continue to be in demand to train the needed specialists and to direct research. The United States Public Health Service is furnishing subsidies to build up psychology departments, especially for clinical training. Continued expansion of clinical psychology is expected. The Veterans Administration planned in early 1950 to increase its staff of clinical psychologists to a total of 1,200 in 5 years, to 1,500 in 10 years, and to an even greater number by 1970. Employment in State-supported clinics should rise by at least 500 in 5 years. The Navy plans to set up a clinical program when personnel becomes available. It has been estimated that, if the mental health needs of the Nation were adequately met, 10,000 clinical psychologists would be employed.

Budgetary limitations, as well as personnel shortages, now prevent the employment of this number. However, expenditures for mental hygiene are likely to be enlarged owing to an increased understanding of the needs and benefits of such treatment and to stimulation from Federal grants-in-aid. There is also likely to be greater provision for early clinical treatment of maladjusted persons.

In other branches of psychology, employment opportunities are likely to increase as money becomes available to meet recognized needs. Psychology as a science is still in its infancy; even so, many related fields rely on psychological principles and use psychologists for training, consulting, testing, or other purposes. As research proceeds, the science will probably gain greater prestige, and there will be an increasing demand for the application of its principles.

In addition to newly created jobs, some vacancies occur owing to retirements. Such vacancies are now small in number because the field is new and few persons have reached retirement age, but the need for replacements will be appreciable in 20 or 30 years.

**Earnings**

In 1948, median annual earnings of professional psychologists were about $5,450, according to a survey by the American Psychological Association. Those holding Ph. D.'s had median earnings of $6,150, but for those without the doctorate the corresponding figure was about $4,050. Median earnings of women psychologists were about $4,200; those of men, $6,100. In colleges and universities, median earnings ranged from about $3,200 for instructors to approximately $7,650 for department heads and deans. Psychologists employed by the Federal Government had median earnings of $5,650 for 1948; those working for State and city governments, a median of $4,750; those with private organizations, a median of $3,200 for instructors to approximately $7,650 for department heads and deans. Psychologists employed by the Federal Government earn somewhat more than those employed by other institutions. In the Veterans Administration, basic annual salaries in late 1949 started at $4,600 for those who had just completed
the VA training program or its equivalent and went up to $7,600 for branch chiefs. In addition, in-grade pay increases are granted to Federal employees for each 12 or 18 months of service. Basic salary rates in the Army ranged from $4,212 for unmarried psychologists with the rank of first lieutenant to $8,784 for married men with the rank of colonel. After 30 years' service, an Army psychologist can retire on an annual income of about $5,000.

Trainees in clinical psychology under the Veterans Administration program in 1949 were paid for the time actually worked. They usually work about half time and earn about half the specified annual rates for full-time work, which are $3,100 the first year, $3,825 the second year, and $4,600 the third and fourth years. Veterans receive additional benefits under Pub. Law 16 or Pub. Law 346. United States Public Health Service trainees in 1949 received a stipend of $1,200 the first year, $1,600 the second, $2,000 the third, and $2,400 the fourth; they may not receive aid from any other Federal agency. Army-officer trainees with 2 years of graduate training are commissioned as second lieutenants and receive $3,790 if single and $3,970 if married.

Where To Go for More Information

For information on accredited graduate schools and placement opportunities:

American Psychological Association,
1515 Massachusetts Ave. NW.,
Washington 5, D. C.

For information on Veterans Administration training program for clinical psychologists:

Chief, Clinical Psychology Section,
Psychiatry and Neurology Division,
Department of Medicine and Surgery,
Veterans Administration,
Washington 25, D. C.

For information on the clinical psychologist training program of the U. S. Public Health Service:

Training and Standards Section,
National Institute of Mental Health,
U. S. Public Health Service,
Bethesda, Md.

For information on the clinical psychologist training program of the Department of the Army:

Department of the Army,
Office of the Surgeon General,
Attention: Personnel Division,
Washington 25, D. C.

For information on internships in clinical psychology:

National Committee for Mental Hygiene,
1790 Broadway,
New York 19, N. Y.

Social Workers

(D. O. T. 0-27)

Outlook Summary

Excellent employment opportunities expected in early fifties in all types of positions. Long-run outlook good for workers with graduate training; those with only undergraduate training may face increasing competition.

Nature of Work

The three main types of social work are social case work with individuals, social group work, and community organization. Principal specialties within the field of case work are public assistance, other family service work, child welfare services, school social work, medical social work, psychiatric social work, and work in the correctional field such as probation, parole, and other work with delinquents. Some social workers are engaged in teaching, administration, or research. The majority are employed by State and local governments; most of the remainder by private social agencies and the Federal Government; a few by private industry. Social work positions are located in all parts of the country, in both urban and rural areas.

How To Enter

In early 1950, 52 accredited schools (46 in continental United States and the remainder in Canada, Hawaii, and Puerto Rico) offered graduate edu-
cation in social work. Two years of such training is usually considered necessary for positions involving advanced case work and is desirable for all jobs. Qualifications for most Federal civil service positions can be met either by specified amounts of training in social work or by a combination of training and experience. Entrance requirements for graduate schools include undergraduate courses in social and biological sciences and a

social work requires tact and understanding in helping people deal with their problems.

scholastic standing above a specified level. For persons who enter the field with only a B.A. degree, some colleges and universities offer preprofessional courses in social work, or extension courses which may be taken on a part-time basis and applied toward a graduate degree. Some positions, for example in some State public-assistance programs, may be entered without a bachelor's degree. Scholarships are available at most accredited schools of social work, and both private and public agencies encourage further training through scholarships, special work-study arrangements, and educational leave. Emotional maturity and good judgment are essential for most social work positions.

Roughly 100,000 social workers were employed in 1949; about two-thirds were women. The proportion of Negroes employed is small, but greater than before World War II.

Outlook

There was an acute shortage of social workers in mid-1950, owing largely to the increased use of social services and the inability of the professional schools to keep pace with the demand for trained personnel. Although enrollments were approximately 50 percent higher in 1949 than at the end of World War II and schools had waiting lists of applicants, shortages of trained and qualified workers for all types of positions are expected to continue at least during the early fifties. State and local agencies are expected to have increasing need for professionally trained workers for child welfare and mental hygiene services and public assistance. The Veterans Administration will continue to need social workers in certain areas. Experienced workers will probably continue to advance rapidly to better positions in administration, supervision, research, and teaching, thus leaving openings in the case work jobs. Shortages in rural areas will likely be the last to be relieved. The greatest number of workers will continue to be employed in cities. An accelerated program of mobilization involving more people in defense production and in the Armed Forces would further increase the need for social workers to serve in hospital units and to give aid in solving various family adjustment problems.

Workers with graduate training will probably find good employment opportunities in the long run, as well as in the immediate future. Only about one out of three social workers employed in 1949 had this training. There is a definite trend toward higher training requirements, which may be expected to become more widespread as soon as shortages are less severe. How many people will be employed in the field as a whole will depend largely on the appropriations for public social work by Federal, State, and local governments; to a lesser extent on community support of private agencies. In any case, many openings will arise owing to turn-over, which is high because many women leave the field to marry (though marriage is not a barrier to employment in this field).

Earnings and Working Conditions

Public-assistance salaries were estimated to average between $1,800 and $2,400 in most States.
in 1949. Salaries of experienced case workers (including case-work supervisors) in large cities ranged from about $2,700 to $4,000 in most fields; those in small cities and rural areas were somewhat less. Typical salaries for administrators varied from about $3,600 to $13,000, depending on the size of the agency. The entrance salary for most social-work jobs in the Veterans Administration was $3,825 in late 1949.

According to a survey of social workers in Michigan, median annual earnings as of November 1948 were $3,100, with half the workers earning between $2,650 and $3,850. The average for women was $2,880 a year. Men usually received higher pay than women in the same type of position; their earnings in 1948 averaged $3,700. Salaries tended to increase with experience; persons who had been employed in social work less than 2 years averaged $2,500 a year, while those with 20 or more years’ experience averaged $4,150. Workers with no graduate training in social work earned, on the average, $700 less than those reporting some graduate education.

The usual weekly work schedule was 40 hours, according to the Michigan survey. Almost all social workers in this study received paid vacations and sick leave after a year’s service. About six out of seven were covered by some sort of retirement plan.

Where To Find Out More About Social Work

General information on the profession may be obtained from:

American Association of Social Workers,
One Park Ave.,
New York 16, N. Y.


A study of social work education, conducted by Ernest V. Hollis and Alice L. Taylor under the auspices of the National Council on Social Work Education, is scheduled for publication in early 1951. The report will discuss the past, present, and future status of social work and will make recommendations on issues affecting long-range planning in social work education.

A series of bulletins on the outlook for women in social work is being prepared by the Women’s Bureau, United States Department of Labor. The first bulletin, “The Outlook for Women in Social Case Work in a Medical Setting” (No. 235-1), is available from the Superintendent of Documents, Washington 25, D. C. Price 25 cents.

Lawyers

D. O. T. 8-22

Outlook Summary

Profession overcrowded in mid-1950 and likely to remain so in the next few years, though defense program will tend to ease competition among new entrants. Some expansion in demand for legal services likely over the long run.

Nature of Work

A large portion of lawyers’ work consists in advising clients on their legal rights and obligations and in negotiating settlements out of court. In addition, lawyers prosecute or defend both civil and criminal law suits in the courts. They may also represent clients before semijudicial or administrative agencies of the government, draw up legal documents, often act as trustee, guardian or executor, and do other legal work. Those employed by the government may also prepare drafts of proposed legislation, and help to establish procedures for law enforcement.

The number of lawyers and judges in the United States in late 1949 was roughly estimated at 200,000, including more than 4,000 women. The majority of lawyers (about two-thirds, according to a 1947 survey) derive most of their professional income from independent practice, either by themselves or, less often, with partners. The remainder depend on salaried positions with other lawyers, industrial firms, banks, labor unions, government agencies, etc. A considerable number combine salaried and independent practice; others do legal work on a part-time basis in conjunction with such nonlegal pursuits as real estate or insurance.
How To Enter

Prospective lawyers must meet the requirements for admission to the bar of the States where they intend to practice. The main educational requirement is graduation from law school (or equivalent study in a law office, a method of training now very rarely used, although still permitted in 27 States as of mid-1949). Many States require registration and approval by the Board of Bar Examiners before a student begins his law study. Most States require that the law school which the candidate attended be one approved by either the proper State authorities or the American Bar Association; in September 1949, 113 of the Nation's 173 law schools were approved by the American Bar Association. It usually takes 3 years in full-time day school or 4 years in night school to obtain an LL.B.

To be admitted to an ABA-approved law school, at least 2 years of prelaw college work were required in late 1949; 53 of these 113 schools required a minimum of 2 years, 43 required at least 3 years, and 17 required a college degree. Most other law schools required only 2 years of college work. However, the trend is toward higher entrance requirements; a large proportion of students entering law school now have college degrees. Besides meeting the educational requirements, a prospective lawyer must pass the State bar examination—except that in seven States, mostly in the South, graduates of the State university law school and occasionally of other specified law schools are admitted to the bar without examination. Several States require 6 to 12 months' clerkship in a law office, in addition to the specified education and the bar examinations.

Many young lawyers start as law clerks in an established office. Some remain with these firms and, in time, may become partners. After gaining some experience, others open their own offices and may then face a “starvation period” of several years. Many lawyers start in private practice immediately after graduation; for them the first few years may be even more trying. Some lawyers get their first jobs in private industry, especially with insurance companies; a small proportion go directly into government service. All States and bar associations forbid lawyers to advertise or solicit business; therefore, to become known, it is important to participate in community affairs and to get on national commercial law lists and on the lawyers' reference list, if one exists in the area. Writing articles for legal reviews and journals is a good way to gain recognition from other lawyers as a specialist.

Outlook

In mid-1950, the legal profession was overcrowded, and appeared likely to remain so during the next few years, although competition among new entrants will be reduced by the mobilization program. It has been conservatively estimated that about 12,000 young lawyers passed the bar examinations during 1949. This is an all-time peak, close to twice as many as in the years just before World War II. In view of the unprecedented numbers enrolled in law schools, the number of new graduates will probably remain very high for the next year or two unless many students are withdrawn for the Armed Forces.

In the next few years, the average graduate may expect considerable competition in looking for a legal position or attempting to start a practice unless such factors as defense production and increased Government employment operate to provide many new positions for lawyers. Top-ranking students will continue to find openings with relative ease.

Prospects for Negro lawyers were relatively favorable in early 1950, and are expected to remain so for at least several years. The outlook is best in urban areas with a large Negro population—except New York, Chicago, and Washington, D.C. It is especially promising in the South, where only a handful of the Nation's Negro lawyers were employed up to 1950.

Over the long run, the legal profession will probably tend to expand slowly, as a result of population growth and of the numerous economic and social trends which would increase the need for legal services. Deaths and retirements of lawyers—which are roughly estimated at around 4,000 or 5,000 a year—will also create openings. The tendency toward overcrowding in the profession will probably continue, however, unless ways are found to make legal services available to greater numbers of middle- and lower-income people. Legal aid societies in many cities have for
a number of years been offering free services to those who cannot pay, but a great proportion of the population who can afford small fees do not use the legal services they need, largely because the charges are beyond their means or they fear the fees will be too high. Attempts have been made to provide competent low-cost legal services through such programs as the lawyer reference plan which was operating in more than 30 cities in late 1949. Some other programs under discussion are: group practice for a number of specialists, private insurance plans similar to hospitalization insurance, legal-service bureaus for middle-income groups, legal cooperatives, or some type of Government-subsidized legal service administered by the bar. If such plans become widespread and well-known, the new legal business will absorb many young lawyers.

Opportunities for specialists are often better than for lawyers in general practice; many of the larger law firms have such specialists. However, such lawyers are comparatively few in number, and usually practice in the larger cities. Specialties with relatively good prospects in the long run are: tax law (thorough knowledge of accounting is necessary and Government experience helpful), patent law (scientific or engineering training is often required), administrative law (this is becoming increasingly important as more and more lawyers engage in legal dealings with various Government agencies, and as the Government itself employs more lawyers), admiralty law, and international law. Legal training is becoming increasingly useful for many types of business, and for administrative positions in Government; it is also a great asset to people seeking public office.

Best opportunities usually lie in medium-size and smaller cities, especially those with prospects of economic expansion. State capitals and county seats may also offer good opportunities. The profession was especially overcrowded in the very large cities and in Washington, D. C., in early 1950.

Earnings

According to a survey made by the United States Department of Commerce, lawyers in independent practice had a median net income of about $5,700 in 1948, nearly twice as much as in 1941. Incomes tended to be much higher in large than in small communities. Independent lawyers in places of under 1,000 population had a median income of only about $3,100 in 1947, as contrasted with $6,900 in cities of 1,000,000 or more.

Salaried lawyers, who are located mainly in large cities, had higher median 1947 incomes than their colleagues in independent practice—$6,100 compared with $5,300. Earnings of under $3,000 for the year were reported by 26 percent of the independent lawyers and only 6 percent of those on salaries. On the other hand, the proportion with net incomes of $20,000 or more was twice as large among independent as among salaried lawyers (6 and 3 percent, respectively).

For those in independent practice, incomes tended to increase with the size of the law firm. Lawyers practicing alone in 1947, and this included about three-fourths of all independent lawyers, had a median net income of about $4,300; the small percentage in firms of five to eight members had a median of $16,800.

In this profession as in others, incomes mount with increasing age and experience up to a certain point and then tend to drop off. Young lawyers, aged 25–29 years, had a median income of about $3,500 in salaried positions and $3,100 in independent practice in 1947. The highest median income of independent lawyers for 1947 (about $7,000) was reported by the group 50–54 years of age; salaried lawyers seemed to reach their peak income ($8,000) between the ages of 60 and 64.

These figures represent net income after deduction of expenses. Lawyers' operating expenses are high, absorbing, on the average, about a third of their gross income in 1947. Frequently, two or more lawyers share the same office to reduce overhead costs. Many of them, particularly in small towns, have to have some other source of income such as a farm or real estate agency.

Where To Go for More Information

Information on law schools, their entrance requirements, and employment opportunities in particular localities may be obtained from deans of law schools and from State and local bar associations. The American Bar Association, 1140 N. Dearborn St., Chicago, Ill., may also be helpful. Information on opportunities for Negro lawyers is available from the National Bar Association, Mr. J. R. Booker, Century Building, Little Rock,
Ark. The specific requirements for admission to the bar in a particular State may be obtained from the clerk of the highest appellate court at the State capital.

The following reports give information on income of lawyers:


Accountants

(D. O. T. 0-01.)

Outlook Summary

Job competition among inexperienced accountants likely to be eased, with expansion of the defense program; good employment prospects for Certified Public Accountants and other well qualified persons. Continued upward trend in employment in long run.

Nature of Work

There are many types of accounting work, ranging from partnerships in accounting firms and controllerships in corporations to jobs at the clerical level. Accountants may engage in either public or private practice. Public accounting firms are usually headed by C. P. A.'s although they often employ other accountants; they render service to a number of clients on a fee basis. Private accountants work on a salary basis either for a single business establishment, keeping accounts of that business, or for Government agencies in such jobs as auditor, bank examiner, or tax examiner. About 35,000 C. P. A.'s were employed in early 1950, but altogether probably eight or nine times that number of persons were engaged in accounting work. Less than 10 percent were women, and many of these were in teaching positions; about 400 women were C. P. A.'s.

How To Enter

Employment requirements vary with the type of work. A bachelor's degree with a major in accounting or a related field, or a diploma from a school of accounting is usually required for the better jobs, although experience may be substituted for part of the formal education. To qualify as a certified public accountant and receive the certificate from a State board, one must meet certain educational and experience requirements and pass a rigid examination. Eighteen States have regulatory accountancy laws under which only registered accountants or certified public accountants can practice public accounting. Only one of these allowed registration of noncertified public accountants in 1949, although the other 17 formerly did so.

The accountant usually begins in a minor job—compiling data, preparing invoices, or as a junior assistant on the staff of a C. P. A. Advancement may be rapid for able accountants with sufficient educational preparation, but inadequate training often results in routine jobs with little opportunity for promotion—except in cases of unusual ability. Experience in accounting is an excellent background for many types of jobs such as credit manager, controller, purchasing agent, budget officer, and many executive positions.

Outlook

The strong competition which existed among inexperienced accountants in early 1950 in most localities is expected to be reduced as the defense program gets under way. Although there was a shortage of accountants during and immediately after World War II, the unusually large number of new graduates entering the profession in 1948 and 1949 led to a surplus. There was considerable competition for jobs and pay rates were beginning to show the effect of overcrowding in the profession in early 1950. However, a program of expanding defense production and an increase in the
size of the Armed Forces and in Government employment could quickly drain off any oversupply of accountants. Applicants with a college degree and courses in business administration as well as in accounting have better chances of employment than those whose training has been limited to the accounting field. Opportunities for jobs in private accounting are more numerous than those in public accounting.

The demand for C. P. A.’s and other highly qualified accountants was strong in early 1950, and continued gains in employment are expected over the long run. Factors which have increased employment of accountants in recent years, and which are expected to continue, are complex tax systems and a growing emphasis on scientific management in industry. World War II greatly increased the demand for accounting services, especially in the Government, and similar circumstances would again call for expansion of such services. The upward trend in private industry has continued. Many employers, newly introduced to the value of accounting services during World War II, now see the advantage of maintaining production control systems, regular auditing services, and a variety of other accounting practices.

There are some employment opportunities for accountants in every community and in nearly all industries, but the greatest number of jobs, as well as the keenest competition, will continue to be in industrial centers such as New York and Chicago. However, the decentralization of industry has increased the demand for accountants in the smaller industrial communities. Throughout the country, the trend toward increased use of accounting services can be expected to persist over the long run.

Earnings

A survey of C. P. A. firms in New York City in 1948 showed median entrance salaries for junior accountants to be $36 a week in small firms and $37 in medium-large firms. In March 1948, deans and professors in 80 schools of accounting estimated that private and public accountants with 5 years’ experience averaged $73 and $78 a week, respectively; C. P. A.’s with the same experience averaged $89. Salaries of accountants vary greatly according to type of employer and size and location of city, as well as by preparation and experience of the individual.

Federal civil service entrance salary for junior accountants and auditors was $2,875 in late 1949; assistant accountants and bank examiners began at $3,100; most accountants and auditors, who must meet higher qualifications, started at $3,450 a year. More responsible positions at higher pay are usually filled through promotion.

Beginning monthly salaries for accountants in private firms averaged $238 in 1949 and ranged from $170 to $285, according to a survey of 169 large and medium-sized companies.

Where To Go for Further Information

Information, particularly on C. P. A.’s, may be obtained from:

American Institute of Accountants,
270 Madison Ave.,
New York 16, N. Y.

The Committe on Selection of Personnel of the above organization will provide information on the aptitude and achievement tests now given in many schools and by many public accounting firms.

Further information on specialized fields of accounting may be obtained from:

National Association of Cost Accountants,
385 Madison Ave.,
New York 17, N. Y.

Controllers Institute of America,
One E. 42d St.,
New York 17, N. Y.

The Institute of Internal Auditors,
120 Wall St.,
New York 5, N. Y.
Outlook Summary

Employment opportunities for professionally trained librarians are expected to be very good for several years at least. Further expansion of profession over long run.

Nature of Work

The major divisions of the work of every library, large or small, general or specialized, are administration, book selection and order work, cataloging and classification, circulation work, and reference service. In a small library the librarian may perform the duties involving all or several of these functions. In a large organization, different librarians handle each function and there are additional positions such as children's librarian, readers' adviser, public-relations director, subject specialists, personnel director, and positions of a strictly administrative nature.

Training

To be adequately prepared for a position as librarian, one must be a graduate of one of the 34 accredited library schools in the United States or of the 2 accredited schools in Canada. In 1949–50, 21 of these schools conferred a master's degree upon completion of the fifth year of training. Six other library schools gave a year's professional curriculum at the graduate level, but conferred a professional bachelor's degree. Nine schools offered professional programs within the undergraduate 4 years. Undergraduate study should introduce the librarian to various fields of knowledge and include as intensive study as possible in the subject field in which he wishes to specialize. Considerable knowledge of the physical or the social sciences is particularly important in library service.

New graduates usually start out as librarians in small libraries or as assistants in large ones. Opportunities for advancement are by transfer to larger libraries or, in institutions with many employees, by promotion to higher grade positions. Eventual promotion to administrative, supervisory, or specialized positions is possible.

Where Employed

About 30,000 trained librarians were employed in late 1949, of whom 90 percent were women. As of 1948, the 7,400 public libraries employed slightly more than 40 percent of the librarians. Centralized libraries in elementary and secondary schools (numbering some 20,000) employed about 30 percent although, as a rule, only large schools have specially trained librarians. College and university libraries (numbering about 1,700) employed nearly 18 percent. The remainder worked in approximately 1,500 special libraries and 230 Federal and State libraries.

Outlook

Employment opportunities for trained librarians were very good in mid-1950, and there will continue to be good opportunities for new entrants for several years. Growth in this field has been rapid in the past and there are indications of further expansion. Even before World War II the annual placement of library-school graduates reached 100 percent. There is considerable turnover in this field because many young women marry and leave their jobs, and both men and women find positions in other fields in which knowledge of librarianship is an asset. Enrollments in accredited library schools in 1948–49 slightly exceeded the prewar peak (reached in 1939–40). But graduating classes will have to be much larger than those expected on the basis of these enrollments, to provide needed replacements and fill the new positions which will be created by expanding facilities in the next few years.

The greatest number of opportunities will continue to be for reference and circulation librarians, catalogers, librarians for service to children and young people, and school librarians. A smaller number of librarians will be needed for positions which require special competence and preparation—administrators, subject specialists, extension librarians, librarians in adult education, public relations specialists, hospital librarians, and librarians to develop the use of audio-visual materials. There is need for librarians who can carry administrative responsibilities in small libraries and also
OTHER PROFESSIONAL, SEMIPROFESSIONAL, ADMINISTRATIVE

perform most of the routine work, since libraries with very small staffs far outnumber the large ones.

Earnings and Working Conditions

The median annual salary of professional library employees as reported in January 1949 was $3,050 according to a survey of library personnel throughout the country; the nonprofessional workers had a median salary of $1,975. The region where salaries were highest for both professional and nonprofessional workers ($3,575 and $2,425 a year, respectively) was the Border States and the District of Columbia; in the District, a large proportion of all library employees work for the Federal Government. Median pay was lowest for professional librarians in the Middle West ($2,575 a year); for nonprofessional workers, in the Southeast ($1,675 a year).

Salaries vary with the type of position, size of library, and other factors. Median salaries of chief librarians varied from $2,000 a year in small public libraries (those with less than 5 employees) to over $8,000 in libraries with 100 or more employees. Branch librarians had median annual salaries of $2,250 in libraries with 5 to 9 workers and of $4,000 in those with 500 or more employees. The survey also indicated that salaries tend to increase with amount of professional education.

With the Federal Government, the basic entrance salary for most professional librarians was $3,100 a year in late 1949.

According to the above-mentioned survey, the most typical workweek for library employees was 40 hours in 1949. Since many libraries are open during the evening, the schedules of about half the professional and a third of the nonprofessional employees included evening work.

Library employees typically receive holidays with pay or are given extra pay or time off for holidays on which they work. Almost all employees are given paid vacations and sick leave.

Where To Go for Further Information

Additional information—particularly on schools, requirements, and placement—may be obtained from:

American Library Association,
50 E. Huron St.,
Chicago 11, Ill.

Information on special libraries may be obtained from:

Special Libraries Association,
31 E. 10th St.,
New York 3, N. Y.

Statistics of school library systems and other information will be furnished by:

Federal Security Agency,
Office of Education
Washington 25, D. C.

A report on the earnings and working conditions of library employees in 1949 is available from the American Library Association or the U. S. Department of Labor, Bureau of Labor Statistics, Washington 25, D. C.

Information on employment opportunities in the Federal Government is given in pamphlet No. 37, The Librarian in the Federal Civil Service, available on request from:

U. S. Civil Service Commission,
Washington 25, D. C.

Market Research Analysts

(See D. O. T. 0-36.11)

Outlook Summary

Gradually rising employment in this small occupation, but increasing competition for jobs.

Nature of Work

Market research analysts collect, analyze, and interpret information for use in planning marketing programs and guiding sales operations. After studying a marketing problem the analysts usually make recommendations which can be applied directly to the marketing activities of a particular company.

Market research is carried on in a wide variety of organizations which are directly engaged in or connected with marketing. Among the main employers of market analysts are manufacturing companies, both those selling to consumers and
those selling to industrial users. They are also employed by retail stores, wholesale distributors, by the movie industry, by radio stations, newspapers, and many other types of organizations that maintain any kind of sales activity. Many of these users of market research have their own research departments, but others have this work done by independent research firms. There are several hundred of these firms which do research or conduct surveys on special order.

Many advertising agencies have market research staffs. Some of their studies are related to the products of clients of the agency and are done on a fee basis. Much of the research done in advertising agencies, however, is related to preparation of the advertising itself. Surveys are made to help choose the themes of advertising programs and to aid in deciding the kinds of type and the lay-outs which are most likely to attract the attention of readers. Surveys are also used to determine the best types of publication to carry particular advertisements and to test their effectiveness after they have appeared.

A good illustration of the market analyst’s job is his part in the development of a new product. Companies considering the introduction of new products often use the services of market researchers to help them make this decision. Market research personnel check the proposed product for acceptance by potential users for size, convenience, color, and any other qualities which may affect its use. Analysts also investigate the nature of the market for the product, including such points as how many people want to use it, how much they can pay, what the competition is, and how the product should be distributed. With this information a company can decide what products should be added to its line, and what price and distribution policy should be adopted.

Similar analyses are applied to existing products to find out if their distribution is the most effective that can be achieved. If a company is planning to change a product’s price or package, a careful and thorough market research job will guide them in making the decision. Market researchers are also called on to forecast the sales of individual products to serve as a basis for production and sales planning and to make forecasts of changes in styles and other demand factors. They also may advise the sales department in selecting areas in which to concentrate sales efforts and in setting quotas for branch offices and individual salesmen.

The main promotional opportunity for market research analysts is to the job of market research director. Directors are responsible for the general planning and supervision of the market research activities of a particular company. They often work closely with top officials and help to guide the over-all marketing operations. It usually takes at least 5 to 10 years’ experience as an analyst to qualify for a job as a director. The experience requirements for a particular job depend to a large extent on the size of the market research department or staff, and the scope of the research work. In large companies market research work may be a good avenue for promotion to higher jobs outside the market research department. Many market researchers have moved into high level sales or executive work.

Training and Qualifications

A college degree in business with a major in marketing will be required of most new trainees for market research jobs. Although many persons now employed as analysts do not have this background, employers are increasingly giving preference to those who have had specialized training in marketing and market research in college. Some universities give a well-rounded training program for market research, including courses in market research problems and techniques. The marketing curriculum of others includes only basic courses in marketing. Many other types of college courses serve as basic preparation for work in market research. Since statistical techniques are among the principal tools used in market research, courses in statistical methods are essential for a successful career in marketing research. Those preparing for jobs as analysts should also have a good grounding in economic theory and a knowledge of economic institutions and how they affect marketing operations. Courses in other aspects of business such as selling and sales management and accounting may help the market researcher in many of his problems. His work often cuts across the entire field of distribution and selling, including distribution cost analysis and sales management problems.
Courses in psychology are also helpful to many people in market research, especially those who expect to carry on or supervise market research on consumers' products, using questionnaire surveys. In approaching marketing problems it is very important to understand the psychology of the customers, what their wants are, and how they can be satisfied.

New college graduates should not expect to land jobs immediately as full-fledged analysts. To qualify as an analyst, at least a few years of experience are required, either in assisting analysts by doing research under close supervision, or in interviewing or statistical tabulating work. Useful background experience also may be acquired in selling or other activities in the marketing field. Many people have also transferred into market research from research jobs in other fields.

**Employment Outlook**

The number of jobs for market research analysts should grow gradually, both during the next several years, and over the long run. In 1949, there were probably only between 2,000 and 3,000 market analysts employed and the occupation is likely to remain relatively small. Some market research functions have been carried on for many years, but market research did not become firmly established as a separate field until the 1930's. Since then it has had a very rapid growth, especially during the first postwar years. Market research activity and the number of market research jobs should continue to expand, but at a slower rate.

More and more companies will set up market research departments or contract for increasing amounts of work with outside agencies. Market research will also be used more extensively by companies which have already adopted it, to help solve new marketing problems that arise. Market research is a relatively new field in a technical sense, so that many new techniques will be developed in future years to obtain more precise and accurate information.

Under the defense mobilization conditions which are foreseen during the next several years expansion of market research activity may be restricted by the curtailment of some civilian production. At the same time the number of new graduates of market research courses is expected to drop. This decline, combined with the effects of the entry of many young men into the Armed Forces, should result in less competition for the beginning jobs than there was in 1949 and 1950.

**Newspaper Reporters and Editors**

(D. O. T. 0-06,42, 44, 45, 47, 48, 51, 52, and 71)

**Outlook Summary**

Competition for jobs usually keen, especially among new entrants. Some expansion in employment expected in related fields.

**Nature of Work**

Newspaper reporters gather facts for news stories which may be written either by them or by a rewrite man. There are many types of editors, with varying degrees of responsibility. Department editors handle a particular kind of news such as sports or society. City editors assign reporters, photographers, and rewrite men to local news stories and may edit stories and headlines. Managing editors have complete charge of the news department and, with the publisher, set the general news policy of the paper. Editors are usually recruited from reporters. Taking both groups together, about 58,000 were employed in 1940; approximately a fourth were women.

**Qualifications, Training, and Advancement**

Talent for writing is essential and often outweighs academic training in getting jobs and promotions. A college education is desirable, however. More and more, employers are giving preference to people with formal training in journalism, history, and economics.

People usually get into the occupation by start-
ing as a "cub" reporter on a small newspaper or a trade-association paper or by working up from the job of copy boy (where they begin as messengers and advance to routine reporting assignments). Small country and suburban papers prefer local men who know the community and have related skills, such as photography or printing. Trade associations prefer people with a knowledge of their particular field. Many large papers and syndicates hire college graduates as copy boys and give them a chance at reporting after several months.

Reporters may advance to positions as copy readers or to editorships, get reporting jobs on larger papers or with syndicates, or transfer to a variety of better paying, related jobs. They may also do free-lance reporting for more than one newspaper or magazine.

Outlook

The reporting field, always highly competitive, was considerably overcrowded in mid-1950. There were three times as many journalism graduates in June 1950 as in any of the last few years before World War II; the number will probably increase further in the following year or so, unless many students are withdrawn for military service. This expanded supply may keep the field overcrowded in spite of developments which tend to create new openings for reporters. The unsettled international situation in mid-1950 was stimulating greater interest in foreign news and may draw off a few experienced reporters to foreign assignments, thus creating openings for some new reporters. Fields related to newspaper work, such as advertising, radio, and special publications, may be able to absorb a good many people with journalism training or experience. Opportunities with country papers, trade papers, and house organs are expected to be better than with the dailies.

Employment of reporters and editors on daily newspapers will probably not increase much in the long run, although there will always be some openings owing to turn-over. The use of syndicated material and the increasing proportion of space devoted to advertising may reduce the need for reporters on dailies. Some expansion in employment, however, is expected with the labor press, religious press, foreign language, trade association, and country newspapers.

Fields related to newspaper work will continue to employ some new journalism graduates and also absorb a number of experienced reporters each year, thus increasing replacement needs on newspapers. There are indications that the advertising, public relations, radio, and book-publishing fields will use greater numbers with journalistic training and experience in years to come.

Competition for jobs will probably continue to characterize the reporting field over the long run, since many young people are attracted by the reputed glamour of the work. Nevertheless, talented people, including those with little formal training, will always have some chance of breaking into this profession.

Earnings

American Newspaper Guild minimum rates for cub reporters with no previous experience were $35 to $55 a week in 1949. Minimums for experienced reporters ranged between $70 and $110, with actual going rates considerably higher. On 38 dailies employing over 55 percent of the Guild reporters the minimum for experienced reporters was $100. There are no set salary standards for editors; some may make as little as $75 a week, while the managing editor of a large metropolitan daily may earn as much as $50,000 a year. Salaries vary with size of the paper, type of job, experience, and other factors.

Where To Go for Additional Information

Information, especially on union wage rates, is available from:

American Newspaper Guild,
Research Department,
99 University Place,
New York 3, N. Y.

Information about opportunities with small-town papers may be obtained from:

American Press Association,
920 Broadway,
New York 10, N. Y.
The above organization publishes a complete list of the 8,400 weekly newspapers of the country. This list is available at quite a number of libraries. Names and locations of all daily newspapers are published in the Editor and Publisher's International Yearbook, available in most large newspaper offices.

People interested in operating a small newspaper will find valuable information in the following publication:


Radio Announcers
(D. O. T. 0-69.21)

Outlook Summary

Competition for openings likely to be keen, particularly in large cities. Opportunities for newcomers generally limited to small stations. Expanding employment at TV stations. Eventual decline in employment in sound broadcasting probable.

Nature of Work

Announcers act as masters of ceremonies on radio programs of various kinds, read commercials and news flashes, give station identifications, describe sporting events, and do announcing of other types. Especially in small stations, they may also have a variety of other duties—playing phonograph records and other transcriptions which are being broadcast, operating some of the controls on the broadcasting equipment, writing script, even acting as station manager. Most are on the staffs of single stations or radio networks; some work for large advertising agencies. Others are not connected with any company, but free-lance, hiring out for a single job or a series of programs. A few have their own stations.

How To Enter

A well-rounded education, preferably including a college degree, is important for this occupation. Good knowledge of the English language is necessary. Other essential qualifications are a good voice and ability to deal readily with unusual situations. For jobs in telecasting, announcers must meet particularly rigid standards as to personal appearance.

Practically all new announcers begin at small radio stations. If successful there, they may be hired by a larger station or one of the radio networks. Those who hold Federal Communications Commission first class radio-telephone licenses have an advantage in getting jobs at small stations, since they can double as transmitter operators. A few announcers become well-known and highly paid radio personalities, some of them on a freelance basis; occasionally they advance to executive positions in the broadcasting industry.

Outlook

Approximately 2,300 AM, FM, and AM–FM combination stations employed about 8,000 announcers (including both full-time announcers and other full-time staff program employees who did some announcing) in the fall of 1949. Employment of announcers had more than doubled since 1945 but is likely to increase at a much slower rate in the future. Most openings will arise from turnover.

Television stations probably will employ more and more announcers for an indefinite number of years. In mid-1950, there were 106 TV stations on the air, but there are likely to be several hundred of them by the late fifties, unless defense preparations make it necessary to restrict construction of new stations.

Job prospects for those who wish to become announcers are not good. New stations will provide jobs and some openings will result from turnover, but there was a surplus of job-seekers in late 1949, and this appears likely to continue. As in the past, broadcasting companies, particularly those in large communities, will generally be able to choose the best of many applicants. In small communities, where most announcers get their first jobs, competition for openings is likely to be much less keen than in big cities.
Announcers who succeed in getting established generally have steady employment throughout the year. Except for the possibility of station failures, they can reasonably expect to continue working year in and year out, even in periods of business recession. Some sound stations may be forced off the air, especially in metropolitan areas, where competition from TV will be keenest.

**Earnings and Working Conditions**

Full-time staff announcers working for the Nation-wide networks and their key stations had average weekly earnings of $125, according to a Federal Communications Commission survey made during the week of October 16, 1948. Those at other stations with 15 or more employees averaged $72. Stations with fewer than 15 employees do not report earnings for announcers separately; at these stations, staff program employees averaged $51, much less than the average for announcers at the larger stations. Announcers at bigger stations averaged about 40 hours of work for the week; those at small stations had a slightly longer workweek.

Yearly earnings of staff announcers vary widely from city to city. In 1947, according to a survey in 15 large cities, of members of the American Federation of Radio Artists, median earnings from all sources were highest in New York and Chicago. The much smaller group of free-lance announcers generally earned much more. The following table summarizes annual earnings data for both groups of announcers in the cities surveyed:

<table>
<thead>
<tr>
<th>Occupation and city</th>
<th>1 out of 4 earned less than—</th>
<th>1 out of 2 earned more than—</th>
<th>1 out of 4 earned more than—</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff announcers—all cities</td>
<td>$3,400</td>
<td>$4,600</td>
<td>$6,700</td>
</tr>
<tr>
<td>New York</td>
<td>4,400</td>
<td>6,800</td>
<td>10,300</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>3,500</td>
<td>4,900</td>
<td>7,700</td>
</tr>
<tr>
<td>Chicago</td>
<td>4,800</td>
<td>6,700</td>
<td>9,200</td>
</tr>
<tr>
<td>Other cities</td>
<td>3,200</td>
<td>4,300</td>
<td>5,600</td>
</tr>
<tr>
<td>Free-lance announcers—all cities</td>
<td>5,100</td>
<td>9,000</td>
<td>16,200</td>
</tr>
<tr>
<td>New York</td>
<td>8,200</td>
<td>16,100</td>
<td>26,200</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>6,500</td>
<td>10,900</td>
<td>17,900</td>
</tr>
<tr>
<td>Chicago</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Other cities</td>
<td>3,300</td>
<td>5,800</td>
<td>9,600</td>
</tr>
</tbody>
</table>

1 Too few cases to warrant calculation of separate earnings figures.

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**Photographers**

(ф. D. O. T. 0-56.01 through 31)

**Outlook Summary**

Competition for jobs usually keen, especially among new entrants. Occasional openings for highly qualified persons. Long-run trend in employment slowly upward.

**Nature of Work**

Photographers usually specialize in portrait, commercial, news, or aerial work. They must be able to use cameras, lenses, filters, and other equipment and have knowledge of lighting. They must also be able to do such work as developing, finishing, printing, enlarging, and retouching, much of which requires the knowledge and use of chemicals. In small shops, the photographer may do all this work. Even in large studios employing photographic technicians, he often develops and prints his own pictures.

**Where Employed**

Most photographers are employed in studios handling portrait or commercial work. Others work for newspaper and magazine publishers, advertising agencies, manufacturing plants, and Federal, State, and local governments. Many are in business for themselves.

There are photographers in all parts of the country, in small towns as well as large cities. Those located in small towns are usually all-round photographers. Most studios doing commercial work only are located in larger cities (50,000 population or more). In 1940, over half of all photographers were employed in only six States—

How To Enter

Usual method of entering the occupation is by on-the-job training. This normally takes 2 or 3 years and covers all phases of photography, the trainee advancing through the various operations. Some employers have formal apprenticeship programs. Persons may also enter the occupation by attending a school of photography. Completion of a school course is not a substitute however, for on-the-job training, although it may shorten the training period. Selection of a reputable school is very important. Veterans whose only experience in photography was obtained in the Armed Forces need additional training for civilian work.

A high school education, with emphasis on chemistry, physics, and art, is recommended for all prospective photographers but is not necessarily a prerequisite for employment. Photographers also need artistic ability, a pleasing appearance and personality, and a good business sense if they expect to go into business for themselves.

Outlook

The surplus of photographers which existed in mid-1950 was expected to continue for a few years at least. The oversupply was due in part to the very large number of persons who received some training in photography during World War II and to the record number of postwar graduates of photography schools. Furthermore, the decline in portrait business after VJ-day caused a number of studios to curtail their staffs and others to go out of business entirely; many experienced photographers were laid off. The commercial field has been expanding, but not enough to absorb the surplus of experienced men seeking work. On the fringes of the profession, there have been, as usual, a large number of amateurs who are potential job applicants and who intensify the competition for portrait and commercial positions. The fields of news photography and aerial photography will offer a few vacancies; entrants qualified for these fields will meet less competition, because the work is so specialized that most photographers cannot qualify. Inexperienced photographers, however, are likely to have considerable difficulty obtaining jobs in the near future.

Over the long run, employment will probably rise slowly, although it is not likely to reach the World War II levels for some time. In addition, replacement needs owing to deaths and retirements will create some openings. Best opportunities may be expected in commercial work, owing to expanding use of photography in many fields and the frequent discovery of new uses. The largest and most rapidly growing subdivision of commercial photography is industrial photography. The news photography field has reached a plateau and is not expected to show much gain in employment. The field of aerial photography is relatively new and will probably show some growth over a period of time. In all fields, there will be room for the photographer with exceptional talent, superior selling ability, or unusual resourcefulness. Usually, commercial photographers stand a better chance of steady employment than portrait photographers because the latter branch is likely to be more affected by declines in business activity.

Earnings and Working Conditions

Typical salaries for experienced portrait photographers ranged from about $50 to $100 a week in some large cities in early 1947. Those with established reputations earned much more in many instances. Salaries of commercial photographers were about the same; many work on a job basis. News photographers usually averaged about $40 a week, with some of the more experienced receiving as high as $110 or more, at the beginning of 1947, depending on the circulation of the newspaper or magazine. Aerial photographers typically earned from $40 to $50 a week, plus any traveling expenses they may have incurred.

Earnings of photographers in 1950 were reported to be about the same as in 1947.

Commercial and news photographers often work nights and Sundays. Portrait photographers have rush seasons and may work long hours at these times.
Commercial Artists
(D. O. T. 0-44.11, .13, .21, .23, .24, .25, .26)

Outlook Summary

Outlook uncertain for majority in the field. Prospects will continue to be good for those with unusual ability. There is a continual oversupply of poorly qualified persons attempting to enter this occupation.

Nature of Work

Commercial artists design and draw illustrations for advertising copy, books, magazines, and newspapers. They also create posters for billboards and other uses. Preparation of charts and maps for exhibition or publication is another type of work handled. Still other artists are employed to retouch photographic prints. Experienced artists usually specialize in a particular product or field—for example, fashion or industrial illustrations, furniture advertising, or story illustrations.

Where Employed

The largest employers of commercial artists are advertising concerns, department stores, newspaper and magazine publishers, mail order houses, and calendar and greeting-card companies. Some people work as free-lance artists on an independent basis or own a commercial art studio employing several other artists. Most are employed in or near metropolitan areas where the largest users of commercial art are located.

How To Enter

Most commercial artists begin their training in high-school art classes or at vocational art schools and later acquire practical experience. However, some enter through on-the-job training with periods of varying lengths, combined with part-time schooling. Still others enter by obtaining certificates from schools of fine and applied arts; the courses of study offered by such schools usually take 3 years and cover all phases of art work.

Selection of a reputable school is very important. The basic education should include art courses, mathematics, science, and history. A knowledge of lettering and typography, as well as drawing, is essential.

Beginners must be content to start at the bottom and perform routine jobs, until their ability is recognized. Artistic talent, originality, resourcefulness, and salesmanship are among the personal qualifications needed for success.

Outlook

Competition is expected to be keen among new entrants at least during the early fifties. A greater number of artists were trying to break into advertising and other fields of commercial art in mid-1950 than at any time since World War II. The number seeking to enter the field will probably continue at a high level, owing to the large number of students taking training (including veterans

Photograph by U. S. Department of Labor

Experienced commercial artists usually specialize in a particular product or field—example, theater poster advertising.

Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis
under the GI Bill of Rights). However, specialists in certain types of commercial art will still be needed in various localities, and talented artists will probably continue to be in demand in nearly every large city.

The long run trends in demand for commercial art work and employment of commercial artists are uncertain. There are some factors which will tend to increase the use of this medium and others which will tend to decrease it. The fields in which commercial art work has traditionally been used have been expanding rapidly in the past and further expansion is expected. The use of visual advertising, especially in magazines and newspapers, should continue to grow, as it has in the past 10 years. Other forms of art, such as poster and window displays, greeting cards, calendars, and use of visual aids in education should also continue to employ an increasing number of artists. On the other hand, many firms have been replacing commercial art work with photographs, especially since World War II, as improved techniques in color photography have been developed. In the future, technological improvements expected in both color and black and white photography are likely to lead to the use of more photographs in preference to the work of commercial artists.

Greater use of photography would probably not affect opportunities for the artist whose work is considered superior to photography and would increase the number of openings for photographic retouchers. At all times, there is a demand for artists of unusual ability, even when keen competition exists for most of those in the occupation. On the other hand, the occupation has been chronically overcrowded with poorly trained persons whose work is substandard.

Earnings

In late 1949, beginning staff artists in some large cities typically received about $50 a week. Hourly rates for free-lance artists in large cities varied according to the type of work, ranging from about $3 for photo colorers (oil) to $8 for lay-out sketchers, according to limited data for a few large cities. Experienced artists may make as much as $10,000 yearly or more.

See also Interior Decorators, page 127; Industrial Designers, page 96; and Draftsmen, page 99.

**Interior Decorators**

*(D. O. T. 0-43.40)*

**Outlook Summary**

Expanding employment expected over long run. However, this profession is greatly affected by the level of residential and commercial construction activity, which will probably be lowered during the early fifties by the mobilization program.

**Nature of Work**

Decorators design interiors for homes, hotels, ships, theaters, business offices, and other places. They estimate costs and, in most cases, purchase furnishings and supervise their installation. They may also plan displays and model rooms and promote current decorating fashions in other ways. A good many sell draperies, upholstered furniture, and other small furnishings and have their own workshops where these articles are made. Many are employed by large decorating firms or department stores or are in business for themselves. The majority are women.

**Personal Qualifications and Training**

A good interior decorator combines the abilities of the architect, designer, and artist. He must have a knowledge of drawing, materials, color, interior construction, furniture design and arrangement, fine arts, lighting, and estimating. Salesmanship and a pleasing personality and appearance are among the personal qualifications needed.

A good educational background is very important. It is helpful to begin preparation in high school by studying such subjects as mechanical drawing, art, and business administration. Two years of college are considered desirable before entrance into one of the specialized schools of interior decoration, which offers a 3- or 4-year pro-
fessional course. Some persons get their training at trade and vocational schools, but they are likely to meet keen competition later on from persons with more advanced training.

After completion of schooling, on-the-job training with an established decorating firm or department store is invaluable. A beginner may have such duties as keeping stock in order, selling home furnishings, or acting as assistant draftsman. From these entry jobs one may advance to decorator's shopper; then to assistant decorator; and finally to decoration consultant or some other top position. Practical experience is particularly necessary for persons planning to go into business for themselves.

Outlook

Employment opportunities were favorable for well-trained persons in this relatively small but expanding field in mid-1950. A greater amount and variety of decorating materials had become available since World War II. Record numbers of new homes were being built. However, the level of residential and commercial construction activity for the next few years at least will probably be lowered by the mobilization which was beginning in late 1950. In any event, there will continue to be a demand as in the past for redecoration of interiors which have grown worn and shabby.

The supply of well qualified new entrants was increasing in 1950, and newcomers were facing a little more competition than in earlier years. Decorators trained in modern design were in greater demand than those whose training had been predominantly in period design.

Openings are likely to be easiest to find in areas adjacent to large cities and in cities with populations of 50,000 to 150,000. However, persons employed in these cities must usually be content with small businesses and many have some difficulty in securing materials. In the largest cities, where most of the specialized schools of decoration are located and where furnishings are easier to obtain, an oversupply of decorators may exist. Opportunities for beginners in these areas will therefore be limited.

The demand for interior decoration should tend to increase over the long run. Formerly, this was considered a luxury service, but in recent years there has been more and more professional decorating of moderately priced homes and offices. Construction of new houses, schools, hospitals, and other buildings will eventually provide a growing demand for the service. However, this occupation is far more affected by declines in business activity than many others. Only if general economic conditions continue to be good and residential and commercial construction activity remains at high levels may the great majority of decorators look forward to continued employment over a long period of time.

Earnings

Typical earnings of beginners in entrance jobs were around $30 to $40 a week in some large cities in late 1947. A wide range of earnings existed among established decorators, depending on size of establishment, size of city, income of clientele, and other factors; some earned upward of $10,000 or even $20,000 a year. Most decorators in the upper income brackets were in business for themselves, although high salaries were often paid by large establishments to department heads and others.

Earnings of interior decorators were reported to be about the same in 1949 as in 1947.

Where To Get More Information

American Institute of Decorators
41 E. 57th St.
New York, N. Y.
Funeral Directors and Embalmers

Outlook Summary

New entrants seeking apprenticeship opportunities may continue to outnumber openings for several years. Slight expansion of field expected in long run.

Nature of Work

The funeral director, who may also be referred to as mortician or undertaker, makes arrangements for and conducts funerals. He interviews the family to obtain data about the deceased, so that legal requirements can be met, and helps plan the details of the funeral service. Frequently he acts as embalmer.

The embalmer prepares bodies for final disposition, in conformity with State laws and local ordinances. Preparation includes sterilizing and preserving the body by injecting embalming fluid or by other means. Embalmers may also dress the body, apply cosmetics to give a natural appearance, and restore maimed or disfigured bodies.

In 1949, over 40,000 funeral directors and embalmers were employed; more than 2,000 were women. There were 23,827 funeral establishments, including 2,144 operated by Negro members of the profession, according to a 1949 survey by the National Funeral Directors Association. Most establishments have a small volume of business. Nearly half have only one or two employees; many funeral directors operate their own establishment with help only of family members or part-time workers. Approximately a fifth are operated in combination with other businesses such as furniture or hardware stores.

How to Enter

In all States and the District of Columbia embalmers must be licensed. Some States have a separate funeral director’s license while others have a common license for both embalming and funeral directing. Most people now entering these occupations obtain the licenses needed for both types of work.

For embalmers’ licenses, the usual requirements are: Minimum age of 21; good moral character; residence in State for prescribed number of years; high-school graduation (as of late 1949, 11 States required some college training); completing an embalming course; completing apprenticeship (usually a 2-year period, which may have to be served before, after, or concurrently with the required school course); and passing an examination given by the State. Requirements for funeral directors’ licenses are about the same, except that the course in embalming is required in only a few States and only 1 year of apprenticeship is usually specified. There are about 25 schools of embalming, most of which give a 9- to 12-month course. Three universities offer courses in mortuary science.

Outlook

Employment opportunities were limited in 1950 and may remain so for several years. Some new entrants will find openings in partnership with older men or as replacements for those who die or retire. However, more people were seeking apprenticeship opportunities in 1950 than there were openings. Embalming schools have been filled to capacity since the end of World War II; thousands of veterans have taken training under the GI Bill of Rights. Many students have connections with established funeral homes run by friends or members of their families, and thus have much the best chance of securing a place to serve an apprenticeship, as required by all State laws. It is advisable for students to make arrangements for serving the apprenticeship before starting class work in embalming schools. The withdrawal of young men for service in the Armed Forces or in defense production jobs would, of course, reduce the competition for apprenticeship openings.

In the long run, the volume of business handled by funeral homes is likely to increase slowly. The number of deaths is expected to continue rising slowly for about the next 40 years, owing to increasing population. A few men will find oppor-
opportunities to start new funeral homes, although in most localities competition from established firms will be great. In 1949, there was an average of only about 57 deaths per funeral home; however, the amount of business was very unevenly distributed among establishments. Openings with the older firms will be created mainly by retirements and deaths of proprietors or employees.

Jobs are to be found in sizable communities throughout the country. For men starting a new business, selection of a good location is very important. Factors to be considered include the number of people in the locality, death rates, per capita income, and competition from established businesses.

Earnings

Average earnings are not high. Nearly a third of all mortuary establishments in 1939 had annual receipts, before deduction of any expenses, of less than $5,000; only about 15 percent had receipts of $25,000 or more. Typical weekly earnings of licensed embalmers ranged from about $35 to $100 in 1949; those of apprentices from $20 to $50. In small establishments, earnings of owner-operators are often supplemented by income from other businesses such as furniture sales.

Workers in this field usually have very irregular working hours, and are required to be available for a period well beyond the generally accepted 8-hour working day. Workweeks of 80 hours and more are not unusual; a typical schedule for an embalmer in a large establishment is 6 days a week, every third night, and every other Sunday. However, actual duties performed may require only a small proportion of the workweek. Embalmers who service small establishments must usually be on call at all times.

Where To Get Additional Information

National Funeral Directors Association,
135 West Wells St.
Milwaukee 3, Wis.

National Selected Morticians,
520 N. Michigan Ave.
Chicago 11, Ill.

The State Board of Embalmers and Funeral Directors at any State capital.
Clerical, Sales, and Service Occupations

CLERICAL OCCUPATIONS

Eighty years ago very few people were engaged in clerical work. In those days business records were kept to a minimum; letters had to be written and copied by hand and bookkeeping involved laborious copying of figures from one sheet or ledger to another.

Since then the typewriter has been introduced widely, speeding up the writing of letters and providing copies; adding and calculating machines speed up figuring; accounting machines make record-keeping easy; statistical punch-card equipment performs miracles of accuracy and speed in sorting, counting, adding, computing, and printing a vast amount of information.

Despite these and other labor-saving, technological improvements—possibly even because of them—the number of clerical workers has increased greatly. In fact, in the 60 years before 1930, their number grew more rapidly than that of any other major occupation group. Only 1 out of every 160 workers in the country was in a clerical occupation in 1870; in 1930, 1 in 12 was engaged in this type of work. From 1930 to 1940, employment in clerical occupations continued to rise, but the relative gain was considerably less than in the preceding decade. As shown in chart 38, steady gains were made during World War II, and this growth continued without interruption in the postwar period; in 1950, one worker out of every eight was engaged in a clerical occupation.

Underlying this growth has been the increasing complexity of business and government organization. The introduction of additional labor-saving business machines and of more efficient procedures induced by the growing burden of clerical costs, may affect the future trends in this field, particularly in routine bookkeeping and clerical jobs, just as the dial telephone has cut down the employment of telephone operators and the teletype has reduced the number of jobs for telegraph operators. These developments may well slow down the growth of clerical occupations, but in view of their past gains and the increasing complexity of the economy it seems likely that they will continue to gain in importance for some time to come.

The major occupations in the field are shown in chart 39. Largest groups are stenographers, typists, and secretaries; and bookkeepers, accountants, and cashiers. A large number of people are also employed as shipping clerks, telephone operators, and mail carriers. Many clerical workers performing miscellaneous jobs are not classified separately by the Bureau of the Census.

Looking at the chart, one can clearly see the wide variations in skill to be found among the occupations classified as clerical in the 1940 census. They range from accountants, who usually have several years of college or business school training and often hold responsible positions in large firms, to messengers and office boys. Actually, accountants are often considered professional workers. Certified public accountants (of whom there were about 20,000 in 1940) have been in-
cluded with the professions in chart 22; the rest of the accountants—perhaps as many as 200,000—are not shown separately, because they were grouped with the bookkeepers in the 1940 census statistics and an accurate estimate of their number is not available.

Competition is usually keen for many jobs in the clerical field, primarily because of the low entrance requirements. However, turnover is high and, as a result, there are many openings for new entrants. College graduates often enter clerical occupations, to gain experience in a particular industry or business, and later work up to professional or administrative positions. Young people who enter with little training may never advance far and may leave for other jobs. Many women clerical workers leave the labor market after marriage. For a young woman considering a vocational choice, the clerical field is an important area of employment opportunity. Over a fourth of the working women are in clerical jobs—more than in any other single field. Women outnumbered men in this field for the first time in 1940. In early 1945, at the peak of the war effort, there were 2,500,000 more women in clerical occupations than in 1940, while the number of men decreased. As World War II veterans returned to industry, the number of men in clerical occupations increased and the number of women decreased, but by 1949 there were still 2,150,000 more women clerical workers than in 1940, and only about 650,000 more men. A program of mobilization involving considerable expansion of the Armed Forces, defense industries, and Government employment would again create shortages of clerical workers.

Reports on a few occupations usually classified as clerical are included in other sections of this handbook—railroad clerks and baggagemen, with the other railroad occupations, hotel clerks, with the hotel occupations, and proofreaders, with the printing occupations.

**CHART 39**

**MAJOR CLERICAL OCCUPATIONS**

**EMPLOYMENT, 1940**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stenographers, Typists, and Secretaries</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Bookkeepers, Accountants, and Cashiers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shipping and Receiving Clerks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone Operators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mail Carriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Machine Operators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Messengers and Office Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bill Collectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telegraph Operators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ticket Agents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**UNITED STATES DEPARTMENT OF LABOR**
**BUREAU OF LABOR STATISTICS**

Source: U.S. Bureau of the Census
Almost everyone has some idea of what sales work consists of, but most people fail to realize the great variation among sales jobs. An entirely different knowledge and selling technique may be required to sell one type of product to housewives from that involved in selling an industrial product to large companies. Because of the wide variety of products sold and the many different classes of consumers that buy them, sales jobs may differ more among themselves than many other fields of work. The duties, the knowledge and training required, and the personal characteristics required depend upon the particular type of sales job.

Among the different types of sales workers (see chart 40) are manufacturers' salesmen, who sell to stores or other manufacturers; jobbers' salesmen; insurance salesmen; specialty salesmen, who go from door to door selling such items as brushes; and sales clerks employed by department, variety, apparel, grocery, and other kinds of stores.

Sales clerks in stores are by far the most numerous. Some salespersons in stores, such as those selling furniture, must know a great deal about the merchandise they sell. Many are able to build up followings of loyal customers. But most sales clerks merely display merchandise, assist the customer in making a selection, and receive payment or make out a charge slip.

Most manufacturers' salesmen must have a thorough knowledge of the products they are selling and how each product can meet the needs of their customers. In many jobs, technically trained men are required, such as engineers, chemists, and pharmacists. Training courses in sales techniques are given new salesmen by most large companies, and courses in salesmanship are offered by many universities. In addition, at least several years of experience are usually required to become a full-fledged salesman. Many salesmen must travel extensively and be away from home a good part of the time. Most salesmen work on a commission basis, rather than on straight salary, and consequently their earnings may vary considerably from month to month or from year to year, depending on business conditions and other factors.

There has been moderate growth in employment in sales occupations in recent years. By 1940, after nearly a decade of depression, there were many people working in sales occupations simply because they had no other job.

During the war the employment of men in the selling field dropped by a million or about half, but by 1949 it had completely recovered and had reached a point slightly above the 1940 level (chart 41). A wartime increase of a half million women was maintained in the postwar period. The exodus of men was caused in part by selective service withdrawals, but even more by the fact that in the war economy, production of furniture, automobiles, and other consumer durable goods was curtailed or eliminated. Also, manufacturers with Government contracts found it unnecessary to maintain large sales staffs, and manufacturers of consumers' goods, instead of having to make an effort to sell, often found buyers eagerly beating a path to their doorsteps. Moreover, difficulties in recruiting workers in some relatively low-paid sales jobs hastened the prewar trend toward self-service stores, which employ many clerical workers—such as checkers, weighers, and stock clerks—but few salespeople. Employment in sales occupations has increased only half as much since 1940 as total employment in wholesale and retail trade.

In the long run, the field of sales occupations will probably continue to rise. In view of the moderate growth of sales occupations in the past, however, and the continued extension of self-service stores, it does not seem likely that the number of jobs in selling will increase as much in the future as in some of the other occupational fields.
CHART 42

MAJOR SERVICE OCCUPATIONS

EMPLOYMENT, 1940

Waiters and Waitresses
Janitors and Sextons
Servants
Cooks
Guards and Watchmen
Barbers
Beauticians and Manicurists
Policemen, Detectives, etc
Porters
Bartenders
Boarding- and Lodging-house Keepers
Attendants, hospital, etc.
Practical Nurses and Midwives
Housekeepers, Stewards, Hostesses
Firemen, fire department
Elevator Operators
Cleaners and Charwomen
Attendants, amusement, etc.
Attendants, services, n.e.c
Ushers
Bootblacks

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

NOT ELSEWHERE CLASSIFIED

NUMBER OF WOMEN TOO FEW TO SHOW ON CHART

DOMESTIC SERVANTS OR MEMBERS OF ARMED FORCES NOT INCLUDED
EXCEPT THOSE EMPLOYED BY PRIVATE FAMILIES

Source: U.S. Bureau of the Census

http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis
SERVICE OCCUPATIONS

Service occupations are often referred to in glowing terms as a great and promising field of employment. This is true to some extent of service industries, as pointed out in the discussions of industrial trends (p. 28). But service occupations and service industries are not the same thing. Not all workers in service occupations are employed in service industries; janitors in factories and porters on railroad trains are examples of service occupations found in manufacturing and in transportation industries. On the other hand, service industries (which include hotels, automobile repair shops, amusement enterprises, and advertising agencies) employ many professional, clerical, and skilled workers, such as automobile mechanics, advertising copywriters, radio actors, and stenographers. Although the service industries have grown fairly rapidly in the past 40 years, employment in service occupations has increased more slowly.

The major job fields include domestic service, protective service, personal service, and institutional service. The occupations are shown in chart 42, and the recent trends in chart 43. (Part of the increase in employment between 1949 and 1950 shown in chart 43 is due to an improvement in the census sampling procedure, which gives more accurate data for service workers other than domestic).

CHART 43

<table>
<thead>
<tr>
<th>EMPLOYMENT IN SERVICE OCCUPATIONS (EXCEPT DOMESTIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILLIONS OF WORKERS</td>
</tr>
<tr>
<td>1940</td>
</tr>
<tr>
<td>Men</td>
</tr>
</tbody>
</table>

United States Department of Labor Bureau of Labor Statistics

The protective service occupations include mainly policemen, detectives, firemen, guards, and watchmen. Almost all of the workers in the first three of these jobs are employed by Federal, State, and local governments.

The other service occupations include personal services, such as barbers, beauty operators, and practical nurses; and institutional service occupations such as janitors, waiters, cooks, and elevator operators. Some require considerable skill and training; others are comparatively unskilled. In most, the long-run trend is slowly upward. With higher income levels and a rising population, restaurants, hotels, barber and beauty shops, and theaters and other places of amusement should furnish gradually increasing employment opportunities. As more hospitals and large commercial and public buildings and apartment houses are built, more jobs will open for janitors, charwomen, elevator operators, and hospital attendants.

It seems likely that the service occupations as a group will grow moderately in the long run, but they are not the great and promising field of the future, as they are sometimes described.
PROTECTIVE SERVICE OCCUPATIONS

This large field includes those workers whose jobs involve the protection and safety of people and property, and the enforcement of the Nation's laws.

Guards and watchmen are the largest group of protective service workers in civilian employment. In 1940, there were about 208,000 guards and watchmen employed, with some jobs in almost every industry. The war and postwar expansion in general business activity has considerably increased the number of guards and watchmen. Also many business firms have become more aware of the importance of plant protection. As National security requirements are tightened in the early 1950's, employment in these occupations probably will rise.

Most job openings, though, will arise from turnover. Guard and watchman jobs are usually of such a nature that older men can be effectively employed, and many firms use some of their older workers in these jobs. As a result, a large number leave these occupations each year because of death, retirement, and other reasons.

Firemen employed by fire departments are another important group of protective service workers, numbering about 77 thousand in 1940. Since then there has been a substantial gain. It is likely that the total number of firemen will continue to increase with the continuing growth of cities and surrounding urban places where most full-time firemen are employed. There will also be many openings to replace those who die or retire.

The law enforcement group of protective service workers—policemen, detectives, etc.—is comprised of government employees. Several of the more important occupations in this group—policemen, detectives, Federal police and detectives, and FBI agents—are covered in the following reports.

Policemen
(D. O. T. 2-66.20 to .29)

Outlook Summary

Large and expanding field. Several thousand newcomers will be needed each year.

Nature of Work

Most policemen are city employees, though many work for counties and States. Those employed by the Federal Government are not covered by this statement, but are discussed separately (see p. 139).

Policemen usually wear uniforms. In large cities, they are assigned to a particular type of work, such as walking a beat, accident or crime prevention, dance- or pool-hall inspection, traffic patrol, homicide squad, or radio operation. Policewomen are assigned mainly to crime prevention and detection work among women, young people, and children. County police and those in smaller communities usually have more diversified work.

Many of the State-wide police departments were at one time chiefly concerned with traffic control, but more and more their authority is being broadened. In 1948, the only State police departments confined to the enforcement of traffic regulations were in the following 11 States:

- California
- Colorado
- Florida
- Minnesota
- Mississippi
- Montana
- Nebraska
- North Dakota
- Ohio
- Tennessee
- Wisconsin

Departments in all other States operated under general police authority.

Qualifications, Training, and Advancement

In many cities, especially the larger ones, the jobs are filled on the basis of competitive examinations. In such cities, job seekers may have to meet very rigid requirements, especially with respect to age, height, health, strength, agility, physical endurance, and emotional stability. Applicants must have sufficient education to meet basic requirements. There has been and will probably continue to be a strong tendency to raise hiring standards for police jobs, and examinations are
becoming increasingly difficult. Veterans, especially those with military police training and experience, are likely to have some advantage over other applicants. For most police jobs, applicants must meet residence requirements.

Many police departments have training programs for new recruits and also provide in-service training. The number of communities with such programs is growing, mainly, as a result of increasing emphasis on crime prevention and traffic control.

Opportunity for advancement to the rank of sergeant is fair—better in large and medium-sized cities than in small communities. Further advancement is possible to lieutenant, then to captain, and on up the ladder. In most large cities, promotions up to the rank of captain are made on the basis of competitive examinations. Appointment to a higher grade (inspector, deputy chief, chief, and commissioner) is usually made without examination. In addition to direct promotions in rank, policemen often have chances to be transferred or promoted to the detective force of the police department.

**Outlook**

Police work is an expanding field. Employment in early 1949 was estimated at about 110,000 nonranking policemen, an increase of almost 15 percent over the 1940 employment. Included in the 1949 employment were about 1,000 policewomen and 2,200 Negro policemen.

Employment of policemen is expected to continue to increase throughout the 1950-60 decade. This long-range increase in employment will occur mainly because of the increasing growth of population in cities and their suburbs, and because of a continued growth of motor vehicle traffic. Other factors, such as the reduction of scheduled work-hours per week, more emphasis on crime prevention and accident prevention, and the need for more traffic controls will also encourage further expansion of police departments in many localities.

In addition to the new policemen needed to increase the police forces, turnover will probably provide several thousand job opportunities annually. It is estimated that an average of about 2,500 to 3,000 policemen will die or retire each year and replacements will be needed. Many vacancies will also occur because of promotions and transfers to other types of work.

Geographically, opportunities are widespread. All but the smallest communities will probably have a few openings each year. Most opportunities will be in big cities, where there are more policemen in proportion to population than in small cities, and the turnover is somewhat higher. Competition for the available jobs, however, is likely to be stiffer in large than in small communities.

**Earnings and Working Conditions**

Base starting salaries of city policemen in 1949 were generally over $2,500 a year, and are usually higher in the larger cities than in smaller communities. Earnings vary not only with the size of the community, but with the region of the country. Automatic pay raises are generally provided in most police departments. In large cities, the raises usually amount to $300 to $500 over a period of about 5 years; thereafter, advancement in earnings is almost always through advancement in rank only.

The most common work schedule for city police was 8 hours a day and 48 hours a week in 1949. However, there is a trend toward a 40-hour week; more than 50 cities had established the 40-hour week and the smaller cities are moving from a 54- to a 48-hour week. State police generally live in barracks, are on call 24 hours a day, and often work more than 72 hours a week. Policemen have unusually secure jobs and stable earnings, paid vacations, better-than-average retirement pensions, and other benefits.

**Where To Go for More Information**

Information on employment opportunities and requirements in a particular locality may be obtained from the chief of police or personnel officer of the local police department, or from a local civil service commission. Inquiries with regard to opportunities in the Metropolitan Police Force of Washington, D. C., should be addressed to United States Civil Service Commission, Washington 25, D. C.

Women interested in police work should see the Outlook for Women in Police Work, Bulletin No.
Detectives

(D. O. T. 2–66.11)

Outlook Summary

Gradually rising employment for at least next 10 years. Detective positions practically always filled by promotion or transfer of uniformed policemen.

Nature of Work

Detectives are plainclothes men and women. The large majority are city employees, though many work for States and counties. Men are usually assigned to investigate crimes of a particular type, such as homicides, burglaries, robberies, illegal use and sale of narcotics, forgeries, illegal pawn shop activities, or pocket-picking. Women detectives—of whom there are very few—generally do crime prevention and detection work among women, young people, and children.

How To Enter

Detective positions are practically always filled by promotions or transfers of uniformed police. Both personal qualifications and length of service in uniform are considered in selecting personnel for detective positions. In many places, especially large cities, the positions are covered by a merit system based on written examinations. Some police departments have apprenticeship periods for new detectives, although many provide no introductory training.

Outlook

There will be many opportunities for appointment to detective jobs in the period from 1950 to 1960. In 1940 there were about 10,000 detectives in the fields covered by this statement. In the country as a whole, employment remained at about the prewar level until the end of the war and then began to rise as former employees returned from the armed services. The total number of detectives employed is now (1950) larger than ever before and will probably continue to increase. This will result partly from the trend toward a shorter workweek and also from the needs created by the greater emphasis on crime prevention and scientific detection. There will also be a few hundred openings each year to replace detectives who die or retire. However, as already indicated, practically all personnel will be obtained from the uniformed police forces.

Earnings and Working Conditions

Detectives usually have the same salary rates as uniformed men at the same grade levels. Their starting salaries are generally over $2,500 a year in most cities and are higher in large cities than in smaller communities. Detectives in some localities are allowed expense accounts for extra costs connected with their work.

Opportunities for advancement to higher grade positions are excellent for men with the needed experience, efficiency, and other qualifications.

Detectives have unusually steady employment and stable earnings, paid vacations, better-than-average retirement pensions, and other benefits.

See also Policemen, page 137; Federal Police and Detectives, page 139; and FBI Agents, page 141.

Federal Police and Detectives

(D. O. T. 2–66.99)

Outlook Summary

No large increase in employment expected but there will be some replacement openings.

Nature of Work

Police and detectives referred to in this statement are employed by the Bureau of Customs,
United States Secret Service, Bureau of Internal Revenue, and Bureau of Narcotics, all of which are in the United States Treasury Department; by the national defense agencies, and by some other Federal agencies. Excluded from the statement are FBI agents (see p. 141), ordinary building guards and watchmen, and unarmed investigators.

Some Federal police are uniformed; others are plainclothes men. Their duties depend on the agency where they are employed and their particular assignment. Some guard the borders and ports of the United States (Bureau of Customs, and Immigration and Naturalization Service); protect the President and President-elect and their families and property, and visiting foreign dignitaries (Secret Service), or guard Government property, especially military and naval establishments (Army and Navy Departments). Other groups enforce certain Federal laws—for example, those regarding counterfeiting (Secret Service), narcotic trade (Bureau of Narcotics), and tax collection (Intelligence and Alcohol Tax Units of the Bureau of Internal Revenue). The work often involves tracking down criminals and making arrests. Job titles include patrol inspector, customs agent, port patrol officer, secret service agent, special agent, patrolman, and narcotics agent.

How To Enter

All these positions are in the Federal Civil Service. Permanent appointments are made only from registers established on the basis of competitive examinations given by the United States Civil Service Commission.

To be admitted to examinations for agent positions in the Treasury Department, applicants must have some college training or experience in investigative work. Port patrol officers’ examinations and requirements are different from those for Treasury agents’ jobs, while customs agents are usually appointed from within the Bureau of Customs. Veterans are given 5 or 10 points preference in the grading of all examinations. Physical requirements are strict—more so for some kinds of jobs than others.

Newly hired employees receive on-the-job training, including classroom instruction, for periods varying from several weeks to about a year. Exhaustive background and character investigations are conducted on applicants prior to appointment.

Outlook

This is not a large field of employment. The Treasury Department has some 3,000 agents, and only a few more than that number are employed by all other agencies combined.

Altogether there probably will be a few hundred openings each year in the early fifties. Most of these will result from turnover, but it is likely that the stepping-up of defense preparations which began in mid-1950 will require some additional Federal police. Over the long run employment is expected to grow slowly.

Earnings

In 1949, the starting salary for some jobs was $3,100 a year for men without experience and about $4,600 a year for those with related experience. “Within-grade” pay increases are given at regular intervals, as in other Federal jobs. The maximum salary for Treasury agent classification was $5,350 a year. Opportunity for advancement to supervisory positions with still higher pay usually comes only after many years of experience.

Like government workers generally, these men have steady employment and stable earnings, paid vacations, sick leave, better-than-average retirement annuities, and other benefits.

Where To Go for More Information

Inquiries about examination should be made at regional offices of the United States Civil Service Commission or at any first- or second-class post office (except those in cities in which Civil Service regional offices are located). Notices regarding examinations are posted on bulletin boards in first- and second-class post offices and in other Federal buildings. Many newspapers publish items regarding examinations. The Commission has regional offices in the following cities:

- New York, N. Y. St. Louis, Mo.
- Atlanta, Ga. San Francisco, Calif.
- Cincinnati, Ohio Denver, Colo.
- Chicago, Ill. Dallas, Tex.

See also FBI Agents, page 141; Policemen, page 137; and Detectives, page 139.
PROTECTIVE SERVICE OCCUPATIONS

FBI Agents
(D. O. T. 2-66.99)

Outlook Summary

Number of agents will increase sharply in the early fifties but not nearly enough to provide positions for all job seekers. Applications are welcomed, especially from qualified veterans.

Nature of Work

FBI (Federal Bureau of Investigation) agents are plainclothes men. They investigate all types of violations of Federal law not specifically assigned to other agencies, including antitrust violations, bribery, fraud against the Government, bank robbery, kidnapping, white-slave traffic, motor-vehicle theft, espionage, and sabotage.

How To Enter

The FBI, part of the United States Department of Justice, hires its agents directly (not through the U. S. Civil Service Commission). Applicants must be (1) graduates from resident law schools and members of the bar in good standing; or (2) graduates of accounting schools and possess certified public accountant’s certificates. They must also be male citizens of the United States, between the ages of 25 and 40 years, and willing to serve anywhere in the United States or its Territories. Furthermore, they must be at least 5 feet 7 inches tall; have unimpaired hearing, excellent vision, and normal color perception; be capable of strenuous exertion; and have no physical defects which would prevent use of firearms or participation in dangerous assignments.

Written and oral examinations are given, covering law, accounting, and aptitude for meeting the public and conducting investigations. Exhaustive background and character investigations are conducted on applicants prior to appointment.

Outlook

In 1949, employment was about 4,000. Several thousand additional men will be needed in the next few years to combat the sharply increased crime rate, to handle security aspects of the stepped-up defense program undertaken in mid-1950, and to discharge the Bureau’s various other responsibilities. Turn-over, although small, should make some vacancies, and if prewar experience is any indication, the number of agents employed will rise in the long run. However, the number of interested applicants will probably far exceed the number of available jobs. The FBI nevertheless welcomes inquiries from applicants, particularly from qualified veterans, and interviews plus the opportunity to file applications are granted.

Earnings and Working Conditions

All agents start at $5,000 a year. Periodic “within-grade” pay increases are given, as in all Federal agencies. Opportunities for advancement to higher-grade positions are excellent for men with the needed experience, efficiency, and other qualifications. Top pay for regular field agents is $7,400 a year.

The basic workweek is 40 hours, but all agents are on call 24 hours a day, 7 days a week. Though assigned to one of the many FBI offices in different parts of the country, agents may be called upon at any time to handle jobs requiring travel outside their headquarters city. A subsistence allowance on a graduated scale from $9 to $7 a day is paid for work away from that city. Transportation of families and shipment of household effects are at Government expense on official transfers.

FBI men have paid vacations and sick leave, relatively secure employment and stable earnings, and annuities on retirement.

Where To Go for More Information

Additional information and application forms may be obtained by writing to:

Personnel Office, FBI,
Room 2266,
U. S. Department of Justice Building,
Washington 25, D. C.

See also Policemen, page 137; Detectives, page 139; and Federal Police and Detectives, page 139.
OTHER CLERICAL, SALES, AND SERVICE OCCUPATIONS

Secretaries, Stenographers, and Typists

(D. O. T. 1-33; 1-37,12, .14, .15, and .32)

Outlook Summary

Excellent employment prospects for well-trained secretaries and stenographers in at least the early fifties; good prospects for typists. Long-run employment trend upward.

Nature of Work

Typists’ work ranges from simple copying to reproducing complicated statistical tables and manuscripts. Most typists also have to do a variety of clerical work. Stenographers, besides typing, take dictation in shorthand; a small number use a stenotype machine. A few become specialists in foreign languages, legal or police work, or public or court stenography. Court reporters must be able to record difficult technical language at very high rates of speed for several hours at a time. Secretaries usually handle stenographic duties along with business details which do not need their employer’s personal attention. Some specialize in legal, medical, private, social, or other types of secretarial work.

Over 1,000,000 persons were employed in these occupations in 1940. The number has increased greatly since that time. The great majority of the workers (94 percent in 1940) are women. Nevertheless, a good many men are employed in this field (about 69,000 in 1940). Men are often preferred for stenographic jobs with finance, insurance, real-estate companies, and in transportation industries. Court stenographers are usually men, although some women stenotypists are employed.

How To Enter

Completion of a business course in high school, junior college, or business school is usually preferred for entrance into these occupations. Additional training in colleges with departments designed specifically for training in business subjects is desirable. Typists need good training not only in typing but in spelling, vocabulary, punctuation, grammar, and correspondence procedures; stenographers must also be able to take dictation quickly and accurately. Ability to use other office machines is helpful for many jobs. The better-paid positions often require a knowledge of the fundamentals and terminology of a particular field, such as law, medicine, engineering, or foreign languages.

Starting out as a typist, a person with ability and additional training may advance to a stenographic job; stenographers may advance to secretarial and administrative assistant positions. Specialized knowledge of the particular industry or business is most helpful for advancement.

Outlook

Employment opportunities for well-trained secretaries and stenographers are expected to be excellent in the early fifties at least. Prospects for typists are generally good, although opportunities vary from one local area to another. There was a shortage of secretaries and stenographers at the beginning of 1950 in most localities, despite the fact that increasing numbers of young people have completed courses in junior colleges, specialized schools, or high schools since World War II. The high demand for stenographers has been due largely to continuing business prosperity and to the high rate of turn-over in the occupation. The defense mobilization program will provide even more employment opportunities. Typists are not in as much demand as stenographers, since employers prefer workers with more than one skill to offer; also the number of typists seeking to enter the field each year will continue to be greater than the number of new stenographers and secretaries because of the comparatively low training requirements for typists. However, a large increase in defense activities and in Government employment will create a shortage of workers in this field also.
In the long run, employment will probably tend to rise slowly. In addition, high turn-over rates, usual in occupations where young women predominate, will continue to create many job openings. Since these workers are needed in every industry, business, and profession, they are likely to be less seriously affected by declines in economic activity than those in occupations found in only one industry. Well-trained stenographers and secretaries have a better chance of holding their jobs than typists.

Jobs will be found in most sections of the country, in small towns as well as large cities. The greatest number of openings, but also keenest competition for jobs, will be in large industrial and population centers. About three-fifths of the workers in 1940 were employed in eight States: New York, Illinois, Pennsylvania, California, Ohio, New Jersey, Massachusetts, and Michigan.

**Earnings and Working Conditions**

According to a survey of office workers in 17 large cities, average weekly salaries of women workers in the first half of 1949 were as follows:

<table>
<thead>
<tr>
<th>City</th>
<th>Stenographers</th>
<th>Typists</th>
<th>Clerk-typists</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Technical</td>
<td>General</td>
<td>Class A</td>
</tr>
<tr>
<td>Atlanta</td>
<td>$45.00</td>
<td>$33.00</td>
<td>$34.50</td>
</tr>
<tr>
<td>Boston</td>
<td>47.00</td>
<td>39.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Chicago</td>
<td>54.00</td>
<td>47.50</td>
<td>45.50</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>(1)</td>
<td>41.00</td>
<td>38.50</td>
</tr>
<tr>
<td>Cleveland</td>
<td>52.50</td>
<td>46.00</td>
<td>43.50</td>
</tr>
<tr>
<td>Dallas</td>
<td>52.50</td>
<td>44.50</td>
<td>38.50</td>
</tr>
<tr>
<td>Hartford</td>
<td>54.50</td>
<td>42.00</td>
<td>35.50</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>56.00</td>
<td>46.00</td>
<td>41.50</td>
</tr>
<tr>
<td>Minneapolis-St. Paul</td>
<td>46.00</td>
<td>39.00</td>
<td>33.50</td>
</tr>
<tr>
<td>New Orleans</td>
<td>52.00</td>
<td>39.00</td>
<td>36.50</td>
</tr>
<tr>
<td>New York</td>
<td>52.50</td>
<td>41.50</td>
<td>36.50</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>46.50</td>
<td>40.50</td>
<td>33.50</td>
</tr>
<tr>
<td>Portland, Oreg.</td>
<td>(1)</td>
<td>44.50</td>
<td>43.50</td>
</tr>
<tr>
<td>Richmond, Va.</td>
<td>(1)</td>
<td>42.50</td>
<td>39.50</td>
</tr>
<tr>
<td>St. Louis</td>
<td>44.50</td>
<td>40.50</td>
<td>34.50</td>
</tr>
<tr>
<td>Seattle</td>
<td>55.50</td>
<td>47.00</td>
<td>43.00</td>
</tr>
<tr>
<td>Washington, D. C.</td>
<td>51.50</td>
<td>48.50</td>
<td>44.50</td>
</tr>
</tbody>
</table>

1 Insufficient data to justify presentation of an average.

In the Federal civil service, typists had an annual starting salary of $2,200 or $2,450 in early 1950; stenographers started at $2,450. Stenographers may advance to secretarial and administrative assistant jobs, which pay higher salaries. Court stenographers in the Federal service began at $3,450. State and local governments generally have somewhat lower salary scales than the Federal Government.

The most usual work schedule for office workers in the 17 cities surveyed in 1949 was 5 days a week and 40 hours or less. Those in finance, insurance, and real estate offices most frequently worked 37 1/2 hours a week. Practically all office workers with a year's service received 2 weeks' vacation. The majority of offices had no formal provisions for sick leave.

**Where To Go for Further Information**

Information on training is available from:

- United Business Education Association, (A department of the National Education Association,) 1201 16th St., NW., Washington 6, D. C.

Information on private business schools may be obtained from:

- National Council of Business Schools, 2601 16th St., NW., Washington 9, D. C.


Information on Government jobs may be obtained from State or municipal civil service authorities or the United States Civil Service Commission, Washington 25, D. C.

Notices of civil service jobs and examinations are frequently posted in local post offices.
Outlook Summary

Many openings in early fifties, resulting primarily from high rate of turn-over. Some increase in number of bookkeeping positions over long run.

Nature of Work

Jobs in bookkeeping range from entry positions as clerk or machine operator to head bookkeeper. Bookkeeping clerks perform routine tasks such as recording and posting items by hand; in small businesses, they may also perform related duties such as typing, filing, answering the telephone, and mailing statements. Bookkeeping-machine operators may use relatively simple machines to record only one type of data or may operate complicated machines that record a great variety of information.

General bookkeepers keep complete and systematic sets of records of their employers' business transactions, recording items in proper journals and on special forms, posting ledgers, balancing books, and compiling reports. In large establishments which employ many office workers, a bookkeeper may be assigned to work with one phase or section of a complete set of records, as accounts payable or accounts receivable. The head bookkeeper in a large office has full responsibility for his department.

Training

Most employers require graduation from a high school, business or vocational school, or junior college. Many employers, however, prefer not to hire college-trained persons for routine bookkeeping jobs. A business course which includes training in many office functions such as typing, shorthand, and use of various office machines, as well as bookkeeping procedures, will usually be of greatest value in obtaining a job in this field, particularly in a small office. Head bookkeepers usually qualify either by education in accounting or extensive experience.

Where Employed

Bookkeepers are employed in all industries, with by far the greatest number in wholesale and retail trade. Many employment opportunities are found with banks, insurance companies, railroads, and utility companies.

Outlook

A considerable number of openings in bookkeeping jobs in the early fifties will result chiefly from the high rate of turn-over in this large occupation. More than 700,000 workers were employed in bookkeeping jobs in 1949. A large proportion of these positions are filled by young women, many of whom leave their jobs after a few years, thus creating openings for new employees.

There is a trend, especially in large offices, toward breaking down bookkeeping functions into office-machine operator and other routine clerical jobs; the vast majority of openings in the bookkeeping field will be of this nature. There are usually plenty of people in the labor market with the qualifications needed for such positions. However, the comparatively low salaries offered limit the number of applicants when other jobs are available. During a period of rapid expansion of defense production a shortage of applicants for routine bookkeeping jobs may develop. Openings for bookkeepers who are required to assume responsibility for a complete set of books will probably continue to be few, and will generally be filled by promotion from within or by those with accounting training or experience.

Over the long run, the need for bookkeepers will probably tend to increase because the growth of scientific management in industry, complex tax systems, and the general complexities of the economy necessitate more record keeping. However, the demand for bookkeepers at any given time depends mainly on the level of business activity and the number of individual businesses.

Earnings and Working Conditions

Average weekly earnings of men employed as bookkeepers ranged from $53 to $70 in 17
large cities, according to a survey of office workers' salaries in the first half of 1949. In nearly all cities, hand bookkeepers received higher pay than workers in any other office occupation; women bookkeepers averaged somewhat less than men ($45 to $62). The average weekly salaries of women hand bookkeepers and of bookkeeping-machine operators in the cities surveyed are shown below:

<table>
<thead>
<tr>
<th>City</th>
<th>Hand bookkeepers</th>
<th>Bookkeeping-machine operators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class A</td>
<td>Class B</td>
</tr>
<tr>
<td>Atlanta</td>
<td>$50.00</td>
<td>$43.50</td>
</tr>
<tr>
<td>Boston</td>
<td>47.50</td>
<td>47.50</td>
</tr>
<tr>
<td>Chicago</td>
<td>55.50</td>
<td>50.50</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>56.00</td>
<td>48.50</td>
</tr>
<tr>
<td>Cleveland</td>
<td>56.50</td>
<td>50.00</td>
</tr>
<tr>
<td>Dallas</td>
<td>46.50</td>
<td>46.50</td>
</tr>
<tr>
<td>Hartford</td>
<td>51.00</td>
<td>43.50</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>62.50</td>
<td>54.00</td>
</tr>
<tr>
<td>Minneapolis-St. Paul</td>
<td>43.00</td>
<td>47.50</td>
</tr>
<tr>
<td>New Orleans</td>
<td>48.50</td>
<td>38.50</td>
</tr>
<tr>
<td>New York</td>
<td>60.00</td>
<td>50.50</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>49.50</td>
<td>44.50</td>
</tr>
<tr>
<td>Portland, Oreg</td>
<td>60.00</td>
<td>49.00</td>
</tr>
<tr>
<td>Richmond, Va</td>
<td>50.50</td>
<td>41.00</td>
</tr>
<tr>
<td>St. Louis</td>
<td>46.00</td>
<td>47.50</td>
</tr>
<tr>
<td>Seattle</td>
<td>55.50</td>
<td>49.00</td>
</tr>
<tr>
<td>Washington, D. C.</td>
<td>59.50</td>
<td>43.50</td>
</tr>
</tbody>
</table>

The most usual work schedule for office workers in the cities surveyed was 5 days and 40 hours or less a week. Workers in finance, insurance and real estate offices were generally on a 37 1/2-hour week. Practically all employees in the study received 2-weeks' vacation after a year's service. The majority were in establishments that did not have formal provisions for paid sick leave. Many were covered by insurance and pension plans paid for in whole or in part by employers.

**Where To Go for Additional Information**

Information on training is available from:
- United Business Education Association, (A department of the National Education Association) 1201 16th St., NW.
- Washington 6, D. C.

Information on private business schools may be obtained from:
- National Council of Business Schools, 2601 16th St., NW.
- Washington 9, D. C.


**Automobile Parts Salesmen**

**(D. O. T. 1-75.22)**

**Outlook Summary**

Many openings for trainees in stock clerk jobs with automobile dealers and parts jobbers during the early fifties. Retail parts and accessories stores will also hire and train many new salesmen to fill vacancies caused by turn-over. Longer run trend of employment slowly upward.

**Nature of Work**

There are more than 50,000 automobile parts salesmen in the country. Most of them work for automobile dealers and parts jobbers. A large proportion are also employed in retail auto parts and accessory stores. The occupation includes both counter and outside salesmen, the former
being the larger group. For either type of job, a knowledge of several thousand automotive parts, often for various makes of cars, is necessary. Salesmen must identify parts, using micrometers, calipers, and other measuring instruments when necessary. They fill orders, quote prices, and give other information using catalogs as a source. Some jobs involve examining faulty parts to determine what has to be replaced. In the retail stores a bigger part of the job is selling accessories, and often many items unrelated to automobiles are handled, such as electrical appliances and sporting goods.

Outside salesmen call on such places as auto repair shops, service stations, or retail stores, which sell auto parts and accessories. They usually cover a set territory ranging in size from sections of a large city to several States. Where the sales territory is large a salesman may often have to travel for a week or more at a time. Definite sales ability is necessary for this type of work, and it is usually the more successful countermen who become outside salesmen. A car is generally necessary, but in some cases may be furnished by the company.

**How To Enter**

Men usually enter this field as stock or receiving clerks. Those employed by automobile dealers or parts jobbers usually work several months before becoming junior countermen, and it may take as long as 2 years more to become a fully qualified counter salesman. Outside salesmen must have had some experience as counter salesmen. A few employers have established 3-year training programs with provisions for spending a definite amount of time in each department. In many stores, particularly those selling accessories as well as parts, it takes much less time to learn the job. A qualified and aggressive salesman can often work himself up to store manager in about 5 years with future possibilities of becoming a district manager or eventually a high executive in the company. In these more responsible jobs, sales and managerial ability are extremely important.

**Outlook**

Many men who are mechanically inclined and have some sales ability will find jobs as stock or receiving clerks in the early fifties. Turn-over will be the most important source of jobs. Large numbers of persons in the occupation will turn to other fields of work or move up to more responsible positions in their firms, and a few will go into business for themselves. Openings will also arise as workers die, retire, or are drafted.

A large volume of auto parts will be sold in the fifties. There were about 35 million passenger cars registered in mid-1950, 18 million of which were manufactured before World War II. Because this large and still growing number of cars will need a great many repair parts, employment will remain at a high level. If defense preparations make it necessary to curtail automobile production, the volume of parts sold will tend to increase. Employment of parts salesmen would not rise correspondingly, however, since many companies could handle a greater volume of parts without increasing their sales forces.

Jobs are to be found in all parts of the country, in small towns as well as in large cities. The greatest number of jobs are in States with the highest number of motor vehicles—California, New York, Pennsylvania, Ohio, Illinois, Texas, Michigan, and New Jersey.

**Earnings**

Countermen are usually paid on an hourly basis, outside salesmen on a salary. The general method of payment is a basic guaranteed rate plus some
OTHER CLERICAL, SALES, AND SERVICE OCCUPATIONS

...type of commission or bonus. The size of the shop and its location have a great influence on earnings. According to a survey of franchised auto parts dealers in the larger cities, the base pay of parts salesmen in early 1949 ranged from $1,800 to $3,600 a year in firms employing a total of 20 to 49 people; and from $2,100 to $4,200 for firms with 50 to 99 employees; in all instances there were additional commissions or bonuses. Yearly earnings of outside salesmen in some of the large cities in mid-1949 were approximately $5,000 to $7,000, with some earning considerably more.

Where To Find Out More About This Occupation

National Standard Parts Association,
8 S. Michigan Ave.,
Chicago 3, Ill.
Motor and Equipment Wholesalers Association,
300 W. Jackson Blvd.,
Chicago 6, Ill.

Service Station Attendants, Managers, and Owners
(D. O. T. 0-72.12 and 7-60.500)

Outlook Summary

Job openings expected to be quite numerous in early fifties mainly because of the high turn-over in this field. Opportunities for going into business will be more limited, however.

Nature of Work

Attendants work in service stations owned or controlled by oil companies and in independent stations. They have a variety of duties—supplying passenger cars, trucks, and busses with gasoline, oil, water, and air; changing oil and doing lubrication jobs; installing accessories; changing tires and repairing inner tubes. Since service stations generally have many supplies for sale—for example, batteries, spark plugs, light bulbs, and tires—selling these makes up an important part of the attendant's duties.

Short training programs are conducted by many oil companies for employed attendants and managers, operators (who lease a station, usually from an oil company), or owners. Except in some very large stations, managers, operators, and owners perform many or all of the duties of attendants, in addition to buying supplies, supervising their employees, and handling other business duties. The most common method of going into business in this field is to lease a station from an oil company. Previous experience as an attendant is highly desirable.

There were about 190,000 service stations in operation in late 1949, employing roughly 200,000 attendants and 180,000 managers, operators, and owners. The greatest number of stations were in States having the most motor vehicles—California, New York, Pennsylvania, Ohio, Illinois, Texas, Michigan, and New Jersey.

Outlook

Thousands of young men will find openings in service stations during the early fifties. Most of the men in this occupation are young and there is always a great deal of turn-over. In the next several years turn-over will be higher than during the 1945-49 period, because jobs will be easier to get in many other lines of work and because of the draft. Employment in this occupation may decline if defense preparations make it necessary to restrict the use of gasoline. Even in this event, there would still be many openings arising through turn-over.

Opportunities for purchasing or leasing a new service station will be limited in the early fifties, but there will continue to be many chances to buy stations already operating. A considerable number of stations were available immediately after the war, but these were quickly taken over by veterans and other people interested in the business. Stations selling the most popular brands of gasoline will probably continue to be the hardest to get. The best locations for new stations in the early fifties will probably be in the vicinity of newly developed residential areas. The minimum amount of capital needed to buy or build a station ranged between $3,000 and $5,000 in late 1949, depending upon the size and location of the station.

Wages and Working Conditions

Wages in mid-1949 were almost double what they were before the war. The average attend-
Barbers

(D. O. T. 2-32.01)

Outlook Summary

Thousands of openings each year in the early fifties to replace barbers who leave the occupation. Gradual increase in employment in the long run.

Nature of Work

Barbers provide a variety of personal services, such as haircuts, shaves, shampoos, scalp treatments, and facial massages. In the beginning of 1949 there were an estimated quarter of a million barbers working in about 125,000 barber shops. A large proportion of them were self-employed.

Training and Advancement

The most frequent method of entering the occupation is by taking a trade course in a public vocational school or a 6- to 9-month course in a commercial barbers' college. Graduates of such courses must usually serve 18 months as apprentices (or learners) before qualifying as journeymen. Apprentices must meet minimum-age requirements (generally 16 or 18 years); must, as a rule, have a grade-school education or its equivalent; and must be able to pass health examinations. In all States except Virginia, both apprentices and master barbers must have licenses.

Experienced barbers can advance by going into shops where customers spend more money on such services as facial massages, shampoos, and scalp treatments, or by opening their own shops. In some shops which are not managed by the owner, there is opportunity for promotion to manager. The majority of barbers are self-employed.

Outlook

Because this is such a large occupation, thousands of newcomers enter it every year. Employment is expected to remain near 1949 levels, so that most openings for new workers will be to replace barbers who leave the trade because of death, retirement, changing to other jobs, or for military service. These drop-outs should create thousands of vacancies each year. Many men were attracted to the trade by the early postwar shortage of barbers. As a result there was fairly stiff competition for beginners' jobs by late 1949. In the early fifties, however, increasing turnover in the trade probably will bring about an increasing number of openings. In the long run, a gradual increase in employment is expected, owing mostly to growth in the population.

Earnings and Working Conditions

Most barbers are paid a fixed basic salary plus a commission, although some receive only a straight salary and others are completely on a commission basis. Typical union contracts for many large cities in late 1949 provided for a minimum of $35 to $40 a week, or 60 to 70 percent of the barber's gross take, whichever is greater. In New York City, the minimum was $44 a week. Tips usually form a considerable addition to the barber's take-home pay. The earnings of indi-
individual workers vary, depending on such factors as the type and location of the shop, the custom of the community regarding tips, as well as the skill and personality of the particular operator. Earnings tend to increase as the barber establishes a personal following. Self-employed men also tend to earn more. The employee usually pays for his uniforms, razors, combs, and scissors.

Hours are long; 46 to 48 is the maximum according to most union contracts. Workers receive a 1-week paid vacation after a year's service in a number of shops; some union contracts provide for 2 weeks vacation. Insurance benefits are also included in many of these contracts.

Organized barbers belong to the following unions: Journeymen Barbers, Hairdressers, and Cosmetologists International Union of America, AFL, and the Barbers and Beauty Culturists Union of America, CIO. Those who are shop owners or managers may belong to the Associated Master Barbers and Beauticians of America.

Where To Go for More Information

For the licensing requirements in the particular State where one would like to work, it is advisable to write directly to that State licensing board. The following organizations can provide additional information on such subjects as earnings, working conditions, training requirements, and job opportunities:

- Barbers and Beauty Culturists Union of America, CIO,
  330 Flatbush Ave.,
  Brooklyn 17, N. Y.
- Journeymen Barbers, Hairdressers, and Cosmetologists International Union of America, AFL,
  12th and Delaware Sts.,
  Indianapolis 7, Ind.
- National Education Council,
  Associated Master Barbers and Beauticians of America,
  537 S. Dearborn St.,
  Chicago 3, Ill.

Beauty Operators

(See D. O. T. 2-32.11—.14, .21, .22, .31)

Outlook Summary

Opportunities for inexperienced persons somewhat limited in the early fifties, but turn-over will create thousands of openings each year. Gradual increase in employment in the long run.

Nature of Work.

The majority of workers are all-round operators who give a variety of services such as shampoos, haircuts, hair setting, permanent waves, hair dyeing, face and scalp treatments, and manicures. There are, however, some less skilled operators who can do manicuring only. In the larger shops, some operators with all-round training may specialize in such services as electrolysis, hair styling, permanent waving, hair dyeing, or facials. The few men in the occupation are mainly stylists specializing in hair cutting, setting, and permanent waving. Many operators are self-employed.

There were approximately 125,000 beauty shops in operation at the beginning of 1949, employing over 300,000 operators, including owners, managers, and specialists such as manicurists and electrologists. Only a small percentage of these workers were men.

Training and Advancement

As of the end of 1949, there were licensing requirements in all States except Delaware and Virginia. To qualify for licenses, operators must meet the requirements of the State in which they expect to work. There is a great deal of variation, but these requirements generally include passing a health examination, being at least 16 or 18 years of age, having at least a grade school or, in some cases a high school education, and the completion of an approved training course. In late 1949, the required amount of training varied from 1,000 to 1,800 hours and more. There were some indications that the minimum might be raised to 1,500 hours and an applicant would do well to get at least that much training. Prospective beauty operators usually meet these requirements by taking a 6- or 8-month course in beauty culture in a commercial beauty school or a trade course in a public vocational school. In the District of Co-
lumbia and the 46 States which require licensing, there were in late 1949 about 1,100 schools offering beauty culture courses approved by the State examining boards. There are schools in every State, in both small towns and large cities. Learning on the job is not common, although some States accept this kind of training in lieu of trade school courses.

After completing a beauty course and obtaining a license, an operator ordinarily starts out in a small neighborhood shop, although especially skillful girls are sometimes able to go directly into higher-grade shops. Licensed operators are sometimes hired by large cosmetic manufacturers, and then are given special beauty courses at the company’s training centers. Occasionally, some of the more competent beauty operators may become instructors in schools of beauty culture or inspectors for State licensing boards.

Experienced operators may advance by moving to a better shop or by becoming specialists. Only the exceptionally good operator can earn more as a specialist, however. A few operators, employed in large salons, may be promoted to positions as managers. Many operators with enough skill, business ability, and capital have successfully opened their own shops.

**Outlook**

Beauty operators just out of school may have a hard time finding job openings in the early fifties. Experienced people will be preferred over inexperienced workers because beauty shop owners rarely can spare the time to train new workers. No increase in total employment is foreseen during this period, so that what openings occur will come from turn-over. Turn-over will create many thousands of job opportunities in the early fifties, since this is an occupation composed primarily of young women, who frequently work a few years and then leave to get married, raise families, or take other jobs. However, it is likely that there will be more than enough newcomers in the next few years to meet all replacement needs.

In the long run, employment in this field is likely to show a very gradual upward trend, since population is expected to grow and there is a general tendency for an increasing proportion of women to patronize beauty shops.

**Earnings and Working Conditions**

Earnings are influenced by length of experience, personality, ability, and clientele of the operator, as well as by type of shop, its location, and popularity. Therefore, earnings vary widely. Most operators receive a basic guaranteed wage, plus a commission on their sales. Tips also add a considerable amount to their take-home pay. Basic union rates in New York City in late 1949 ranged from $35 to $60 a week; in other cities basic rates are somewhat lower.

Before an operator earns a commission, she must usually have sales amounting to twice the basic guaranteed wage. Then 40 to 50 percent of the total gross take above that amount is given to her as a commission. This is known in the trade as “40 percent (or 50 percent) over double.” According to a survey of beauty salons in department stores in 175 different localities, the average beauty operator in early 1949 earned between $40 and $45 a week, exclusive of tips. Operators in neighborhood shops would have slightly lower total earnings. Manicurists generally earn less than all-round operators. In States where there are minimum wage laws covering this work, the minimum rates in effect in mid-1949 ranged from $17 to $30 a week. Beginners just out of school would be most affected by these regulations. The total amount of money earned from tips was much less in late 1949 than 2 or 3 years earlier, because the volume of work had fallen off; individual tips still remained about the same, however.

The general workweek in this occupation in late 1949 was 40 to 44 hours; some union shops worked 39 hours. The 5-day week is becoming more popular. However, a considerable number of operators, especially in the small shops, have much longer hours. Some shops give 1 week’s vacation with pay; a few 2 weeks. Unionization has been increasing in this field, especially in the big cities in the East. The two unions organizing beauty operators are: Barbers and Beauty Culturists Union of America, CIO, and the Journeymen Barbers, Hairdressers and Cosmetologists International Union of America, AFL.

**Where To Go for More Information**

For information on the specific licensing requirements in the States where one intends to
work, it is advisable to write to that particular State Board of Beauty Culture.

The following organizations may be helpful in supplying information on such topics as job opportunities, training requirements, and working conditions:

Barbers and Beauty Culturists Union of America,
CIO,
230 Flatbush Ave.,
Brooklyn 17, N. Y.

Journeymen Barbers, Hairdressers and Cosmetologists, International Union of America, AFL,
12th and Delaware Sts.,
Indianapolis 7, Ind.

National Council of Boards of Beauty Culture,
17 N. State St.,
Chicago 2, Ill.

Barbers and Beauty Culturists Union of America,
CIO,
330 Flatbush Ave.,
Brooklyn 17, N. Y.

Journeymen Barbers, Hairdressers and Cosmetologists, International Union of America, AFL,
12th and Delaware Sts.,
Indianapolis 7, Ind.

National Council of Boards of Beauty Culture,
17 N. State St.,
Chicago 2, Ill.

To people interested in opening a beauty shop of their own, the following pamphlet will be helpful:


Hospital Attendants

Outlook Summary

Good employment opportunities in early fifties. The need in the future will considerably exceed that of the years before World War II.

Nature of Work

Hospital attendants assist the nursing staff in hospitals by performing routine or less skilled tasks in the care of patients. Such services usually include dressing patients, answering call bells, making beds, serving food, assisting the patient in walking, giving alcohol rubs, and possibly cleaning rooms and equipment. There is a trend toward standardizing their training and duties. Many are employed in hospitals for mental patients.

Training and Other Qualifications

Preparation for practice varies considerably. Many persons qualify for jobs as attendants through experience only and obtain jobs without being licensed. Veterans trained in such work in the Army or Navy will qualify for most jobs as attendants in hospitals. Two years of high school are preferred, though not required, for entrance to an approved course for training attendants. About half the States have made provision for voluntary licensing and requirements vary, but usually call for graduation from an approved course of 9 to 18 months, or the passing of an examination. In 1948, there were nearly 142,000 attendants and practical nurses and almost 36,000 orderlies in approved hospitals in the United States. Of this number, over half were men. They worked for the most part in veterans’ hospitals or hospital departments in which all the patients were men, and frequently mentally ill.

Outlook

Employment outlook for the trained hospital attendant is good for the early fifties. The most desirable jobs will go to those with approved training, as the trend is toward licensing to protect both patients and qualified personnel. Schools trained very few attendants during World War II, and poorly qualified persons often obtained jobs. Attendants trained in special courses such as those given by the Army and Navy should have no difficulty in obtaining employment either in veterans’ or in other hospitals. The Federal Civil Service restricts positions as hospital attendants to veterans so long as such applicants are available.

1 Prepared by the Women’s Bureau, U. S. Department of Labor.
There is a growing tendency toward the use of attendants to assist the professional nurse. As new treatments are developed, more assistants are required to aid the nurse or physician during the treatment and also with the preparation of the patient for it. Trained attendants or assistants usually are needed for such special purposes as, for example, in the application of hot moist packs under the Kenny treatment for poliomyelitis. World War II greatly increased the number of veterans who will require long-time hospitalization and the services of attendants. The partial mobilization which began in mid-1950 is expected to accelerate the demand in military and veterans’ hospitals. The increasing hospitalization of those suffering from mental or nervous conditions adds to the demand for trained attendants in mental institutions, as does the growing hospitalization of tuberculous and other patients with chronic illnesses. There is a growing trend toward merging the hospital attendant and practical nurse groups so that basic training and requirements for licensing will be similar.

**Earnings**

The basic annual beginning salary for hospital attendant jobs under civil service in late 1949 was $2,200. Hospital attendants not qualified as practical nurses were included among the untrained men and women hospital employees whose average gross annual earnings in 1947 were reported by the American Hospital Association as being $1,476 and $1,284 respectively.

**Where To Go for More Information**

Additional information on the outlook for women as hospital attendants is given in the following publication:


Information may also be obtained from:

American Hospital Association,
18 E. Division St.,
Chicago, Ill.

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**Practical Nurses**

(D. O. T. 2-38.20)

**Outlook Summary**

Very good employment opportunities in fifties and in near future, particularly for those with training. It will become increasingly difficult for those without training to obtain the most desirable employment.

**Nature of Work and Where Employed**

Practical nurses work in institutions, as visiting nurses with visiting nurse associations, and in homes. They work under the general direction of a licensed physician or the supervision of a registered professional nurse. They perform nursing duties and housekeeping duties as needed.

**Training and Other Qualifications**

Preparation for practice varies considerably. For applicants under 25 years of age, 2 years of high school are usually required for entrance to an approved course for training nurses; for older applicants, graduation from elementary school is acceptable. Courses are often available in public vocational schools and in many hospitals requiring no tuition fee. In the 84 approved schools of practical nursing, located in 20 States, tuition ranged up to $175 in 1947. Hospital experience is required as part of the training. Full maintenance is generally provided by the hospital and a stipend for service is accepted practice.

 Licensing of practical nurses is recommended by the American Nurses Association, but there was mandatory legislation of this kind in 1949 only in New York, Arkansas, Louisiana, and Hawaii. Twenty-five additional States have made provision for licensing. Requirements for licensure vary but usually call for graduation from an approved school where courses are 9 to 18 months in length, and the passing of an examination covering such subjects as care of children and of the aged, care of convalescents, care of medical and surgical patients, care of the mentally ill, dietetics and food preparation, hygiene, elementary anatomy, and

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1 Prepared by the Women's Bureau, U. S. Department of Labor.
nursing methods. In States with permissive licensure laws, those licensed are given preference.

Outlook

In 1948 there were nearly 142,000 practical nurses and attendants employed in approved hospitals in the United States in addition to almost 36,000 orderlies. About 150,000 are believed to be employed in private homes or by visiting nurse associations. More than half the hospital group are men whereas more than 95 percent of the non-institutional group are women. The employment outlook for both groups is good. Because of a slowly growing insistence on licensing it will become increasingly difficult for those without training to obtain the most desirable employment. During World War II, the needs of hospitals, public-health agencies, and industry, as well as an increased number of patients cared for at home, created a demand for practical nurses which was far greater than the supply. This demand will continue because of the increasing use of hospital facilities brought on by the partial mobilization which began in mid-1950, other Government programs, insurance, and preventive medicine.

The trained practical nurse performs many of the functions formerly performed by the professional nurse, such as the taking of temperatures and the giving of certain routine treatments. Earlier discharge of patients from hospitals after surgery or childbirth lengthens the convalescent period at home during which some nursing is required. Visiting nurse service and practical nursing at home will continue in high demand because of the increased number of chronically ill persons—the result of the larger proportion of older people in the population.

Earnings and Hours of Work

Salaries vary greatly according to the place of employment, the hours worked, the amount of responsibility assumed and general economic conditions. During the depression period many practical nurses worked for wages amounting to little more than subsistence. On the other hand, during the war some practical nurses in communities where the shortage was critical earned as much or more than some professional nurses. In some States, practical nurses and professional nurses have agreed that 75 percent of the usual professional nurse's salary is an acceptable salary for the practical nurse in any given area in the State. In 1947, the graduate of an approved school of practical nursing might earn as much as $7 to $11 a day (without maintenance). The average gross monthly beginning earnings for practical nurses in hospitals in 1947 were $132.

Resident duty hours vary from 8 to 20 a day. In hospitals, 8 hours is often the rule, but there is wide variation of schedules and hours. Practical nurses in hospitals averaged a 47-hour workweek in 1947.

Where To Go for More Information

Additional information on the outlook for women as practical nurses is given in the following publication:


Information may also be obtained from:

National Association for Practical Nurse Education, Suite 407,
654 Madison Ave.,
New York 21, N. Y.

National Federation of Licensed Practical Nurses, Inc.,
Suite 1018,
250 W. 57th St.,
New York 19, N. Y.
Trades and Industrial Occupations

The trades and industrial occupations—skilled, semiskilled, and unskilled—are the largest of the broad groupings of fields of work. They offer employment to 4 out of 10 workers in the United States today. These workers are of prime importance to the economy because they are the men and women who produce the goods; they mine the coal and ore, run the railroads, build the houses, bake the bread, make the clothes, and keep our mechanical civilization in running order.

To the many young people whose interests and abilities lie in the mechanical or manual spheres, the trades and industrial occupations offer the bulk of employment opportunities. Within this area is offered a wide range of occupations varying in skill and earnings from the tool and die maker to the unskilled laborer.

While most of the jobs fall clearly into either the skilled, semiskilled or unskilled groups, distinctions cannot always be finely drawn. This is particularly true because the nature of the work in the occupations often changes as new machines or methods are introduced. Thus some of the types of work formerly done by all-round craftsmen are now broken down into several different steps, each requiring a shorter period of training than was originally demanded of the craftsman. These are usually classified as semiskilled occupations, but in some cases the skilled designation has been kept. In the same way it is often difficult to distinguish between unskilled occupations and the simpler machine-tending jobs in the semiskilled group.

For practical purposes in guidance, information on the outlook in each of the various unskilled and semiskilled occupations is not of major importance. For the most part a worker can move fairly easily from one to another, since training for most semiskilled occupations is given on the job in a few weeks or months at the most. To qualify for a skilled occupation, on the other hand, requires either a formal apprenticeship or a long period of experience and training in semiskilled jobs which gives the worker a chance to learn all the different phases of the craft.

The introduction of machinery and new, efficient processes over the last two centuries has slowly changed the relationship of the skilled, semiskilled, and unskilled occupations. In the old days the all-round craftsman, who made the entire product, and the unskilled laborer were the predominant occupations. As machinery came in and the process was broken down into a number of steps, each handled by a different worker, the semiskilled group gained in importance at the expense of both skilled and unskilled workers. In recent years the semiskilled have increased rapidly, the skilled have just about held their own, and the unskilled have declined. It has been easier to devise machines to do the lifting, carrying, digging, and other jobs in the province of the unskilled laborer than to find mechanical substitutes for the craftsman.

The reports on these occupations are grouped by industry or field of work, rather than by level of skill, since from the point of view of practical guidance that is the most useful grouping. The occupations which are found in a wide variety of industries or in industries for which an entire chapter has not been prepared are included in this section of the handbook. The great majority of the trades and industrial occupations, however, are described in the section on “Some Major Industries and Their Occupations.”

SKILLED OCCUPATIONS

Skilled workers or craftsmen are a key group in our economy. They make the machines for our machine age, and the patterns, models, working samples, tools, dies, templates, or jigs without which industrial processes could not be carried out by semiskilled or unskilled workers. They keep things running, too, since they are the repairmen, not only for equipment used in industry but also for the large amount of mechanical equipment and appliances used by consumers—automobiles, household appliances, radios, and many other items.
MAJOR GROUPS OF SKILLED WORKERS

EMPLOYMENT, 1940

These functions suggest why the skilled occupations have continued to grow, and why they offer good employment opportunities to a large number of young people. Moreover, because so many skilled workers are older men, a large number of jobs will open each year as men in the field die or retire.

The relative importance of the various skilled groups has been changing. While the artisan has in some cases been displaced by semiskilled workers, the repairmen occupations have been growing as the amount of mechanical equipment in use increases. Chart 45 shows that the occupations which characteristically do repair work—the largest single one of which is automobile mechanic—are the second largest group of skilled workers, exceeded only by the building trades. Moreover a great many of the skilled workers in other fields do repair work as their major function; this is true, for example, of machinists, upholsterers, and plumbers, carpenters, and other building-trades workers.

The end of the decade of the thirties found the skilled occupations, many of which are in the construction and durable goods industries, severely hit by the depression. Fully 900,000 skilled workers—or 1 out of 7—were unemployed, and another 460,000 were employed in semiskilled, unskilled, and other occupations. In contrast to the situation in the professions, training of new workers in many skilled trades had slowed down to a trickle. Moreover, immigration laws adopted
in the twenties had cut off one of the major sources of the skilled labor supply. By 1940, half of the craftsmen employed were over 41 years of age, and relatively few young men were being trained in all-round skills.

War production required great numbers of skilled workers. Employment of craftsmen, foremen and kindred workers increased by over 2 million in the early years of World War II at the height of the factory and cantonment construction program, and then fell off somewhat, emphasis shifting to the metal trades as munitions production hit its peak (see chart 46). This rapid expansion of employment—at a time when many skilled men were being called to the Armed Forces—is remarkable in view of the long period required to train craftsmen. It was made possible by recruitment from among the 1,360,000 skilled workers who were unemployed or engaged in other occupations in 1940, by temporary upgrading to craft or foreman jobs of semiskilled and other workers who already had partial training or qualifying experience, and to some slight extent by expansion of apprentice training in the metal trades beginning at the start of the lend-lease program. As a result, many of those employed in skilled occupations during the war did not have a fully rounded background in their craft. In some crafts such as tool and die maker and machinist, it was simply not possible to expand employment so rapidly and many men in these trades worked extraordinarily long hours during the war.

Recruitment of skilled workers for war industries was also facilitated by the movement of craftsmen from other industries. Employment of automobile mechanics dropped by about 150,000 during the war, many of them moving to factory jobs where their mechanical background could be utilized in skilled jobs. After the construction peak of 1942 many building craftsmen also moved into factory jobs.

In the postwar period, as construction activity increased, employment of skilled workers surpassed the wartime peak by half a million. Apprenticeship programs received great impetus as a result of the desire of veterans for thorough training leading to a skilled trade. From about 20,000 at the end of the war, the number of apprentices in programs registered with the Bureau of Apprenticeship of the United States Department of Labor shot up to more than 250,000 by the end of 1949. More than half the apprentices at that time were in the building trades, and more than two-thirds of them were veterans.

In the long run the place of some craftsmen will be taken by semiskilled workers. But as mechanical equipment becomes more widely used—in industry, on farms, in the home—the need increases for the rapidly growing repairmen occupations. Furthermore, the small nucleus of all-round skilled craftsmen used in developing new equipment should increase in size somewhat as technology advances. In machine shops and printing—two of the major fields for skilled workers in manufacturing—moderate increases in employment seem likely in the long run. Foundry occupations may not show any significant rise over present high levels and employment in railroad occupations is likely to decline. The model-making occupations in industry—tool and die makers, pattern makers, sample makers in apparel plants, etc.—will, in general, gain in employment only slightly, since a large increase in production and plant employment can usually be achieved with only a small expansion in this type of work. With greater use of semiskilled workers in industry,
the number of skilled workers serving as foremen, leadmen, set-up men, lay-out men, inspectors, and similar workers should increase. Thus, it seems likely that there will be a gradual increase in the long run, in the number of workers in the skilled occupations. Moreover, the expanded defense production program will substantially increase the need for workers in many skilled occupations during the early fifties, especially in the metalworking fields. A large share of the additional requirements in the skilled occupations will be met, however, by breaking down jobs and utilizing less skilled, partially trained workers.

**SEMISKILLED AND UNSKILLED WORKERS**

More than one-fifth of the workers in the United States are “operatives,” the census designation for what are often called semiskilled workers.

Like all broad occupational classifications this one has within it jobs varying widely in nature of the work, in earnings, and in levels of skill. For example, truck driving, one of the largest occupations in the group, calls for skill in driving, knowledge of routes and traffic rules, ability to make minor repairs, some clerical work, and independent responsibility and judgment. On the other hand, some machine operator jobs in industry require only the repetition of a half-dozen different motions all day long—reach for a metal blank and put it in the machine, pull the lever, press the button, push the lever, take out the piece of metal, which now has been stamped or cut, and place it on a pile, reach for another metal blank. Such a routine can be picked up in a day and mastered in a few weeks.

With some exceptions, such as the truck driver’s occupation, these jobs are generally fairly routine and repetitive. Often they pay fairly well, however, particularly when an incentive system based on the amount of production a worker achieves is in use. Frequently semiskilled workers in a large, efficient plant, or one that is represented by a strong union will earn more than skilled workers in inefficient or unorganized plants.

The semiskilled worker does not need to invest years of his life in learning his trade. This is a disadvantage in some ways, as was pointed out in the discussion of skilled workers—the worker with less training has less flexibility and is not so valuable to his employer. On the other hand, the semiskilled trades offer certain advantages young men should consider seriously. With training and experience in a craft, a man often has a wider choice of jobs; he may work in different cities or industries; he is able to handle not only the skilled job in the plant but also, if necessary, one requiring less skill, and he is therefore more valuable to his employer than the one-machine man. This pays off in job security, and usually in earnings as well. Moreover in many plants the skilled man, who understands the whole process, is given preference in promotion to a foreman’s job.

![Chart 47](http://fraser.stlouisfed.org/)
himself another job, and, in a brief period of training, learns the new occupation. Too often the craftsmen hang on in the outmoded occupation as long as they can, and longer than they should.

In the guidance and education of those who may become semiskilled workers it is important to stress flexibility. In a sense, many a semiskilled worker has a job or a series of jobs, rather than an occupation. His skill should consist not so much in doing one kind of work as in readily learning new kinds in response to his own need to find a new or better job or the needs of industry for an adaptable labor force. Rather than extensive training in a vocational school in one type of work, this person needs some familiarity with many different types—machine shop, woodworking shop, welding, electrical work, etc. He does not need to attain proficiency in any one of these fields, but does need an industrial literacy—a familiarity with the different types of processes and machines so that he can adapt readily to them.

The need for adaptability in the semiskilled worker is illustrated by the great increase in employment in this field in a short period in response to the needs of the war production program.

During World War II, manufacturing employment increased and more new and heavily mechanized industrial plants were built. More semiskilled workers were needed, and over 4,000,000 were added—half as many as were employed in 1940 (see chart 47). Great numbers of hastily trained welders, riveters, machine tool operators, and assemblers, the largest part of whom were semiskilled, went to work in shipyards, aircraft factories, and munitions plants. The number of welders and machine tool operators nearly tripled from 1940 to 1943.

After a sharp drop when the war ended, employment in semiskilled jobs has again climbed nearly to peak wartime levels. Some workers had to learn new skills in the postwar period; more than 100,000 welders, for example, had to shift to other occupations. In many machine shops where some form of mass production had been introduced during the war, a return to prewar products and methods has meant need for fewer semiskilled men and more all-round machinists and skilled machine-tool operators. Nevertheless, employment in the semiskilled group, though not as high as at the peak of war industry employment, is far above prewar levels, and this group of occupations has increased its share of the working population. During the early fifties, considerable expansion in employment in these occupations is likely as a result of expanding defense requirements, especially in the metalworking fields.

In view of the long-term trends and the recent developments, it seems likely that these occupations will continue to grow, both in number and in relative importance. There are still large areas of work in which further mechanization holds the promise of additional employment opportunities for semiskilled workers. These include farming, the movement and handling of material in industry, and construction.

The increase in employment of semiskilled workers will mean relatively fewer jobs for unskilled workers. There are now over 3 million people engaged in unskilled jobs in industry. The long-term trend in this group has been downward relative to other occupation groups, and this trend continued during the war. Workers were drawn out of these jobs by the better pay in other occupations. Rapid strides in the use of machinery are displacing laborers from the principal work they are called upon to do in many industries: moving materials, loading, unloading, digging and shoveling, etc.

Employment in these occupations dropped during the war and increased after the war to above prewar levels partly because of the great amount of construction work being done (see chart 48). The long-term downward trend in relative importance will probably continue.
MECHANICS AND REPAIRMEN

Automobile Mechanics
(See D. O. T. 5–81.010, .120, .420, and .510)

Outlook Summary

There will be many apprenticeship and other on-the-job training openings for beginners in this large trade during the early fifties. Turn-over, high in this trade, will continue to be the main source of job openings. Long-run employment trend slowly upward.

Nature of Work

Automobile mechanics do repair work on passenger cars, busses, and trucks. Typical repair jobs are tuning up the motor, replacing piston rings, re-aligning the wheels, and adjusting or relining the brakes. Mechanics may be either general mechanics or specialists such as auto electricians, carburetor experts, and paint and body repairmen. Body repairmen, as a rule, are skilled only in straightening, repairing or refinishing fenders and bodies. The other specialists are usually mechanics with all-round knowledge of automotive repair who have concentrated upon one kind of repair work.

Where Employed

Most of the estimated 500,000 mechanics work in service departments of car and truck dealers or in independent repair garages. There were about 150,000 such establishments in 1949, many of them owned and operated by mechanics. Mechanics are also employed in garages of transportation companies and other large firms which service their own fleets. Some work in gasoline service stations, where they usually do only light repair work.

There are auto mechanics in all parts of the country, including small rural communities. States with the greatest number of auto mechanics are those which have the largest number of motor vehicles. In 1948, these were California, New York, Pennsylvania, Ohio, Illinois, Texas, Michigan, and New Jersey.

How To Enter

Most mechanics learn the trade by working in a garage or repair shop as helper, greaser, or washer. It will be helpful to men who enter the trade in this way to take courses in related technical subjects which are given in most public vocational schools. These courses aid in understanding how automobile engines operate, and give knowledge of the parts used in different types and makes of cars.

The best way to learn the trade is to serve a 3- or 4-year apprenticeship, which assures the beginner of a definite schedule of training, covering the entire field in an orderly fashion. For example, in one agreement which calls for at least 8,000 hours (about 4 years) training, the apprentice must spend at least 2,000 hours working on motors. The contract also calls for 1,000 hours each on front axle and steering, rear wheel and axle assembly, and transmission and clutch work; 600 hours in learning how to adjust and repair brakes. Such formal apprenticeships have become increasingly common since the end of the war. In June 1949, it was estimated that about 29,000 were working as apprentices. In addition, an even larger number of men were learning this trade in late 1949 while working as helpers or in other beginning jobs.

It is desirable to have completed at least 2 years of high school before beginning on-the-job training or entering a vocational school. Many high schools offer some training in auto repair in their shop courses. Courses in English, general science, physics, and mathematics are also very helpful, especially for men who want to advance to supervisory jobs or open their own shops. Mechanics employed by automobile and truck dealers are sometimes sent to automobile factories or parts manufacturers for specialized training.

Those entering automotive work should have definite mechanical ability and an interest in working with tools. This knack for mechanical work
often makes the difference between an average mechanic and a really good one.

**Outlook**

The Nation had more than 45 million automobiles in 1950, half of which were manufactured before World War II. This means that the volume of repair work will stay at a high level during the early fifties, whether or not defense preparations make it necessary to curtail the production of new cars.

Employment of automobile mechanics probably will stay near the 1950 level of approximately 500,000. Nevertheless, many new trainees will be needed each year in this large occupation to replace men who die, retire, enter military service, or leave their jobs for other reasons. Training opportunities may not be as plentiful as during the 1945-48 period, however, when shops were hiring thousands of veterans to make up for wartime shortage of good trainees.

Some of the vacancies will arise as men die or retire. In 10 or 15 years, when a substantial proportion of the workers in the trade will be over 55 years of age, the number of drop-outs resulting from death and retirement probably will increase sharply.

There will be a strong demand for body repairmen in the early fifties. As a result of postwar changes in auto body design, such as use of larger sheets of steel on the body and the omission of running boards, auto bodies are more easily damaged and require more complex and extensive repair work.

- Mechanics with business ability, plus considerable experience, will still find favorable opportunities to open their own repair shops. However, the trend is toward greater numbers of mechanics working for large truck and car dealers, since the capital required to open a modern well-equipped shop is often beyond the means of many mechanics.

In the long run, motor travel will increase. Employment will probably continue to rise unless a simpler way of propelling cars is developed and widely adopted, such as might be possible with gas turbine engines. Although newer cars require fewer repairs, the expected growth in the number of motor vehicles will probably be great enough to assure an increase in the total amount of repair work, and consequently in employment.

**Earnings and Working Conditions**

Class A mechanics had average straight-time earnings in July 1948 ranging from $1.31 in Providence, R. I., to $2.15 in Cleveland, Ohio, according to a survey of independent general repair shops in dealer's service departments in 30 large cities. In about a third of these cities, average earnings exceeded $1.75 an hour, and were $2 or more in San Francisco, St. Louis, Detroit, and Cleveland. For Class B mechanics, average straight-time earnings in the 18 cities for which data were available ranged from 80 cents an hour in Atlanta to $1.72 in San Francisco. Automobile electricians earned more than Class A mechanics (from $1.33 to $2.25 an hour); body repairmen made still more ($1.37 to $2.36). As of the end of 1949, wages in most cities were slightly higher.

In general, wage rates were substantially higher in the Pacific Coast and Great Lakes cities than in other regions. Within cities, pay varies widely, depending upon the individual's skill, the size and location of the shop, and, where there are incentive wage plans, on the volume of business done. Earnings in small rural areas tend to be considerably lower than in cities. Mechanics may be paid a straight salary, sometimes with an incentive bonus; but the flat rate system, whereby the mechanic receives a percentage of the labor cost
charged the customer, is the most common, especially in the large cities.

About a third of the mechanics covered in the July 1948 survey had a 44-hour week. Most of the others worked longer, except in Cleveland, St. Louis, San Francisco, and Seattle, where the majority were on a 40-hour week. More than 90 percent of the shops surveyed gave their mechanics vacation with pay. Most shops pay for holidays, usually six in number. Work is fairly steady throughout the year.

Unionization is not very widespread among mechanics as a whole, but where it exists it is usually found in the shops of large dealers and the repair shops of truck and bus fleets. They are highly organized on the West Coast, but there is some unionization in other parts of the country, particularly in large cities.

Where To Go for Further Information


Accounting-Bookkeeping Machine Servicemen

(D.O.T. 5-83.121)

Outlook Summary

Opportunities will be good during the early fifties for a limited number of men to be trained in this work. Most of these openings will go to men already employed by the companies which make and service the machines, and who are experienced in repairing adding machines, calculators, or cash registers. For those successful in entering the field, prospects are for steady employment.

Nature of work

These servicemen inspect, adjust, and repair accounting-bookkeeping machines. There are a number of different types of these machines—some post entries, some do billing, while others are combination typewriters and computing devices. All types have keyboards, like typewriters and adding machines. These machines are used wherever a great deal of accounting and bookkeeping is done, such as in department stores, large retail and wholesale businesses, and banks. Since there are several different types of machines, each complicated, the servicing is highly skilled work. Servicing these machines is often combined with the servicing of other office machines.

Repair work involves determining the cause of trouble in the machines, replacing worn or broken parts, and cleaning and oiling machines. Servicemen use common hand tools such as wrenches, punches, pliers, screw drivers, and a few hand tools which are specially designed for the particular type of machine being repaired. Adjustments and minor repairs are made in the offices where the machines are used. However, some major repair work is taken to the shop.

Where Employed

These servicemen are employed principally in large cities, since this is where the bulk of the machines are used. Most accounting-bookkeeping machine mechanics are employed in the local service branches of companies which manufacture this equipment. There is little transferring of servicemen among the five main companies in this field. Only a very few servicemen are in independent repair shops.

Training and Qualifications

Training programs for accounting-bookkeeping machine repairmen vary greatly among the companies employing these workers, partly because this work is frequently combined with the repair of other business machines. One large concern uses its mechanics primarily on the accounting-bookkeeping machines and does not combine this work with other repair work. Two other major companies train their mechanics to work on all of the office machines that they manufacture. One of these firms has a 4- to 5-year training program.

Usually a man must have had 1 or 2 years’ experience as an adding machine, calculator, or cash
Repairing accounting-bookkeeping machines is one of the most highly paid of business-machine servicing jobs. Many trainees begin as accounting-bookkeeping machine repairmen in order to be eligible for accounting-bookkeeping machine training—which consists of 2 or 3 years of on-the-job instruction and, in some cases, an additional 6 months of training at a company school. Some of the repair work on accounting-bookkeeping machines requires considerable experience and knowledge of the machines. Servicemen who have just completed their training need additional experience before they are qualified to perform all repair work.

The main aptitudes needed by a trainee are general mechanical ability and manual dexterity. Most manufacturers of these machines prefer to hire men in their early twenties as trainees. Since servicemen in this field make many contacts with customers, a presentable appearance and manner is important to the employers.

**Outlook**

During the early fifties, prospects will be good for a limited number of new men to enter this field. Additional workers will be trained in order to service the growing number of accounting-bookkeeping machines in use. However, most of the trainees will be drawn from the ranks of mechanics already employed in repairing other business machines, for the companies which make and service accounting-bookkeeping machines. These companies manufacture other machines, such as adding machines, calculators, and cash registers, and the practice has developed of transferring some of the more skillful mechanics on these less complex machines to servicing the more intricate bookkeeping machines.

Although this field is small, comprising about 1,800 workers in 1949, it will probably expand gradually for several years to come. The trend is not only toward greater sales of these machines, but also toward greater complexity in newly developed equipment, which tends to increase the need for servicemen.

Long-run prospects are excellent for stable employment for those already in the trade or for those entering in the next few years, since this occupation is little affected by declines in general business activity. The tendency during poor business years is to keep old machines in repair rather than to buy new ones.

**Earnings and Working Conditions**

In 1949, experienced servicemen typically earned from $60 to $85 for a 40-hour week, with some working 8 hours longer and receiving overtime pay. It generally takes a trainee about 3 years to reach this level of earnings. Experienced servicemen may be promoted to supervisory jobs. Men showing sales aptitude are sometimes transferred to the sales departments.

Repairing these machines is comparatively free from the danger of accident and is cleaner than most other mechanical trades. Since most work is performed in the offices where the machines are located, servicemen generally dress like office workers.

**Where To Find Additional Information**


*See also:* Cash Register Servicemen, page 166; Calculating Machine Servicemen, page 165; and Adding Machine Servicemen, p. 164.
Accounting-Statistical Machine Servicemen

(1950, O. T. 5-83, 126, 128)

Outlook Summary

A small number of new workers will be hired for trainee jobs during the early fifties. The long-run outlook is for a gradual upward trend in the number of servicemen.

Nature of Work

These servicemen inspect, adjust, and repair punched-card accounting-statistical machines, such as card-punching, sorting, and tabulating machines, collators, multipliers and dividers, and verifiers. They also install machines in offices and sometimes train personnel to operate them. Accounting-statistical machines record and tabulate large masses of accounting and statistical data. The information is punched on cards alphabetically or according to a code, and the cards are put into machines which sort them and tabulate the results. These machines are used mainly in large organizations, such as government agencies, department stores, insurance companies, and large industrial establishments for payroll and other accounting records, inventory control, statistical surveys, and similar purposes.

Repair work involves determining the cause of trouble in the machines, replacing worn or broken parts, and cleaning and oiling machines. Servicemen use common hand tools such as screwdrivers, wrenches, punches, and pliers, and a few hand tools which are specially made for these machines. Repairs and adjustments are usually made in the establishments where the machines are used.

Where Employed

Accounting-statistical machine servicemen are employed by two firms which manufacture and service all accounting-statistical machines. These men may be assigned by their companies to work anywhere in the United States, but usually their work is in large cities. They rarely transfer from one company to the other.

Training and Qualifications

Men seeking employment in this field should have general mechanical ability and enjoy working with machinery. Both concerns employing these servicemen generally require that new trainees be in their early twenties and have at least 2 years' technical schooling in electrical or mechanical engineering or equivalent electrical or mechanical experience. One company is now hiring only graduate electrical engineers as trainees for servicemen jobs, because the electronic features of their machines are becoming increasingly important.

Men hired as trainees are first given a trial period of 1 or 2 months' on-the-job training. If the new trainees are satisfactory, they are sent to the company school for a period of from 3 to 6 months. After completion of the school course they are put to work under supervision until they are able to service and repair machines on their own. This last period of training usually lasts from about 12 to 18 months.

Outlook

For many years in the future there will be continued growth in the use of punched-card accounting-statistical machines. This growth, together with the need for replacing those who leave this work, means that prospects should be favorable for entering the occupation and remaining for many years. The number of men that will be hired in any one year will be limited, however, by the small size of the occupation—there were 4,000 employed at the beginning of 1950—and by the fact that increases in use of the machines will be gradual rather than sharp.

Employment in this field will be steady, because this work is little affected by changes in general business conditions and because the policy of the companies in this field is to keep their servicemen even when work is slack. In the past, there have been few lay-offs in time of depression.

Earnings and Working Conditions

The earnings of servicemen vary considerably. Typical weekly straight-time earnings for accounting-statistical machine servicemen with at least 3 years' experience ranged from about $65 to $85 at the end of 1949. However, some of the most
skilled servicemen earned up to $100 a week. The company that employs the majority of servicemen pays its trainees $250 a month to start. Periodic pay increases are given to servicemen according to skill and experience. Servicemen may be promoted to supervisory jobs, or may get into the sales departments.

Servicing and repairing these machines is cleaner and lighter work than most other mechanical trades. The occupation is comparatively free from the danger of accident. Servicemen generally dress like office workers, since the work is clean and is usually performed in the offices where the machines are used.

Where To Get Additional Information


See also Adding Machine Servicemen, page 164; Calculating Machine Servicemen, page 165; and Cash Register Servicemen, page 166.

Adding Machine Servicemen
(D.O.T. 5-83.122)

Outlook Summary

A small number of new workers will be able to find jobs in this field during the first half of the fifties. The long-run outlook is for steady employment.

Nature of Work

Servicemen inspect, adjust, and repair adding machines. Adjustments and minor repairs are usually made in the offices where the machines are used. Major repair work is taken to the shop. Repair work involves determining the cause of trouble, replacing worn or broken parts, and cleaning and oiling machines. Servicemen use common hand tools such as screw drivers, wrenches, pliers, punches, and special tools designed for the particular type of machine being repaired. In some cases servicing of both adding machines and calculators is combined in a single job. In independent repair shops, adding-machines are often serviced by mechanics who also repair typewriters.

Where Employed

Servicemen are employed principally in large cities, where the bulk of the adding machines are used. Adding machine servicemen are employed both in manufacturer’s service branches, which are operated in connection with the sales offices of the firms, and in independently owned local repair shops. Other sources of employment are in the Federal, State, and local governments and in a few large banks and other firms which use large numbers of adding machines.

Training and Qualifications

The training period for adding machine mechanics ranges from 6 months to a year or more of on-the-job instruction. Servicemen employed in manufacturers’ service branches generally receive a few weeks supplemental training in the manufacturers’ own school, usually located at the plant. Manufacturers train men to work only on their own line of machines.

In independent shops new men may learn to repair adding machines by working as helpers. Some pick up the skill while working as typewriter mechanics.

The main aptitudes needed by a trainee are general mechanical ability and manual dexterity. Most manufacturers of adding machines prefer new trainees to be in their early twenties.

Outlook

During the first half of the fifties, there will be jobs for a small number of trainees in adding machine repair. Most manufacturers of the equipment are conducting expanded training programs. Since this is a small occupation, however—in 1949 there were about 2,000 adding machine servicemen in the country—the number of openings for new workers will be limited.

Longer run prospects are for an upward trend in the employment of servicemen. The number of adding machines in use in business and in government is tending to increase. Moreover, the repair of adding machines is little affected by
changes in general economic conditions. In time of depression there are few lay-offs, since during these years the tendency is to keep old machines in repair, rather than to buy new machines.

Earnings and Working Conditions

During 1949, typical earnings for a 40-hour week ranged from $50 to $75. In addition, commissions are sometimes paid to servicemen and supervisors on sales of supplies and contracts to do servicing for a particular firm. Men servicing calculators, as well as adding machines, generally earn more than men servicing only adding machines.

Service mechanics may be promoted to positions as service supervisors. The weekly earnings of service supervisors range up to $100 and over. In manufacturers’ branches, mechanics are sometimes transferred to the sales department.

Repairing adding machines is comparatively free from the danger of accident and is cleaner than most other mechanical trades. Servicemen generally dress like white-collar workers, since most service work is performed in the offices or stores where the machines are located.

Where To Find Additional Information


See also: Calculating Machine Servicemen, page 165; and Typewriter Servicemen, page 168.

Calculating Machine Servicemen

(D.O.T. 5-58.123)

Outlook Summary

There will be opportunities for a limited number of new men to enter this field during the first half of the fifties. Long-run prospects are for steady employment.

Nature of Work

These servicemen inspect, adjust, and repair calculating machines. Calculating machines, which add, subtract, divide, multiply, and also perform combinations of these operations, are used mostly in offices where a great many computations are necessary. These machines, most of which are electrically operated, have elaborate mechanisms, and, therefore, skilled men are required to repair them. Minor repairs and adjustments are made in the offices where the machines are used. Major repair work may be taken to the shop. Repairing the machine involves determining the cause of trouble in the machines, repairing or replacing broken or worn parts, and cleaning and oiling the machines. The mechanic uses common hand tools designed for the particular type of machine on which he is working. Servicemen are sometimes required to explain to new operators how to operate the machines. In some cases, servicing of calculators is combined with the servicing of other business machines, particularly adding machines, and also accounting-bookkeeping machines.

Where Employed

Most servicemen are employed in large cities, since this is where the bulk of the calculators are used. Mechanics servicing calculators are usually employed in manufacturers’ local service branches which are operated in connection with the sales offices of these firms. However, a few work in independently owned local repair shops. Most of these independent shops are small and employ only a few workers. Another source of employment is the Federal Government.

Training and Qualifications

Trainees employed by manufacturers of calculating machines generally receive from 1 to 3 years of on-the-job training, often combined with a 3- or 4-month course at a company school. Servicemen employed by the manufacturers are trained to service only the company’s products.

Servicemen working in independent shops must be able to repair all makes of calculators, and need a longer training period. Most calculator servicemen in independent shops receive no formal training, but learn through experience gained while helping experienced mechanics.
Cleaning a calculator with a fine spray of cleaning fluid—an important step in keeping the complicated mechanism in good running condition.

The main aptitudes needed by trainees are general mechanical ability and manual dexterity. The calculating machine manufacturers generally prefer to hire men in their early twenties.

Outlook

Opportunities for new workers to enter this field will be fairly good in the early fifties. The manufacturers of calculators have expanded their training programs during the past several years to provide servicing for the increased number of calculators in use. However, the number of new workers entering the occupation will be limited, since in 1949 only about 2,400 men were engaged primarily in repairing calculators.

Looking further into the future, prospects are for an upward trend in the employment of servicemen, lasting for many years. There will be a growing demand for calculators in business and government. At the same time, there is a trend toward more complicated calculators, as they are improved and adapted to new uses. There will be relatively few openings to replace men leaving the occupation during the next 10 or 15 years. Turnover of servicemen is low, and there is only a small proportion of older men in the trade who will be dying or retiring during this period.

Servicing of calculators is little affected by changes in general economic conditions. There are few lay-offs during depressions as the tendency during poor years is to keep the old machines in repair rather than to buy new ones.

Earnings and Working Conditions

In 1949, typical earnings for a 40-hour week ranged from $50 to $85. Including commissions and overtime, earnings were often considerably higher. Commissions are sometimes paid to service mechanics on sales of contracts to do servicing for a particular firm.

Servicemen may be promoted to supervisory jobs. The weekly earnings of a service manager range up to $120 and over—depending largely on the size of the shop. In manufacturers' service branches, mechanics are sometimes transferred to the sales departments.

Repairing calculators is usually light work and cleaner than most other mechanical trades. The occupation is relatively free from serious accidents. Generally, servicemen dress like office workers, since most service work is performed in the offices where the machines are located.

Where To Find Additional Information


See also Adding Machine Servicemen, page 164.

Cash Register Servicemen

Outlook Summary

During the first half of the fifties, a limited number of new workers will be able to enter this field. The long-run outlook is for steady employment.

Nature of Work

Cash-register servicemen inspect, adjust, and repair cash registers. Next to typewriters, cash registers are the most widely used business machines. They are found mainly in retail stores...
and service establishments. Cash registers vary greatly in the number of things they can do. The simple models merely record each transaction, total the day's receipts, and provide a change drawer. The more complicated cash registers tabulate several different kinds of information on one transaction simultaneously, such as identification of clerk, department, and type of merchandise, as well as provide printed receipts with such information for the customer. The more elaborate cash registers actually perform many functions of accounting machines.

In some cases servicemen work on other types of business machines, such as adding machines or accounting machines. Most repairs and adjustments are made in the establishments where the machines are used. Usually only major repair jobs are taken to the shop. Repairing cash registers involves determining the cause of trouble in the machines, replacing worn or broken parts, and cleaning and oiling machines. Servicemen use common hand tools, such as screw drivers, pliers, and punches, and special hand tools designed for cash registers.

Where Employed

Cash register servicemen are employed principally in large cities. However, most cities of 50,000 population and over have shops repairing cash registers. The great majority of servicemen primarily engaged in repairing cash registers are employed in the local service branches of the few manufacturing firms in this field. There is little transferring of servicemen among firms. Some of the repair work, especially in smaller towns, is done in independently owned local shops, with only a few employees, which repair other types of business machines, such as typewriters and adding machines.

Training and Qualifications

The training period for cash register mechanics employed in the manufacturers' service branches generally consists of 12 to 18 months of on-the-job training in the branch that hires him, followed by about 6 months at the company school. Cash register servicemen working in manufacturers' shops are trained to repair only the company's own line of machines.

Servicemen working in independent repair shops generally have not had formal training, unless they are former employees of manufacturers' service branches. Most of the men in the independent shops pick up the trade while working as helpers in the shops. In independent shops, servicemen are required to repair several different makes of cash registers, and several years of this informal training is required.

New men entering the field should have general mechanical ability and enjoy working with machines. Since servicemen in this field make many contacts with customers, a presentable appearance and manner are important, and servicemen must be able to carry on some business transactions. Manufacturers generally prefer to hire as trainees high school graduates in their early twenties.

Outlook

During the early fifties, a limited number of new workers will be able to enter the field as trainees. Cash-register manufacturers have expanded their training programs, but are not planning to take on as many trainees in the next several years as they did during 1948 and 1949. The number of men who can enter in any one year, however, is also limited by the small size of the occupation. In 1949 there were probably not more than 2,700 cash-register repairmen in the United States.
Longer-run prospects are for an upward trend in the employment of servicemen. Gradually increasing sales of new machines and the trend toward more complicated machines, which can do a wider variety of operations will make it necessary for the manufacturers to build up larger service organizations.

This work is not greatly affected by changes in general economic conditions. In time of depression there are few lay-offs. Cash registers are great timesavers and they serve so many essential commercial purposes that they are a necessity in most businesses. Depressions affect the sales of new machines, but the repair and service work continues.

Earnings and Working Conditions

In 1949, experienced cash-register servicemen typically earned from $60 to $80 a week, plus overtime for work beyond 40 hours. It generally takes a trainee 3 years to reach this level of earnings. Earnings may be increased through promotions to service supervisory jobs. Men showing sales talents are sometimes transferred to the sales department.

Repairing cash registers is comparatively free from the danger of accident and is cleaner than most other mechanical trades. Since most service work is performed in the offices or stores where the machines are located, servicemen generally dress like white-collar workers.

Where To Get Additional Information


Typewriter Servicemen

(D.O.T. 5-83.127)

Outlook Summary

There will be a number of job openings for new workers during the first half of the fifties. The long-run outlook is for steady employment.

Nature of Work

Typewriter servicemen inspect, adjust, and repair typewriters. Repair work may involve replacing worn or broken parts, aligning the type to print evenly, fixing the escapement (spacer), and adjusting the shift mechanism and ribbon movement. Servicemen also clean and oil the machines. Most servicing and repair work is taken to the shop. However, minor servicing jobs may be done in the offices where the machines are used. The mechanics use common hand tools such as screwdrivers, pliers, and punches.

The operating mechanism of electric typewriters differs from that used in the ordinary mechanical typewriters, and men who have not had some training on the electric machines cannot service them. One company which makes and services only electric typewriters employs servicemen who work full-time on the electric machines. In the other companies which make both types of machines, servicing of electric machines is still a small part of the repair business. In some cases, repair shops have a few men who have been trained to handle the electric machines, and they spend all their time on them. In other shops, the men who know the electric typewriters also work on the regular mechanical machines.

In some small shops, typewriter servicing may be combined with the servicing of other business equipment, particularly adding machines. Most servicemen are bench men; that is, their work is done in the repair shop. "Outside" men make contacts with customers as well as frequently doing some work in the shop. They inspect the customer's machines and determine whether or not they should be brought back to the shop for repair. Outside men, particularly those employed by small independent shops, may also sell typewriter ribbons and supplies; occasionally, they sell typewriters.

Where Employed

Typewriter repair men are employed both in the local service branches of typewriter manufacturers...
and in independently owned local repair shops (which frequently sell typewriters as well as repair them). Many servicemen have their own shops.

Geographically, typewriter servicemen are widely distributed. Every city and large town has men employed in the occupation. However, the greatest concentration of servicemen is in large cities, where most clerical work is done.

Training and Qualifications

The length and kind of training for typewriter servicemen varies. Most of it, however, is received on the job. Training periods range from 1 to 3 years. Servicemen employed in independently owned shops require more training and experience, as they must be able to repair all makes of typewriters and, sometimes, adding machines and calculators; servicemen employed in the service branches of manufacturing companies generally repair only one make of typewriter.

In many independent shops, new workers become servicemen by working as helpers, gradually picking up the necessary skills. In some independent shops and in the manufacturers' service branches, however, training schedules are set up and experienced servicemen and supervisors teach the new men systematically.

In addition, trainees in the service branches are frequently sent to a company school at the factory for a few weeks or months of intensive training. Some typewriter servicemen are trained in 2- or 3-year formal apprenticeships which include work on several makes and types of business machines.

To be able to service electric typewriters it is necessary to have special training. The companies which make and repair both types of machines are sending experienced mechanics to company schools for 2 or 3 weeks’ instruction on the electric machines. New trainees hired by these companies will learn to repair electric machines as part of their training program.

There are at least two privately owned schools, not connected with any manufacturer, training typewriter servicemen. These schools are equipped to give additional training on servicing adding machines and calculators.

Outlook

Opportunities to enter the trade during the early fifties will be better than in most prewar years. However, the number of new trainees taken on will be smaller than in 1947 and 1948. Skilled men are still in strong demand and will have little difficulty in getting jobs. The number of new workers who will find job openings in this field will be greater than in other kinds of business-machine servicing. There were more than 10,000 typewriter mechanics in 1949 making this by far the largest business-machine servicing occupation.

Those who enter the occupation during the next few years, will have excellent chances for continued employment over the longer run. Employment in this field will tend to rise gradually as the number of typewriters in use increases. Moreover, typewriter repair work is not greatly affected by changes in general economic conditions. In poor business years, sales of new machines fall, but the amount of repair work remains fairly steady, as old machines are kept in use instead of being replaced.

Earnings and Working Conditions

The typical pay of experienced typewriter servicemen for a 40-hour week in 1949 ranged from about $45 to $75 in the larger cities, although some highly skilled men made more. Servicemen in independent repair shops usually earn more than men in the manufacturers’ service branches, largely because men in the independent shops must be able to repair various makes of typewriters.

Many typewriter repair shops pay servicemen commissions on sales of typewriters, supplies, and contracts to do servicing for particular firms. Servicemen may increase their earnings through promotion to service supervisors or shop managers. In many cases they have opportunities to open their own shops. Typewriter servicing is light work, comparatively free from accidents, and cleaner than most other mechanical trades.

Where To Get Additional Information


See Also Adding Machine Servicemen, page 164.
**Diesel Mechanics**

(D. O. T. 5-83.931)

**Outlook Summary**

In the early fifties a limited number of men will be taken on as helpers and apprentices in shops which handle Diesel repair work. Prospects for experienced engine mechanics who specialize in Diesel work are highly favorable. Volume of Diesel repair work will increase over long run.

**Nature of Work**

Diesel-engine mechanics maintain and repair Diesel engines. Their duties include diagnosing engine trouble, disassembling the engine, replacing or repairing defective parts, reassembling the engine, and adjusting the fuel and air valves. The Diesel engine is similar to the gasoline (or carburetor) engine in many respects. From the point of view of the mechanic, the essential difference between the carburetor engine and the Diesel engine lies in their different methods of ignition. The Diesel engine has no electric ignition system or carburetor such as is found in the gasoline engine, but has an oil-injector system and fuel pumps, with which the mechanic must be familiar. However, the basic stationary and working parts are similar in both engines. As a result, Diesel-engine maintenance is usually carried on by workers who are employed as engine mechanics rather than as specialized Diesel mechanics. For example, Diesel-powered busses, trucks, tractors, and construction machinery are usually maintained by automobile or tractor mechanics. Railroad electricians and machinists generally repair Diesel locomotives.

**Training and Qualifications**

Most mechanics who repair Diesel engines have had training and experience on other engines. Qualifications for Diesel maintenance jobs vary among industries. Mechanics employed in servicing and repairing Diesel locomotives are drawn from among railroad shop craftsmen who are required to serve a 4-year apprenticeship. Marine engineers, who are in charge of the operation and maintenance of Diesel engines on ships, must be licensed by the United States Bureau of Marine Inspection and Navigation. Experience in the engine department of ships and a written examination are among the chief requirements for a marine license. Mechanics who service Diesel engines in the vehicular field, including trucks, busses, tractors, and construction machinery, generally are gasoline-engine mechanics who have learned how to repair Diesel engines. There are a number of schools which provide instruction in Diesel engine repair and maintenance. Such training is most valuable when it supplements experience in gasoline-engine maintenance. Those without actual experience who take courses in Diesel theory and practice will find it difficult to qualify directly for Diesel maintenance and repair work.

**Where Employed**

Diesel maintenance jobs are found in a wide variety of fields. Among the more important sources of employment are bus lines, trucking companies, railroads, ships, electric power plants, large farms, logging camps, marine-engine repair establishments, and garages and firms that service Diesel tractors and construction machinery.

**Outlook**

The use of Diesel power probably will continue to expand for many years. Almost all of the new locomotives ordered by the railroads are Diesels; more Diesel trucks and busses are on the highways; and thousands of Diesel tractors are sold to farmers annually. This points to a continued increase for a number of years at least, in the number of Diesel maintenance jobs, which will go to mechanics who already have experience in repairing other types of engines. For example, a company changing over to use of Diesel engines will usually assign experienced mechanics already on its payroll to service the Diesel equipment, and give them the slight retraining necessary. Other companies who are filling expansion needs with Diesel engines will hire experienced engine mechanics wherever possible. Also, in many shops, union-management agreements specify that men in the shop be given first chance at vacancies. In these shops most new men will be taken on as apprentices or helpers, regardless of whether they
have had previous training in Diesel engines. Men who have had school training but no practical experience in Diesels, will find few opportunities to start as full-fledged mechanics.

Eventually, as Diesels come into greater use, on-the-job training opportunities for inexperienced applicants may become more common. Diesel engines are likely, however, to continue to be but a very small proportion of all engines in use. Unless unexpected developments occur, they

will not be used to any appreciable extent in passenger automobiles.

Where To Get Additional Information


Electrical-Household-Appliance Servicemen

(D. O. T. 5–83.04)

Outlook Summary

Sizable expansion of employment over long run. A few thousand openings for beginners each year, in the early fifties.

Nature of Work

Repairmen are employed mainly by service departments of stores, wholesalers of electrical household appliances, shops specializing in the repair of appliances, and appliance manufacturers and electric companies. There are many owner-operated retail repair shops.

Main duties of servicemen are to install, repair, and rebuild large appliances such as ranges, refrigerators, and washing machines, and to repair smaller ones such as irons and toasters. Sometimes servicemen repair both appliances and radios. Servicemen in small repair shops frequently repair almost every type and make of electric appliance. Those working in shops specializing in the repair of small appliances usually learn to repair all types handled by their shop. Shops which handle both large and small appliances have some servicemen who repair only small appliances and others who specialize in one or more types of major appliances. Some men, for example, repair the major appliances of a particular manufacturer, others handle only refrigerators; still others, automatic washing machines.

Training

Almost all the workers in this occupation begin as helpers and learn their skills through work experience. Occasionally, workers are sent to schools operated by manufacturers of appliances for short periods of training or are given instruction by factory representatives at their places of work. Repair of simple appliances can be learned in a few months, but to become an all-round serviceman or to learn how to repair complicated appliances requires as much as 3 years of on-the-job training. School courses in the fundamentals of electricity are helpful in understanding the work, but to be considered fully qualified, a worker must have had several years of practical experience.

Outlook

Employment in this occupation will increase for many years as the number of appliances continues to grow. Many appliances which in early 1950 were found in relatively few homes, for example, electric dishwashers, will eventually be purchased by millions of families. Moreover, continued growth in the number of families will mean a greater use of electric appliances. Besides the appliances now on the market, the industry will continue to introduce new ones.

As the number of appliances grows, demand for service will increase. The amount of work for servicemen will also be increased as more and more automatically operated appliances are used. Automatic appliances have more parts which can break down and are harder to repair than non-automatic appliances. This factor making for more employment may be somewhat offset by improvements in the durability and reliability of appliances which will tend to reduce the amount of servicing. In the balance, however, it is likely that many more servicemen will be employed in
the future than the 60,000 now estimated to be in this occupation.

Despite the expected growth in employment of appliance servicemen, the prospects of establishing successful retail and repair shops generally will not be favorable in the next few years. A great many such shops were started in the postwar period, and competition for business is likely to be keen for some time.

Earnings

The only Nation-wide earnings data for electric appliance servicemen available is that for servicemen employed by electric utility companies. In the spring of 1948, electric company servicemen had average hourly wage rates of $1.45. Those in the Pacific Coast region had the highest average, $1.66 an hour, and servicemen in the region including Delaware, District of Columbia, Kentucky, Maryland, Virginia, and West Virginia, had the lowest average, $1.34 an hour.

Where To Go for Additional Information

Servicemen interested in going into business for themselves will find valuable information in:


See also Radio and Television Technicians, page 173, and Refrigeration and Air-Conditioning Mechanics, page 177.

Radar Technicians

(D. O. T. 5-83.449)

Outlook Summary

Small but rapidly expanding field with openings for qualified men.

Nature of Work

This group is made up of men engaged mainly in supervising installation of radar (radio detection and ranging) equipment and in servicing and repairing such equipment; some do actual installation work. Radar work calls for advanced knowledge of electronic principles and a high degree of technical skill. Radar technicians must be able to make reports on difficulties encountered and recommend improvements in construction and design. They often service other types of electronic equipment as well as radar.

Where Employed

Most radar technicians work for the very small number of concerns manufacturing and selling radar equipment and holding contracts to service military radar. Many technicians who service military equipment work outside continental United States. Those servicing commercial radar are located mostly in the big port cities in this country.

Training and Other Qualifications

Only men with good experience or training in radar or radio are hired. Many are former radio repairmen. Some are college graduates; at least one company considers a college degree, preferably in electrical engineering, essential. Even college-trained engineers must, however, have basic mechanical skills to be considered fully qualified as technicians. A number of schools, colleges, and radio institutes offer courses in electronics; some have well-rounded programs, including laboratory work and practice in the types of mechanical tasks met with in technician jobs. Although thousands of men were trained to operate and maintain radar equipment in the armed services, this military experience alone rarely, if ever, qualifies a man for civilian work.

New employees almost always receive on-the-job training. For entrants with especially good experience, the training period may last only a few weeks; for others, it may last a year or more.

Outlook

During the early fifties there probably will be a shortage of radar technicians, mainly because
of rapid expansion in the use of military radar equipment. Only a limited number of men have sufficient skill, experience, and theoretical knowledge to handle radar servicing, and it will take time to train additional men to meet the rapidly expanding needs. Moreover, only men capable of learning theoretical electronics and with unusual aptitude for this type of work can become qualified radar technicians. Some of the men who do not meet all the requirements for radar technician jobs will find opportunities in television servicing and other types of electronics work.

Earnings

In 1949, fully qualified men with good radar experience made about $4,000 for the first year or so with a company. Typical annual earnings in the occupation in 1950, were between this figure and $5,000. Men working away from their headquarters cities have their expenses paid by the company or receive extra pay. Special bonuses may be given for overseas work. The basic workweek is usually 40 hours, with time-and-a-half for overtime.

See also Radio and Television Technicians, page 173; Electrical Engineers, page 86.

Radio and Television Technicians

(D. O. T. 5–83.411 and 6–98.210)

Outlook Summary

Good opportunities for men thoroughly trained in electronics during early part of the 1950–60 decade. Long-run employment trend upward in TV installation and repair—probably down in radio repair.

Nature of Work

Radio and television technicians mainly install and repair home and automobile sets. Technicians with FCC licenses work on two-way aircraft, police, boat, and taxicab radios and a small number install and service other types of electronic equipment such as public address and interoffice communications systems. A few thousand are employed in research laboratories or work as testers and trouble-shooters in radio and television manufacturing plants. In small towns, radio repairmen frequently service electrical appliances. Altogether there probably were about 100,000 radio and television technicians in late 1949.

A majority of the technicians who repair radio sets are self-employed; some repair radios only during their spare time. Other radio men are employed by large repair shops, radio stores, garages, wholesale distributors, manufacturers of electronic equipment, and other types of concerns. Increasingly, television repair is also being handled by independent servicemen but many television technicians work for manufacturers, companies contracting with manufacturers to install and repair their sets, distributors, and large repair shops.

How To Enter

Most radio repairmen get their initial training in vocational and technical schools, in the Armed Forces, as helpers or apprentices, in radio manufacturing plants, through amateur radio, or from correspondence schools. The quality of initial training and the ability of the men vary greatly, so that there is a very wide range in degree of skill among new entrants. Many months of work experience are needed to learn the trade thoroughly. Radio technicians who test aviation, police, marine, or taxicab transmitters are required to have an FCC second-class radio operator's license.

Television repairmen need much more basic training and knowledge of electronic theory than radio repairmen. The latter may learn television work through on-the-job training with television servicing companies. Independent servicemen who wish to learn television repair sometimes get training materials and technical help from TV manufacturing companies. These companies also train their own employees to test and repair TV sets. Men with no previous training can enter the trade by studying for about a year in one of the better technical or vocational schools; a few schools provide excellent placement service. TV technicians who work in the homes of customers are required to have a neat appearance and pleasant personalities.
Men going into the radio repair business for themselves must have at least $500 worth of tools and equipment. The additional equipment needed to service television sets costs from $700 to $1,000.

Outlook

During the early fifties there will be a strong demand for skilled electronic technicians. They will be needed to service home radio and television sets and in manufacturing and servicing military, industrial, and other types of electronic equipment. Repair work on home radio and television sets, which employ the bulk of these technicians, will continue to expand, even though military requirements are likely to cut down the production of new sets. Production and servicing of military electronic equipment will grow rapidly. Although skilled men will easily find jobs in the early fifties, there will at the same time be many men with inadequate training in electronics or with no aptitude for this type of work, who will be qualified only for helpers' or assistants' positions. Many who might have enough knowledge and skill for radio repair will not be able to handle the much more difficult television work.

In addition to openings arising from expanding employment in this occupation, there will be a fairly large number of openings created by turnover. Many technicians who repair home radio and television sets are young men subject to draft for military service. Moreover, some technicians now engaged in repairing home sets will shift to jobs with companies manufacturing or servicing military electronic equipment.

Over the long run, increasing use of television sets will call for a growing number of technicians, because TV sets are much more complicated than the radio sets they tend to replace. Although the total number of technicians employed will increase, many men who now have their own radio repair shops will be forced out of business unless they can successfully enter the TV repair field.

Earnings and Working Conditions

Radio servicemen working for others generally have lower wage rates than most other groups of skilled workers. Only a small proportion of radio repairmen are union members. Some big cities have associations of independent radio servicemen.

Apprentices or helpers in television work had weekly earnings ranging from about $30 to $60 in 1949. Supervisors and foremen had earnings ranging from about $60 to $120 a week. Many TV technicians are members of the International Brotherhood of Electrical Workers; some belong to other unions.

Radio repairing is inside work. Television technicians frequently have to work outside while putting up and adjusting aerials; sometimes this means climbing to dangerous positions on roofs and working in bad weather.

Where To Go for More Information

Some communities have radio servicemen's organizations that can provide information on employment opportunities, wages, and working conditions. Servicemen interested in going into business for themselves will find valuable information in:


See also Radar Technicians, p. 172; and Broadcasting Engineers and Technicians, p. 103.
MECHANICS AND REPAIRMEN

Telephone Installation and Maintenance Craftsmen

(D. O. T. 5-53.030, .250, and .410)

Outlook Summary

Employment likely to remain at about the 1950 level for several years, with several thousand openings each year resulting from turn-over. Stable employment over long run.

Nature of Work

Group includes station installers and repairmen, who install and maintain telephone equipment in private homes, offices, and pay telephone booths; PBX installers and repairmen, who work on private switchboard equipment; central-office repairmen, who do maintenance work on the telephone companies' central-office equipment; linemen, who string and repair wire and place cable; and cable splicers, who splice and maintain aerial and underground cable. Most workers in these occupations are employed by the associated companies of the Bell System, but some work for independent telephone companies, which have about a sixth of the total telephones in the United States.

Qualifications

High-school graduates are given preference for jobs in these occupations, and a knowledge of basic principles of electricity is an asset. New entrants are usually hired for general telephone work and are given all-round classroom and on-the-job training. Then they are placed in the particular occupation where workers are needed. They usually progress within a single craft, though men are often shifted from one type of work to another as the need arises. It usually takes about 8 years to advance to the top of the wage-progression schedule in the Bell System companies. Some of the small companies also have progression schedules covering varied periods of time, but others promote workers on the basis of their individual competence. Veterans are usually granted some credit for training and experience received in the service.

Outlook

Employment of telephone installation and maintenance craftsmen probably will remain at about the present level over the next few years. The number of men in these occupations was about 135,000 in October 1949, about twice the figure reported in late 1945. The work force was expanded to install and maintain an average of more than 3,000,000 additional telephones each year. When the enormous backlog created by the depression of the Thirties and World War II will have been taken care of, installations will be made at a more moderate rate. In late 1949, however, the associated Bell Companies alone still had about 800,000 unfilled orders for telephones.

The volume of repair and maintenance work will continue to rise as new phones are added and should serve to maintain present employment levels even though there will be a decrease in the number of installations. Although employment will remain fairly level in the early fifties, turnover rates may rise as men enter the armed services and as a tighter labor market makes it easier to shift from one job to another.

Employment probably will tend to increase slowly over the long run. Many of the Nation's families—in both urban and rural areas—are waiting for telephones; the construction of facilities to provide this service is going ahead actively. Moreover, the growing population will create additional demand for telephone service. Special types of telephone service, such as automobile installations, will continue to expand, although this will be a very small factor for many years.

Gains in employment which will result from the rising number of telephones in use will be partly limited by improvements in telephone equipment which will enable each maintenance man to service a larger number of phones. However, the mechanization program, including dial equipment, intertoll dialing, etc., and developments such as coaxial cable, radio relay, etc., are resulting in a large increase in the central office forces which
will tend to offset any reduction in outside forces such as cable splicers and other craftsmen who handle lines and cables.

Earnings and Working Conditions

Starting rates with Bell companies ranged from about $30 to $38 a week in late 1949, depending on the community. The highest salaries provided for by the progression schedules varied from about $72 to $90 (somewhat less for linemen). The standard workweek is 40 hours, but overtime is frequently necessary. Linemen have to work outdoors in all kinds of weather.

Where To Go for Additional Information

People interested in employment with a telephone company should go to their nearest central office where they will be directed to the proper person.

See also Central Office Equipment Installers, Telephone, page 176; and Linemen and Troublemen, page 468.

Telephone, Central Office Equipment Installers

(D. O. T. 5-53.010)

Outlook Summary

Employment likely to decline in next several years. A limited number of men will be hired to meet replacement needs in early fifties.

Nature of Work

This group is engaged mainly in installing manual and dial switchboards and other equipment in the central offices of telephone companies. In general, the duties involve placing the equipment in locations designated in floor plans, connecting the various units with cables, and adjusting the devices for maximum efficiency. The principal employer is Western Electric Co., a subsidiary of the American Telephone and Telegraph Co. The next largest is the Automatic Electric Co., which produces a good deal of equipment for foreign companies as well as for independent telephone companies in this country. The associated companies of the Bell System also employ a small number of installers in large cities, to make relatively simple installations.

Qualifications

Applicants must have at least a high-school education or its equivalent. Courses in electricity are an asset. Men with college education have an advantage in competing for advancement within the company, especially if they have engineering training. It is absolutely necessary that the applicant be willing to travel.

The Western Electric Co. gives new employees on-the-job training, supplemented as required by classroom training. It takes about 6 years to work up to the top of the progression schedule. Some of the small companies also have progression schedules covering various period of time, while others promote workers on the basis of their individual competence.

Outlook

Employment will decline gradually from the high level of late 1949 through the early fifties. The number of installers working for the Western Electric Co. grew rapidly in the early postwar period. At the end of World War II, there were 3,700 installers as compared with 16,700 in early 1949. During this period, the Bell System alone installed 10,000,000 telephones, an expansion which would have been impossible without a tremendous enlargement of central office facilities. During the next several years, a great deal of equipment will be installed to convert manual systems to dial and to expand central offices, but probably less equipment will be installed each year than during the years between 1946 and 1949. Because of decline in employment the number of job openings will be small, although there will be some as a result of turn-over in the occupation.

After the next few years, when the postwar expansion and modernization program is completed, openings will arise much less frequently than at any time since the end of World War II. Most of the hiring will be to replace installers who die, retire, are promoted, or leave their jobs for other reasons. Employment probably will tend to be relatively stable, since there is likely to be a continuation of the long-run growth in the use of telephones.
MECHANICS AND REPAIRMEN

Earnings and Hours of Work

For most installers, wages started at 90 to 97 cents an hour in early 1949, with increase up to a maximum of $1.56 to $1.69 an hour after 6 years' experience. The standard workweek is 40 hours, but it is often necessary to work overtime.

Where To Go for Additional Information

People interested in employment as a central-office installer should go to the nearest telephone company office, where they will be directed to the proper person for information.

See also Telephone Installation and Maintenance Craftsmen, page 175.

Refrigeration and Air-Conditioning Mechanics

OUTLOOK SUMMARY

Limited numbers of apprentices will be hired during the early fifties. Employment trend upward over long run.

NATURE OF WORK

Refrigeration mechanics install and service large self-contained refrigeration and air-conditioning units of the types used in such places as food stores and restaurants. They must know refrigerants and how to repair compressors, condensers, pumps, and other equipment. Central systems, such as those used in theaters, factories, office buildings, and cold storage warehouses use a good deal of piping, electrical, and sheet metal duct work. This type of installation requires the services of craftsmen such as sheet metal workers, pipefitters, and electricians in addition to the refrigeration specialists. The stationary engineers who maintain the big central systems and men who repair only household refrigerators are not covered by this report.

Mechanics usually work for heating, refrigeration, or air-conditioning contractors and for companies that sell and service large self-contained refrigeration and air-conditioning units. Many are in business for themselves as contractors. Some mechanics are employed by manufacturers of refrigeration and air-conditioning equipment.

HOW TO ENTER

The usual way of becoming a mechanic is to serve a 5-year formal apprenticeship in programs jointly supervised by unions and employers. In areas where the trade is not organized, shop helpers and assistants frequently learn the trade by working on the equipment over a period of years. Sometimes men who repair household refrigerators are given an opportunity to learn how to install and repair the larger equipment. Young men are usually preferred for apprenticeships and other beginning jobs, but age requirements are frequently waived for veterans.

In some cities mechanics are required to have licenses. Many cities require that refrigeration contractors be licensed.

OUTLOOK

The total number of men employed as refrigeration and air-conditioning mechanics will increase.
over the long run, owing to expanding use of commercial and industrial refrigeration and air-conditioning equipment. An increasing number of mechanics will be needed to install and repair air-conditioning equipment—mostly for commercial users, such as stores, restaurants, and office buildings. Air-conditioning systems for private homes are still too costly for all except the comparatively small number of high-income families. Industrial process air-conditioning and refrigeration will also employ more and more men. Employment on commercial refrigeration, ranging in size from walk-in boxes to cold storage warehouses, will have an upward trend for many years to come. The long-run upward trend in employment in this occupation may be interrupted during the early fifties, however, if defense preparations make it necessary to cut back production of civilian refrigeration and air-conditioning equipment.

In any event, it probably will be difficult for beginners to enter the trade. Commercial and industrial refrigeration and air-conditioning work is concentrated in cities where the trade is organized and men become journeymen mechanics by serving apprenticeships. Even in good times there are usually many more applicants for apprenticeship than can be taken on.

Earnings and Working Conditions

Separate earnings information for air-conditioning and refrigeration mechanics is not available. However, minimum union wage rates for pipefitters in major cities on July 1, 1949, ranged from $1.90 to $3 an hour; from $1.50 to $3 for electricians; and from $1.75 to $2.75 for sheet metal workers. Apprentices generally start at less than half the journeyman’s rate. They get increases after each 6 months and after completing their apprenticeships get the journeyman’s rate.

Many mechanics, especially in large cities, are represented by the United Association of Journeymen and Apprentices of the Plumbing and Pipe-Fitting Industry. This union, the International Brotherhood of Electrical Workers, and the Sheet Metal Workers’ International Association represent most of the workers who install and repair air-conditioning and refrigeration systems.

Except in the southernmost regions of the United States the demand for repair services and new installations is seasonal. During peak summer months overtime work is common.

Where To Go for Additional Information

Further information on the nature of the work, apprenticeship and other training opportunities, earnings, etc., may be obtained from:

Local unions of the United Association of Journeymen and Apprentices of the Plumbing and Pipe-Fitting Industry (AFL), the International Brotherhood of Electrical Workers (AFL), the Sheet Metal Workers’ International Association (AFL), and local air-conditioning and refrigeration contractors associations.

See also Electricians, page 393; Electrical-Household-Appliance-Servicemen, page 171; Pipefitters, page 389; Sheet Metal Workers, page 395.

Gunsmiths

(D. O. T. 5-83.542)

Outlook Summary

Openings for new workers will be extremely scarce in the early fifties. This is a very small occupation and turn-over is very low. A slight increase in employment likely in the long run.

Nature of Work

The gunsmith rebuilds, repairs, and alters small firearms such as rifles or pistols. His duties include the replacement of broken and worn-out parts and the making of new parts, frequently involving the use of such machine tools as the lathe and grinding machine, as well as many types of hand and woodworking tools. In addition, the more skilled gunsmiths spend a great deal of time designing and making new guns. In designing new guns they may have to lay out the plan on paper, select the proper materials, and do precision machining and wood shaping.

Most gunsmiths are proprietors of their own small shops. There are two main types of shops,
Each employing different types of workers: (1) Combination locksmith and gun-repair shops operated by mechanics who do general repair work on mechanical equipment and guns. The gun-repair work in this type of shop is primarily seasonal. (2) Shops operated by expert craftsmen who work on guns throughout the year and who specialize in intricate jobs, very often working on unusual and expensive arms. Since the war, a growing number of such expert craftsmen are also being employed by general sporting goods shops.

The American Rifle Association estimated that there were about 5,000 men doing some gunsmith's work in 1949, but only about 500 of these were engaged in gunsmithing on a full-time basis. There are gunsmith's shops throughout the country, but the greatest number are located in areas where hunting is an important sport. The following 10 States issued the most hunting licenses in the 1948-49 hunting season, ending June 30, 1949: Michigan, Pennsylvania, New York, Ohio, Minnesota, California, Illinois, Wisconsin, Indiana, and Washington. Some of the gunsmiths' shops in the small towns do a large volume of mail order business derived from their advertising in national sports magazines. Most locksmith and gun repair shops are located in cities and the larger towns.

How To Enter

The most common way of learning this trade is through practical experience. Those working in lock and gun repair shops usually start in as helpers and learn on the job. Most expert gunsmiths started out by tinkering with their own guns as a hobby and then became interested enough to study and acquire some machine-shop experience. After doing this for a few years, some men may undertake small repairs for their friends, doing the work after hours in their garage or basement shop. By starting out on just such a small scale and gradually acquiring a good reputation, a few men have been able to establish themselves in business on a full-time basis.

An apprenticeship is about the best way to learn this trade, but there are very few gunsmiths shops large enough to spare the time of an expert craftsman to supervise the training. However, there are several vocational schools, mostly located in the West, which give good training courses in gunsmithing. Even graduates of these schools must get several years of working experience before they can be considered as experts.

The main personal qualification for a man who wants to become a gunsmith is a love of guns. He must also have a high degree of mechanical ability. At least a year of machine-shop training, either in school or through working in a machine shop, is also essential. Men who did some gunsmithing in military ordnance departments during the war usually must get several years more of civilian experience before they are considered fully qualified.

Outlook

So few men do gunsmithing as a full-time job (only 500 in 1949) that the number of replacements each year needed for those who die, retire, or transfer to other work, will be extremely small in the early fifties. More than enough skilled experienced people will be available to fill any such openings, since so many men already do this on a part-time basis. Therefore, opportunities will be very limited for newcomers who want to do this work full time. There may be occasional opportunities, however, for a really skilled young man with a good record of experience as an amateur gunsmith, to do gunsmithing on a part-time basis.

The amount of work available for gunsmiths depends largely on the amount of hunting being done. Since World War II, hunting has become more popular than ever (over 12½ million hunting licenses were issued for the 1948-49 season, one and one-half times as many as before the war.) Many men became interested in this sport as a result of their military experiences. Game conservation programs have increased the amount of wildlife available for hunting in many areas.

In the long run there is likely to be only a slight increase in full-time employment of gunsmiths, and the occupation will continue to be very small. There will also be a moderate number of openings in locksmith and general repair shops.

Where To Go for More Information

Information on the name and location of training schools, as well as job requirements and employment opportunities, may be obtained from:

National Rifle Association of America,
1600 Rhode Island Ave., NW.,
Washington 25, D. C.
The publication of this organization, The American Rifleman, frequently carries technical articles, help wanted columns, and other information of value to anyone interested in entering this field.

Industrial Machinery Repairmen
(D. O. T. 5-83.641)

Outlook Summary

Increasing employment is in prospect in this occupation.

Nature of Work

Industrial machinery repairmen, often called maintenance mechanics, maintain and repair machinery and other mechanical equipment in all types of industrial plants. Their duties include examining the machinery to determine cause of trouble, dismantling, repairing, or replacing defective parts, reassembling the machinery, and making necessary adjustments for efficient operation. Often some of the duties of the millwright in the moving and assembling of machinery and equipment are included. Maintenance mechanics usually specialize in the type of machinery or equipment used in the industry in which they are employed, and generally are required to have a knowledge of the operation of the machines which they repair.

Where Employed

These workers are employed in almost every type of industrial plant which uses any great amount of machinery or equipment. Many industrial machinery repairmen are employed in metalworking establishments including plants making automobiles, electrical equipment, iron and steel products, and machinery. Automobile plants employ well over 4,000. Other groups work in nonmetal industries such as textile mills, petroleum refineries, chemical plants, and paper and pulp mills; several thousand are employed in coal and metal mining.

Because industrial machinery repairmen do maintenance work in such a wide variety of industries, some are employed in every section of the country. These workers are concentrated, however, in the principal industrial States including New York, Pennsylvania, Ohio, Illinois, Michigan, New Jersey, California, and Massachusetts.

Training and Qualifications

The amount of skill and training required for industrial machinery repairmen varies widely with the type of machinery and equipment in the plant. Training is usually obtained on the job, particularly since workers often specialize on one type of equipment. In many plants, machinists or machine operators are transferred to the maintenance department to do this job; in other plants inexperienced workers are hired as helpers and learn the job while working. A 3- or 4-year apprenticeship may be required by some firms.

Outlook

The expected rise in industrial activity due to expanding defense requirements will increase the number of maintenance mechanics during the 1950–60 decade. Many openings will result from the need to replace workers who switch to other jobs, retire, die, or are called up for military service. Over the long run, the growing mechanization of industry is expected to increase the need for maintenance mechanics to keep production equipment in working order.

Earnings

Industrial machinery repairmen are generally among the better-paid maintenance workers. Their earnings vary considerably among industries.

Recent data on earnings of industrial machinery repairmen are not available for most industries. However, in passenger automobile manufacturing plants in February 1950, these workers averaged $1.89 an hour, and in the airframe industry in May–June 1949, they averaged $1.62 an hour.

See also Millwrights, page 223.
Jewelers and Jewelry Repairmen
(D. O. T. 4–71.010, .020, and .025)

Outlook Summary

Limited number of openings for those who wish to learn these trades in the early fifties. Little increase in employment likely in the next 10 or 15 years.

Nature of Work and Where Employed

Jewelers make or repair rings, pins, earrings, bracelets, necklaces, chains, fraternal emblems, religious jewelry, and other ornaments. They may also design jewelry, do hand engraving, or set stones. They work with metals such as gold, silver, platinum, or palladium, and precious, semiprecious, and synthetic stones. The manufacture of a piece of jewelry is done mostly by hand and involves such skilled operations as making molds according to design, casting metals, shaping and filing down the rough piece, soldering and polishing. Repair work, usually less complicated, consists of such jobs as making rings larger or smaller, soldering broken parts, or resetting stones.

Jewelers are employed in retail stores, trade shops, and manufacturing establishments. Trade shops are small establishments which repair jewelry or make jewelry on a custom order basis for the retail stores in a particular locality. Retail stores and trade shops usually employ only a few jewelers—in many retail stores there is only one skilled man.

Precious jewelry is manufactured in a large number of small shops and in a few large establishments. In the small shops, most of the work is made to order, so that a large proportion of the employees are highly skilled all-round jewelers. In the larger establishments, there is considerable specialization among the skilled workers. Some of them set diamonds, others design jewelry, do hand engraving, assemble parts, or polish the finished pieces. Also, the bigger manufacturing plants employ a much larger proportion of semiskilled and unskilled workers than do the small shops.

About 1,350 establishments manufacturing precious jewelry employed an average of 20,600 production workers in 1947. The New York City area (including northern New Jersey) is the largest center of precious jewelry manufacturing. The Providence, R. I.-Attleboro, Mass., area ranks next in importance in precious jewelry manufacturing.

How To Enter

It takes 2 to 3 years of on-the-job training and experience in the trade to become qualified to handle the simpler jobs, and several years more to become a highly skilled all-round jeweler. The beginner may start out as a charger (setting up the work for soldering) or do simple soldering or rough polishing; as he gains experience he may get a chance to undertake more difficult work. The best way to learn the trade is through an apprenticeship training program which takes from 2 to 4 years. However, since only a few of the larger shops are able to undertake such formal training programs, apprenticeships are not widespread in this industry.

There are trade schools which teach jewelry work, but even with school training, it is necessary for the newcomer to get several years of practical
experience before he is considered a skilled worker. Many employers send their apprentices and other trainees to day or evening classes in these trade schools, and consider the time spent as part of their working hours; in some instances the employer pays the tuition.

To become an all-round jeweler, it is necessary to have artistic talent and mechanical ability. Because this is light sedentary work, it has been found suitable for people with physical handicaps of certain types. Many disabled veterans have been employed successfully in this field. Skilled jewelers sometimes set up their own small manufacturing shops or acquire retail stores or trade shops.

Outlook

Young people who want to become jewelers will have difficulty finding openings where they can learn the trade in the early fifties. Little expansion from 1949 employment levels is expected in either jewelry manufacturing or retail trade. Almost all openings will rise through turn-over. Beginners will have a better chance of getting started in the manufacturing shops, because that is where most skilled jewelers are employed and because retail jewelry stores prefer to hire skilled workers. However, in manufacturing shops the number of apprentices is limited by union agreement. Despite a scarcity of openings, some applicants with a high degree of artistic talent and mechanical ability will be able to find jobs, since this is a field where employers are always searching for fresh and original talent. Moreover, there will continue to be a demand in manufacturing shops for certain highly specialized craftsmen such as hand stone setters, model makers, and sample makers.

Employment of jewelers depends to a great degree on general business conditions, since this is a luxury trade. However, even with good business conditions, little increase in employment is likely in the next 10 years.

Earnings and Working Conditions

According to a survey made by an employers' association, average earnings for skilled workers in precious jewelry manufacturing shops in the New York City area were about $2.10 an hour in late 1949, or about $70 to $75 for the customary 35-hour week. Many are paid on a piece-work basis, but their earnings were about the same. Apprentices started at 70 cents an hour and received increases every 3 months until they reached the journeyman's rate. Fall is usually the busiest season in jewelry manufacturing. Many skilled workers belong to the International Jewelry Workers Union, AFL, some to the Playthings, Jewelry, and Novelty Workers International Union, CIO.

The general range of earnings of men employed in retail stores and trade shops in late 1949 was about $60 to $160 a week. Earnings vary considerably at different seasons of the year, following closely the fluctuations in retail jewelry sales. Top earnings usually come before and immediately after Christmas. Self-employed repairmen may work considerable overtime during that period. Summer is usually the slowest season.

Where To Go for More Information

Additional information on job opportunities, training, earnings, and related matters may be obtained from the following organizations:

International Jewelry Workers Union, AFL,
Suite 825, 551 Fifth Ave.,
New York 17, N. Y.

Jewelry Crafts Association, Inc.,
20 West 47th St.,
New York 10, N. Y.

National Association of Credit Jewelers,
545 Fifth Ave.,
New York 17, N. Y.

Playthings, Jewelry & Novelty Workers International Union, CIO,
225 Lafayette St., Rm. 606,
New York 12, N. Y.

The following pamphlet contains information helpful to those interested in going into business for themselves.


See also Costume Jewelry Workers, page 227.
Shoe Repairmen

(D. O. T. 4-60.100)

Outlook Summary

Declining occupation. Limited number of opportunities for trained men to take over businesses of older repairmen or to open new shops. Men learn trade by working with experienced shoe repairmen.

Nature of Work

The shoe repairman (often called a shoemaker) resoles and reheels shoes and performs various other repair jobs. To resole a shoe, he first rips off the old sole with a pair of nippers and levels and sands the welt (narrow strip of leather between the shoe upper and the sole). Next, the new sole is set in place over the welt and permanently attached either by cementing, nailing, or machine stitching. Then the edges of the new sole are held against a revolving trimmer until the sole is trimmed to the shape of the shoe. Finally, the bottom of the sole is buffed, and the edges and bottom are waxed and stained to give a finished appearance. In reheeling, the old heel must be snipped off, and a new one shaped and fastened into place. The new heel is buffed and finished in the same manner as new soles. Numerous other shoe repair services, such as cleaning, dyeing, stretching, stitching ripped seams, patching holes, attaching heel and toe plates, and replacing buttons and buckles, are a part of the everyday work of the shoe repairman.

There were roughly 50,000 shoe repair shops in 1939, most of which were small one-man businesses. Altogether, there were about 60,000 shoe repairmen. In large cities, shoe repair facilities are often combined with other types of personal services, such as dry cleaning, laundry, hat blocking, and tailoring. Shoe repairmen sometimes own the concessions in these valet shops.

How To Get Into the Trade

The most common method of entering this trade is by serving an apprenticeship of about 2 years under an experienced shoe repairman. However, many repairmen pick up the trade by getting a minor job in one of the large shops and advancing from the least difficult to the most difficult operations. Less emphasis is placed upon apprenticeship in large shops, where beginners are often hired and trained in a few months to do one particular operation. Vocational schools teach this trade, but most employers prefer people trained on the job. Those who have had school training usually are not considered fully qualified until they have had some practical experience.

The majority of repairmen eventually go into business for themselves. Several years’ experience working for someone else is valuable, not only to develop skill, but to learn how to operate a shoe repair business.

Outlook

In general, prospects for opening successful new shops will not be good. Nevertheless, men who have learned the trade by working for someone else as a helper or apprentice will occasionally find favorable opportunities to take over shoe repair businesses or concessions, or to open new shops. Some beginners will be hired as helpers to replace these workers and to replace helpers and apprentices who leave the occupation to take other jobs. However, because the number of shops is not expected to increase, there will be only a limited number of helper openings.

The number of shoe repairmen has decreased over the past 30 years. Introduction of labor-saving machinery has been the chief factor making it possible for fewer repairmen to serve a greater number of people. The trend of employment probably will be downward in the future, also, partly because leather soles and heels are being replaced by new type composition soles and heels which outwear leather by a considerable margin. Moreover, advances in labor-saving repair equipment and the tendency for larger, more efficient shops to get a greater share of the work will make it possible for fewer repairmen to handle a given amount of work. Population growth, on the other
hand, will partly offset the factors making for decreased employment.

Earnings

No recent information is available on the earnings of owner-operators, who comprise the great majority of shoe repairmen. Wages for skilled employees in the big cities in late 1949 ranged between $55 and $80 a week; for semiskilled workers, $35 to $45. Hours of work are often long. Employment in shoe repairing is fairly steady throughout the year, with the busiest season occurring in early spring and fall. There is some unionization among shoe repairmen, especially in the larger cities.

Where To Go for More Information

The following publication contains valuable information for persons interested in going into the business for themselves:


Watch Repairmen

(D. O. T. 4-71.510)

Outlook Summary

Limited number of openings for jobs in the early fifties. Graduates of first-rate training schools have best chances of finding beginning jobs. Slight increase in employment likely over the long run.

Nature of Work

Watch repairmen (who are frequently referred to as “watchmakers”) repair and adjust timepieces. This involves a variety of duties such as inserting new springs, refitting pivots, truing balance wheels, and grinding old parts or making new parts. These workers also clean and oil the parts, refinish dials, and repair or replace wristbands. In small shops, watch repairmen may perform some of the simpler types of jewelry repair and sometimes sell jewelry and watches. It is customary to specialize in either watch or clock repair work. The latter generally requires less skill than the former.

Where Employed

Most watchmakers work in retail jewelry stores or separate watch repair shops, either as owners or employees. Some of the separate watch repair shops service the public directly, while others, known as trade shops, repair watches for retail stores. Many watch repairmen are also employed in department stores and mail order houses. In some instances, watchmakers operate a watch repair concession in a retail store. A small number of watch repairmen are also found in jewelled-watched factories and in firms that import watch movements and parts and assemble them into complete watches.

There were about 35,000 to 40,000 watchmakers employed in early 1949, including a small number of women. They work in all parts of the country, but the greatest proportion are concentrated in large cities.

How To Enter

Watch repairing is extremely intricate and precise work which requires much patience as well as a high degree of mechanical skill. Since this is light sedentary work it is suitable for many handicapped people.

Anyone wishing to enter the trade will find it difficult to do so without a year and a half to 2 years of training in one of the better watchmaking schools. There were about 125 schools of watchmaking in operation in late 1949, but some of these schools did not give training that was of a quality acceptable to most employers.

The best watchmakers’ schools provide thorough training in all phases of the trade, but even their graduates need many months of experience and
practice on the job to reach a high rate of output. Men trained at lower-rated schools may need 3 to 5 years of work experience to become highly skilled. Some employers employ men with less than a year's training in a school or with no school background at all and attempt to train them on the job, but watchmakers are usually too busy now to give beginners adequate attention. Only a small number of the larger shops have formal apprenticeship programs. Small shops, particularly in large cities, generally hire only skilled men.

Certificates, which are widely recognized by employers throughout the country, are issued by the Horological Institute of America to those who are able to pass the Institute's examinations and thus demonstrate a certain quality of workmanship. Certified watchmaker certificates are granted to those able to pass a relatively simple examination, usually men who have completed watchmaking school or the equivalent in on-the-job training. Master watchmaker certificates are awarded to men who pass the more difficult examination, usually men who have had about 5 or more years' experience. Certificates of proficiency are also issued by the Testing and Certification Laboratory of the United Horological Association of America. However, the States which require licenses—namely, Wisconsin, Indiana, Iowa, Minnesota, Oregon, Louisiana, and Oklahoma—will not accept the certificates of either organization in lieu of their own examinations. The State of Ohio requires no license, but has regulations specifying the minimum number of hours of training a watchmaker must have in order to practice his trade.

Outlook

In 1950 there was an ample supply of men trained in watchmaking. There was such a great influx of newly trained watchmakers in the late forties, composed mainly of veterans, that by early 1949, employment had risen to nearly double the prewar figure. Although the number of openings for newcomers will be fewer in the early fifties, watchmaking schools probably will turn out more than 1,000 graduates each year.

Almost all of the openings which arise in the next several years will result from turn-over in retail shops, although a limited number of additional watchmakers will be needed by factories producing military equipment. Graduates of first-rate watchmaking schools will have a strong advantage in getting jobs.

In the long run there is likely to be a slow increase over present levels of employment. The number of watches in use will probably continue to increase. Not only will many persons who do not now have watches buy them, but there is a growing tendency for people to own more than one watch, to wear watches as costume jewelry, and to buy more and more children's watches. Moreover, the continuing popularity of small watches will also help to keep up a large volume of repair work, because they break down more frequently and are much harder to fix.

Earnings and Working Conditions

In late 1949, a beginner trained in a first-rate watchmaking school could expect wages of $40 to $60 a week. Typical earnings of experienced men working for other shops were between $70 and $85 a week. Earnings of self-employed watchmakers vary considerably, depending largely on the volume of repair work and in case of retail jewelry stores, also upon the volume of sales. Work and earnings are fairly steady throughout the year. Only a small proportion of watchmakers belong to unions; The International Jewelry Workers Union, AFL, has organized some of the watchmakers employed in retail stores in a few of the larger cities.

Where To Go for Additional Information

For data on job opportunities, schools giving training courses acceptable to the trade, and similar matters write to:

Horological Institute of America,
P. O. Box 4355,
Washington 12, D. C.

United Horological Association of America,
1549 Lawrence St.,
Denver 2, Colo.

See also Watch and Clock Factory Workers, page 235.
MACHINE-SHOP OCCUPATIONS

Machine-shop workers are the largest occupational group in metalworking and one of the most important groups in all industry. In early 1950, more than 750,000 workers were employed in the skilled and semiskilled machining occupations. In addition, there were many thousands of other workers, such as assemblers, inspectors, helpers, and laborers, employed in machine shops.1

CHART 49

The long-range upward trend of employment in this field, together with a large volume of replacement needs, should provide many opportunities for new workers. Job openings will be particularly numerous in the early fifties as the metalworking industries, which are the main sources of machine shop jobs, expand to meet defense requirements.

Nature of Machine-Shop Work

Machining is done by machine tools, and a machine shop is simply a workplace in which machine tools are used. A machine tool is a power-driven machine which firmly holds both the piece of metal to be shaped and a cutting instrument, or “tool,” and brings them together so that the metal is cut, shaved, ground, or drilled. In some cases, the tool is moved and the metal held stationary; in others, the metal is moved against a stationary tool.

The most common kinds of machine tools include the engine lathe, turret lathe, grinding machine, boring mill, drill press, milling machine, screw machine, shaper, and planer. The operation of lathes is known as “turning.” The piece of metal being cut is rotated against the cutting tool held in the machine. Boring mills and drilling machines are among the machines that make holes in metal. Grinding machines remove the metal with a power-driven, abrasive wheel. Milling machines shape metal with a saw-toothed cutting tool. Planers and shapers are used to machine flat surfaces. A screw machine is a type of lathe.

Some machine shops manufacture metal products and others do maintenance work—making or repairing metal parts for equipment use. The manufacturing shops are of two main types—job shops and production shops—depending upon the way their production is organized. In job shops, the earliest developed, a wide variety of products may be made with relatively few of each kind. Production shops, on the other hand, make large quantities of identical items.

Where Machine-Shop Workers Are Employed

Because of their importance in making metal products, machine-shop workers are employed principally in the metalworking industries. Nearly every industry, however, employs some machine-shop workers in maintenance work. More than three-fourths of all workers in the machine-shop occupations have jobs in metal industries like machinery, primary and fabricated metals, and automobiles. (See chart 49.)

Most of the remaining machine-shop workers are employed by the railroads, public utilities, and in the maintenance shops of nonmetal manufacturing plants which make such products as cotton textiles, paper, cigarettes, and chemicals. Even though the number of machine-shop workers in most nonmetal industries is small, these industries,
taken together, are important as a source of employment for machine-shop workers since they provide almost a fourth of the jobs. Moreover, in many cases the machine-shop jobs rate among the better jobs in the plant and locality, as for example, in many textile mills in southern towns. Because so many machine-shop workers are in metalworking industries, the bulk of them are found in the northeastern and midwestern sections of the country, where these industries are concentrated. Some machine-shop employment, however, is scattered throughout the country in railroad repair shops and the maintenance shops of other industries. There are machine-shop jobs in every State.

Outlook

Many thousands of new workers will get machine-shop jobs during the next decade. Job openings will be particularly numerous in the early fifties as the metalworking industries, which are the main source of machine-shop jobs, expand to meet increasing defense requirements. The long-range employment trend in metalworking industries is also upward, as chart 50 shows. However, as the chart also shows, the metalworking industries are more seriously affected by business depressions than industry generally. Thus, machine-shop workers suffer heavy lay-offs and a greatly reduced workweek when economic conditions are bad.

In the maintenance shops of nonmetal industries, long-run growth in machine-shop employment is also in prospect. These industries as a whole have a general upward trend associated with rising population and national income. Moreover, the gradual mechanization of industry tends to expand the need for maintenance machine-shop workers to keep mechanical equipment in good condition. Many of these nonmetal industries are much less affected by changes in general business conditions than are the metalworking industries, so that machine-shop workers in the nonmetal industries tend to have fairly steady employment over the years.
In addition to the expected rise in machine-shop employment, replacement needs (resulting from the loss of experienced workers) will create thousands of openings for beginners. Death and retirement of experienced men may provide something in the order of 15,000 openings annually during the 1950-60 decade. This will be a particularly important factor in the skilled occupations, which have a relatively high proportion of older workers. In the less skilled occupations, shifting into other lines of work is fairly common; many thousands of openings for newcomers will arise in this way.

In addition, replacements will be needed as workers are called up for service in the Armed Forces; although some of those who are in critical machine-shop occupations may be deferred.

**Machine-Shop Workers and Their Jobs**

Employment in major machine-shop occupations is shown in chart 51. The basic machine shop job is that of machinist, employed mainly where workers are needed who are qualified to do any of the operations in a machine shop. Tool and die makers are essentially highly trained machinists who specialize in making the cutting tools, jigs, fixtures, and dies used in the various metalworking operations. Machine-tool operators are the largest group of machine-shop workers; the occupation includes both skilled and semiskilled workers. Set-up men and lay-out men are skilled, specialized workers employed in shops which carry on volume production; these are among the smaller machine-shop occupations.

Except for the semiskilled machine tool operating jobs, the main method of entering these occupations is through apprenticeship. The apprentice must be mechanically inclined and temperamentally suited to very careful and exact work. Apprentices are generally required to have high-school or trade-school education. There are no special educational requirements for the semiskilled jobs.

Great physical strength is not required for machine-shop work. The workers, however, usually must stand at their jobs most of the day and be able to move about freely. Since continuous attention is required when the machine is in operation, the work may often be rather tedious, especially on simple and repetitive machining jobs. Where the work is varied and complex, and the standards of accuracy high, the worker can consider himself a real craftsman and experience the satisfaction that this feeling gives to the conscientious and capable person.

Because the work is not physically strenuous, many women are employed as machine-tool operators. However, most of them are employed in the less skilled machining operations; practically none are found among the tool and die makers and all-round machinists and relatively few among the skilled machine-tool operators.

Most machine shops are relatively clean, well lighted, and free from dust. They are generally safer places in which to work than are most factories.
MACHINE SHOP OCCUPATIONS

The great majority of machine-shop workers are members of unions. There are a number of labor organizations in this field, some of the more important of which are the International Association of Machinists (Independent), the International Union of Electrical, Radio and Machine Workers (CIO), the United Automobile, Aircraft and Agricultural Implement Workers of America (CIO), and the Mechanics Educational Society of America (Independent).

All-Round Machinists

(D. O. T. 4-75.010)

Outlook Summary

There will be many job opportunities in this occupation during the fifties, with many openings resulting from replacement needs.

Nature of Work

This is a skilled machine-shop occupation in which about 165,000 men are employed. In addition, there are many thousands with training as all-round machinists, but employed in other machine-shop occupations, such as that of machine-tool operator.

Variety is the main feature of the all-round machinist’s work. His training enables him to plan and carry through all operations needed in turning out a machined product and to switch readily from one kind of product to another. He knows how to work from blueprints and written specifications, can select the proper tools and materials required for each job, and can plan the proper sequence of cutting and finishing operations. When necessary, he lays out the work by marking the surface of the metal to show where machining is needed and to indicate the shape and depth of the cuts. After machining, he may finish his work by hand, using files and scrapers, and may assemble the parts by welding. His knowledge of shop practice, of the working properties of such metals as steel, cast iron, aluminum, and brass, and of what the various machine tools do, makes it possible for him to turn a block of metal into an intricate, precise part.

Training and Qualifications

According to most authorities, a 4-year apprenticeship is the best way to learn the machinist trade. Many have qualified without an apprenticeship, however, by picking up the trade over a number of years of varied shop experience.

An apprentice machinist must be mechanically inclined and temperamentally suited to very careful and exact work. Great physical strength is not required for this work. A high school or grade school education is desirable preparation for machinist training and some employers require such preparation. In general, this is a man’s occupation.

Where Employed

The majority of all-round machinist jobs are in maintenance shops in a variety of industries, such as railroads, textile mills, automobile factories, oil...
refineries, steel mills, and printing plants. Many all-round jobs are also found in manufacturing shops (including job and production shops). In production shops, there are large numbers of men trained as all-round machinists, but not usually employed as such; these men specialize in a single machine-shop function, such as set-up or operation of one type of machine tool.

Most of the machinists' jobs are in the Middle Western and Northeastern States where the metalworking industries are concentrated. Machinists are employed in every State, however, because of their use in maintenance work.

Outlook

Job openings for machinists will be plentiful during the early fifties, to fill the needs of expanding defense industries. However, there will be relatively few apprentice openings. In the long run, the number of jobs for all-round machinists in production work may show a slight decline. Continuing technical changes will reduce the skill needed in many machining operations, permitting the substitution of less trained men for machinists. Machinist training will continue, however, to offer considerable advantage to men going into these shops. Machinists are generally preferred for the specialized machine-tool operator jobs, which often pay as well or better than all-round jobs. They also will have many chances to get jobs setting up machines for groups of semiskilled operators. Moreover, all-round machine-shop workers must continue to be hired in order to supply the necessary supervisory staffs—the lead men and foremen—which are extremely important in the modern mass-production shops.

In maintenance shops, the number of all-round machinist jobs should show some growth over a period of many years. The increasing mechanization of industry will expand the need for men to keep production equipment in good working order, and this may mean more jobs for maintenance machinists. Replacement needs will provide many job opportunities. To provide for the replacement of all-round machinists who die or retire, 30 to 40 thousand new machinists must be trained between 1950 and 1960. In June 1949, there were nearly 10,000 registered machinists in training.

Earnings and Working Conditions

Although the pay of all-round machinists compares favorably with that of other machine-shop workers, it is often lower than the earnings of skilled machine-tool operators, many of whom work on an incentive basis. Earnings of production machinists in the machinery industries in selected cities in November 1949, are shown in the following tabulation:

<table>
<thead>
<tr>
<th>City</th>
<th>Average hourly earnings 1</th>
<th>City</th>
<th>Average hourly earnings 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>$1.48</td>
<td>Los Angeles</td>
<td>$1.72</td>
</tr>
<tr>
<td>Baltimore</td>
<td>1.44</td>
<td>Milwaukee</td>
<td>1.65</td>
</tr>
<tr>
<td>Boston</td>
<td>1.57</td>
<td>Minneapolis-St. Paul</td>
<td>1.60</td>
</tr>
<tr>
<td>Chattanooga</td>
<td>1.53</td>
<td>Newark-Jersey City</td>
<td>1.62</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.81</td>
<td>New York City</td>
<td>1.70</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>1.42</td>
<td>Philadelphia</td>
<td>1.61</td>
</tr>
<tr>
<td>Cleveland</td>
<td>1.71</td>
<td>Pittsburgh</td>
<td>1.52</td>
</tr>
<tr>
<td>Dallas</td>
<td>1.50</td>
<td>Portland, Oreg</td>
<td>1.75</td>
</tr>
<tr>
<td>Denver</td>
<td>1.51</td>
<td>Providence</td>
<td>1.40</td>
</tr>
<tr>
<td>Detroit</td>
<td>1.79</td>
<td>St. Louis</td>
<td>1.74</td>
</tr>
<tr>
<td>Hartford</td>
<td>1.46</td>
<td>Seattle</td>
<td>1.79</td>
</tr>
<tr>
<td>Houston</td>
<td>1.80</td>
<td>Syracuse</td>
<td>1.54</td>
</tr>
<tr>
<td>Indianapolis</td>
<td>1.65</td>
<td>Tulsa</td>
<td>1.55</td>
</tr>
</tbody>
</table>

1 Straight-time earnings (excluding premium pay for overtime and night work).

Average straight-time hourly earnings for production machinists in the airframe industry in May–June 1949 were $1.72. Recent earnings data for other industries are not available.

Promotional opportunities for all-round machinists are good. Many advance to foreman of a section in the shop, or to other supervisory jobs. With additional training, some develop into tool or die makers. Some are successful in opening and operating machine shops of their own.
Machine Tool Operators
(D. O. T. 4-78.000 to 78.039 and 6-78.000 to 78.039; 4-78.500 to 78.589 and 6-78.500 to 78.589; 4-78.060 to 78.069)

Outlook Summary
Good job prospects.

Nature of Work
The operators of machine tools make up the bulk of the workers in machine shops. Nearly 470,000 workers were employed as machine-tool operators in the fall of 1949.

Machine-tool operating jobs may be divided into two main classes, according to the skill required. The skilled machine-tool operator does widely varying kinds of machining. Working from blueprints or lay-outs, he sets up his machine for each machining operation, adjusts the feed and speed controls, and measures the finished work to see if it meets specifications. He knows how to sharpen cutting tools when they become dull and understands the machining qualities of various metals. In brief, his work is very much like that of the all-round machinist, except that it is limited to a single type of machine tool.

The majority of machine-tool operators are much less skilled than the machine-tool specialists described above and do work which is repetitive, rather than varied. A typical job consists mainly of placing rough metal stock into an automatic machine tool, watching the machining operation for signs of trouble, and measuring the finished work with specially prepared gages which simplify measurement. He may make minor adjustments to keep the machine tool in operation, but must depend on more skilled men for major adjustments.

Machine-tool operators, skilled and semiskilled alike, are designated according to the kind of tool which they operate—for example, engine-lathe operator, turret-lathe operator, drilling-machine operator, grinding-machine operator, milling-machine operator. There are many other kinds of machine-tool specialists, each of whom knows his particular machine tool.

To become a skilled machine-tool operator requires from 1½ to 3 years of on-the-job training. Many of these jobs, however, are filled by men who have completed all-round machinist apprenticeships. Semiskilled machine-tool operators are generally trained in not more than 6 months on the job.

Where Employed
Skilled machine-tool specialists are employed in all types of machine shops, but most of them work in production shops. The proportion of these specialists varies greatly among production shops, however, depending on the extent of job breakdown and the kind of machining done. They form a smaller percentage of the workers in job and maintenance shops, where an all-round knowledge of machine-shop practice is generally preferred. Nevertheless, a substantial number of skilled operators are employed in these shops, working under the guidance of all-round machinists.

The employment of semiskilled machine-tool operators is confined mainly to production shops and is concentrated particularly in such mass-production industries as automobiles and farm machinery. Because of their limited training, few can be used in either job or maintenance shops.

Outlook
There will be many thousands of opportunities for new workers to get jobs as machine tool operators during the next decade. Job openings will be particularly numerous during the early fifties as the metalworking industries expand to meet defense requirements.

Long-run job prospects for skilled machine-tool specialists are likely to be good. Some employers will continue to train specialists in preference to training all-round men, because it costs less. The growth of specialization in machine-shop work will continue and this trend may offset technical advances which otherwise would reduce the need for skilled operators.

Those who get jobs as semiskilled operators also have good prospects for continued employment in the future. The gradual simplification of machine-tool work through greater use of automatic machines may widen their field of employment. On the other hand, technical advances
which increase the efficiency of machine tools will tend to hold down the total number of jobs in this occupation.

The need to replace the many machine-tool operators who shift to other occupations or who die or retire will result in many job openings for new workers each year. Replacements will also be needed for those entering the Armed Forces.

Earnings and Working Conditions

Many machine-tool operators, especially the less skilled, are paid on an incentive basis and hence their earnings are often as high as machine-shop workers of greater skill. Average hourly straight-time earnings (excluding premium pay for overtime and night work) for drill-press operators and engine-lathe operators in machinery manufacturing industries in selected cities in November 1949 are shown in the accompanying table.

Average straight-time hourly earnings for machine tool operators, in plants producing passenger cars, in February 1950, were as follows:

<table>
<thead>
<tr>
<th>Operator Type</th>
<th>Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring-mill operators</td>
<td>$2.00</td>
</tr>
<tr>
<td>Drill-press operators</td>
<td>1.61</td>
</tr>
<tr>
<td>Lathe operators</td>
<td>1.63</td>
</tr>
<tr>
<td>Milling-machine operators</td>
<td>1.61</td>
</tr>
<tr>
<td>Screw-machine operators</td>
<td>1.67</td>
</tr>
</tbody>
</table>

Recent earnings data for other industries are not available.

Skilled machine-tool specialists may be promoted to such jobs as set-up man or supervisor (on machines on which they have specialized). If they can get experience on several different kinds of machine tools, they, also, may develop into all-round machinists. Semiskilled operators generally have little chance for advancement since they are employed mainly in production shops where the work is very repetitive and where there are few opportunities to develop additional skills.

### Average hourly straight-time earnings, 1949

<table>
<thead>
<tr>
<th>City</th>
<th>Drill-press operators, single- and multiple-spindle</th>
<th>Engine-lathe operators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class A</td>
<td>Class B</td>
</tr>
<tr>
<td>Atlanta</td>
<td>$1.16</td>
<td></td>
</tr>
<tr>
<td>Baltimore</td>
<td>1.19</td>
<td>1.12</td>
</tr>
<tr>
<td>Boston</td>
<td>1.67</td>
<td>1.37</td>
</tr>
<tr>
<td>Buffalo</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>Chattanooga</td>
<td>1.35</td>
<td>1.05</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.65</td>
<td>1.52</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>1.52</td>
<td>1.34</td>
</tr>
<tr>
<td>Cleveland</td>
<td>1.70</td>
<td>1.70</td>
</tr>
<tr>
<td>Dallas</td>
<td>1.36</td>
<td>1.65</td>
</tr>
<tr>
<td>Denver</td>
<td>1.33</td>
<td>1.62</td>
</tr>
<tr>
<td>Detroit</td>
<td>1.80</td>
<td>1.57</td>
</tr>
<tr>
<td>Hartford</td>
<td>1.84</td>
<td>1.35</td>
</tr>
<tr>
<td>Houston</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td>Indianapolis</td>
<td>1.58</td>
<td>1.58</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>1.53</td>
<td>1.11</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>1.69</td>
<td>1.59</td>
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<tr>
<td>Minneapolis-St. Paul</td>
<td>1.61</td>
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<tr>
<td>Newark-Jersey City</td>
<td>1.53</td>
<td>1.43</td>
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<tr>
<td>New York City</td>
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<td></td>
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<tr>
<td>Philadelphia</td>
<td>1.52</td>
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<td>Pittsburgh</td>
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<tr>
<td>Portland, Oreg</td>
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<td></td>
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<tr>
<td>Providence</td>
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<tr>
<td>St. Louis</td>
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</tr>
<tr>
<td>Seattle</td>
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</tr>
<tr>
<td>Syracuse</td>
<td>1.51</td>
<td>1.54</td>
</tr>
<tr>
<td>Tulsa</td>
<td>1.28</td>
<td>1.19</td>
</tr>
<tr>
<td>Worcester</td>
<td>1.62</td>
<td>1.45</td>
</tr>
</tbody>
</table>

### Tool and Die Makers

(D. O. T. 4-75.010, .940, and .210)

**Outlook Summary**

Tool and die making offers good long-range employment prospects.

**Nature of Work**

The function of tool makers is to make the cutting tools used on machine tools, and the jigs, fixtures, and other accessories which hold the work while it is being machined. They also make the gages and other measuring devices needed for precision work. Die makers construct the dies which are used in such metal-forming operations as forging, stamping, and pressing; and they also make the metal molds used in die-casting metal and molding plastics. Tool and die makers must
### Average straight-time hourly earnings of tool and die makers

<table>
<thead>
<tr>
<th>City</th>
<th>Jobbing shops</th>
<th>Other than jobbing shops</th>
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</thead>
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<tr>
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</tr>
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<td>1.67</td>
</tr>
<tr>
<td>Detroit</td>
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<td>2.08</td>
</tr>
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<td>1.70</td>
</tr>
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<td>Houston</td>
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<tr>
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<td>Portland, Oreg</td>
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</tr>
<tr>
<td>Providence</td>
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<td>1.60</td>
</tr>
<tr>
<td>St. Louis</td>
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<td>1.96</td>
</tr>
<tr>
<td>Seattle</td>
<td></td>
<td>2.06</td>
</tr>
<tr>
<td>Syracuse</td>
<td>1.70</td>
<td>1.69</td>
</tr>
<tr>
<td>Tulsa</td>
<td></td>
<td>1.71</td>
</tr>
<tr>
<td>Worcester</td>
<td></td>
<td>1.62</td>
</tr>
</tbody>
</table>

have the broad knowledge of the all-round machinist, including blueprint reading, lay-out work, setting up and operating machine tools, using precision measuring instruments, understanding the working properties of common metals and alloys, and making shop computations. In addition, they must be able to work to closer tolerances than those usually required of machinists and must do a greater amount of precise hand work. These requirements, plus specialization on tools and dies, distinguish tool and die makers from all-round machinists.

### Training and Qualifications

This work requires rounded and varied machine-shop experience, usually obtained through formal apprenticeship or the equivalent in other types of on-the-job training. In July 1949, there were about 6,000 tool and die maker apprentices in training. A tool and die apprenticeship ordinarily covers 4 or 5 years, including mainly shop training in various parts of the job. In addition, during the apprenticeship, courses such as shop arithmetic and blueprint reading are usually given in vocational schools. After apprenticeship, a number of years of experience as a journeyman is often considered necessary to qualify for the more difficult tool and die work. Since tool and die making is the most exacting type of machine-shop jobs, persons planning to enter the trade should have a great deal of mechanical ability and liking for painstaking work. This is essentially a man's job, although little physical strength is required.

### Where Employed

The estimated 85,000 tool and die makers are employed in many different metalworking industries. The automobile industry is the largest employer of these workers. Also very important are tool and die jobbing shops. Many are employed in other machinery industries. Among the nonmetal industries using these workers is the plastics products industry, which employs die makers to make metal molds.

Most of the tool and die maker employment is in the midwestern and northeastern sections of the country. Michigan, especially the Detroit area, has more jobs than any other section. Many
are also employed in Ohio, Illinois, New York, and Pennsylvania.

**Outlook**

Tool and die making offers good long-range employment prospects. These workers are needed not only to repair and replace the tools and dies normally used by industry but also to retool plants for new models and new products. Also the trends toward greater use of die casting, stamping, and plastics molding will tend to increase die-maker employment. In the early fifties, the demand for tool and die makers will be particularly strong as the metalworking industries expand to meet defense requirements.

Even in the event of a general business depression, with machine-shop employment temporarily falling to a low level, experienced tool and die makers, because of their all-round skills, would have fairly good chances to get lower rated machine-shop jobs. Thus, from the point of job security, they may have a considerable advantage over other machine-shop workers.

**Earnings and Working Conditions**

This is the highest paid machine-shop occupation. In November 1949, the average straight-time hourly earnings (excluding premium pay for overtime and night work) of tool and die makers employed in the machinery industries in selected cities are shown in the foregoing tabulation.

Higher rates are generally paid in jobbing shops than in production shops. Average earnings in the airframe industry for tool and die makers in mid-1949 were $1.79 an hour. In passenger-car manufacturing plants, average straight-time hourly earnings, in February 1950, were $1.98 for die makers (excluding leaders) and $1.97 for tool makers (excluding leaders). Recent earnings information for other industries is not available.

Tool and die makers often rise to better jobs. Many have advanced to shop superintendent or other responsible supervisory work, or to such positions as tool designer. (See statement on this occupation, p. 192.) Another avenue of opportunity is the opening of their own small tool and die jobbing shops.

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**Set-up Men (Machine Shop)**

*(D. O. T. 4-75.160)*

**Outlook Summary**

Some openings for qualified men in this small, growing occupation.

**Nature of Work**

The set-up man is a skilled specialist employed in machine shops which carry on large-volume production. His job is to install cutting tools and adjust the controls of machine tools so that they can be run by semiskilled operators.

The usual practice is to assign a set-up man to a number of machine tools, which are often of one type, such as the turret lathe. The set-up man works from blueprints, written specifications, or job lay-outs in order to set the cutting tools in place and to adjust for each machining operation the guides, speed and feed controls, working tables, and other parts of machine tools. After setting up and adjusting a machine, he makes a trial run to see if it is working properly, and then turns it over to the regular operator. During the machining operation he makes all important adjustments needed for accurate production.

In order to become a set-up man, it is usually necessary to qualify first as an all-round machinist or as a skilled machine-tool specialist, since the job requires a good background in machine-shop practice as well as a thorough knowledge of the operation of at least one type of machine tool.

**Outlook**

Set-up men comprise one of the smaller occupations among machine-shop workers. However, the long-run trend toward using these skills in conjunction with semiskilled machine-tool operators in many shops is expected to continue. Thus, there should be openings for men with the necessary qualifications. The number of set-up men should increase substantially during the early fifties because of the expected expansion of production in metalworking industries.
Lay-out Men (Machine Shop)
(D. O. T. 4-75.140)

Outlook Summary

There will be openings for experienced all-round machinists to get into this field.

Nature of Work

The lay-out man is a highly skilled specialist whose job is to make guide marks on metal before it is machined to indicate to the machine-tool operators the kind of machining needed.

Working from blueprints or written specifications, the lay-out man marks guide lines, reference points, and other instructions to operators on rough castings, forgings, or metal stock. He uses a wide assortment of instruments, including the scriber, with which he marks lines on the surface of the metal; the center punch, used to indicate the centers on the ends of metal pieces to be machined or drilled; the keyseat or box rule, used for drawing lines and laying off distances on curved surfaces; dividers, for transferring and comparing distances; L- or T-squares for determining right angles; and calipers and micrometers for accurate measurement. Not only must the lay-out man work with extreme accuracy, but also he has to be familiar with the operation and uses of each of the standard machine tools.

Generally it takes from 6 to 10 years to develop this skill, including the machinist apprenticeship or equivalent training needed to learn the fundamentals of machine-shop practice. Earnings in this occupation are among the highest in machine shops.

Outlook

This is one of the smaller machine-shop occupations. However, employment opportunities for qualified men are likely to be good, since there is a trend toward employing skilled lay-out men in conjunction with semiskilled machine-tool operators in production shops. A considerable rise in the number of lay-out men is in prospect during the early fifties as production in metalworking plants expands to meet defense requirements.

Where To Get Additional Information


The lay-out man must have a broad knowledge of machine-shop work and be able to use marking and measuring instruments.

PHOTOGRAPH BY U. S. DEPARTMENT OF LABOR
FOUNDRY OCCUPATIONS

Foundries constitute one of the principal metalworking fields and one of the larger sources of employment for trained workers in manufacturing. The more than 5,000 foundries in the United States employed about 435,000 production workers in July 1950, many of them in skilled occupations. Prospects are that a large number of new workers will get foundry jobs during the 1950-60 decade. Earnings are above the average for factory work generally.

Characteristics of Foundries

Foundries are places where castings are made. A casting is formed by pouring molten metal into a mold and allowing the metal to harden, taking the shape of the mold. This is one of industry's basic metalworking methods since it can produce metal parts in a wide range of shapes and sizes. Castings in general use include automobile cylinder blocks, water mains, bathtubs, machinery bearings, ship propellers, railway car wheels, machine-tool bases, radiators, valve bodies, locomotive frames, and hundreds of other industrial applications.

Casting is applied to a number of different metals and their alloys. Gray iron accounts for most of the tonnage produced and the largest segment of employment in the entire foundry field. Steel and malleable iron are the other important types of ferrous metals which are cast. Among the nonferrous metals, the main casting materials are brass, bronze, aluminum, and magnesium.

Foundries usually specialize in casting one or two
metals—since somewhat different kinds of equipment and methods are used for the various metals. Most foundry workers can transfer, however, from casting one type of metal to another without much extra training.

Foundries differ greatly in the way their production is organized. Production foundries make large quantities of identical castings, using mainly machine methods and requiring relatively few skilled workers. Many of the production foundries are "captive" or "integrated" foundries, that is, they are departments of firms which use castings in manufacturing finished products such as automobiles, various types of machinery, agricultural implements, plumbing and heating equipment, or electrical machinery. Jobbing foundries, on the other hand, make a variety of shapes and sizes of castings, usually in limited quantities.

Although the amount of mechanization has been increasing, hand methods are still used to a great extent in jobbing shops, and a relatively high proportion of skilled workers is required. Jobbing foundries are usually separate establishments ("independent" or "commercial" foundries), selling their castings to other companies. The distinction between production and jobbing foundries is not always sharply defined, as production foundries often do some jobbing work and jobbing foundries may carry on some semiproduction operations.

Foundries vary greatly in size. In 1947, of the more than 1,600 independent gray-iron foundries, only 13 had more than 1,000 workers each. On the other hand, over one-half of the gray-iron foundries employed fewer than 50 workers. Both steel foundries and malleable-iron foundries are generally larger than the typical gray-iron foundry; more than half of the workers in these foundries were employed in plants with more than 500 employees. Nonferrous foundries are typically small; four-fifths of them had fewer than 50 employees each in 1947.

As the map (chart 52) shows, most of the foundry jobs are in the Midwestern and Northeastern States. Foundries tend to be near the great concentrations of metalworking industries for which they produce castings, and near the supply of such basic materials as pig iron, coke, and nonferrous metals. The leading foundry States are Ohio, Pennsylvania, Illinois, and Michigan. However, foundry jobs appear in substantial numbers in other parts of the country. Alabama, for example, has many foundry workers; in California, foundry employment has recently become more important. Every State has some foundry jobs.

**Employment Outlook**

Foundries are expected to hire many new workers during the 1950-60 decade. Openings will be particularly numerous during the early fifties, as metalworking industries—the principal users of castings—expand to meet defense requirements. Many job opportunities will be created by the need to replace those workers who leave the foundries because of death, retirement, or shifting to other fields of work.

There has been a long-run upward trend in foundry production and employment. This trend reflects the growth of the whole economy and particularly the great expansion of the metalworking industries including the automobile, machinery, railroad, electrical equipment, and plumbing and
heating equipment industries. However, foundry activity has also shown wide fluctuations from year to year. To a high degree, these fluctuations are associated with changes in general business conditions; foundries are especially hard hit during depressions, but in boom times, their situation is particularly favorable. For example, there was a drop of 67 percent in iron and steel castings output between 1929 and 1933, and a rise of 82 percent between 1939 and 1947. Wartime also causes sharp fluctuations in foundry activity. Tremendous requirements for castings for aircraft, tanks, and ordnance lead to a rapid rise in foundry output, followed by some postwar decline.

Chart 53 shows the trend of foundry employment in recent years. It can be seen that the number of workers employed in foundries is far above prewar, although somewhat lower than the wartime peak. In July 1950, about 435,000 production workers had jobs in foundries (including both independent and integrated foundries). In the early fifties, foundry employment is expected to rise above this level, because of the need for castings by defense industries during the next decade.

Long-run prospects are good in many of the industries which use large amounts of castings, including automobile, electrical equipment, farm machinery, many kinds of industrial equipment, and plumbing and heating supplies. This should mean gradually increasing levels of castings production. However, foundry employment is not expected to rise quite as much as production. Continued technical advances in foundry methods will mean that fewer workers will be needed to produce a given amount of castings. Some of the more important technological changes may include more extensive installation of materials-handling equipment and greater use of permanent-mold castings.

Although no great rise in employment is anticipated, over the long run, foundries will hire many workers each year because of the need to replace employees who leave the foundries. Openings resulting from death and retirement may run about 6,000 to 10,000 annually. Replacement demand of this kind will be especially important in the more skilled occupations, in which there are many workers of relatively advanced age. An even greater number of openings should result from the shifting of experienced foundry workers into other kinds of employment. In the semiskilled and unskilled occupations, most of the job openings will arise in this way. Replacements will also be needed for those entering the Armed Forces.

Foundry Workers and Their Jobs

Most skilled jobs in foundries, as well as many of the less skilled, are not found elsewhere in industry. Estimated employment in some of the principal foundry occupations is shown in chart 54. There are many occupations which are not typical of foundry work as such, but which are, nevertheless, represented in foundries. These workers are found throughout industry and include maintenance workers (such as carpenters and electricians), engineers, clerical employees, and laborers.

The customary employment practice is to hire only men for most foundry occupations. During the war, a large number of women worked in foundries, but relatively few have remained. In May 1950, about 5 percent of all employees in independent iron and steel foundries were women. The proportion of Negroes in foundries is fairly high. They are employed not only in many unskilled and semiskilled foundry occupations but also to a substantial extent as skilled molders and coremakers.

Wages in foundries are somewhat above the aver-
FOUNDRY OCCUPATIONS

In July 1950, production workers in independent iron and steel foundries earned an average of about $1.54 an hour (including pay for overtime and night work). Those in nonferrous foundries averaged about $1.60 an hour. This compares with average hourly earnings of about $1.46 for all manufacturing industries in the same month.

The working environment varies greatly among individual foundries. In some, the conditions compare favorably with metalworking industries generally; in others, safety and comfort are below the average for metalworking.

Foundries are sometimes hot places to work, particularly near the melting units in the summer months. Smoke and fumes are sometimes a nuisance. Noise may be a problem in certain operations, particularly in cleaning and finishing.

The injury rate in foundries tends to be relatively high, but there has been considerable improvement of working conditions and safety practices in recent years. The frequency of accidents varies among the different foundry occupations. In general, patternmaking and coremaking are the least hazardous, molding is somewhat more unsafe, and jobs in melting and chipping tend to have among the highest injury rates.

The large majority of foundry workers are union members. The principal labor organizations covering these workers include the International Molders and Foundry Workers Union of North America (AFL), the United Steelworkers of America (CIO), and the United Automobile, Aircraft, and Agricultural Implement Workers of America (CIO). Most patternmakers are members of the Pattern Makers' League of North America (AFL).

The first step in casting is for the patternmaker to make a wood or metal pattern in the shape of the final casting desired. Sandmixers prepare sand for use in molding and coremaking. Hand molders make the sand molds into which metal is poured. The molds are made by packing and ramming sand around the patterns. Molders' helpers may assist in these operations. Machine molders operate one of several types of machines which simplify and speed up the making of large quantities of identical sand molds. Coremakers shape the bodies of sand, or "cores," which are placed inside molds in order to form any hollow spaces needed in castings. Core assemblers may be used to put together core sections. Core-oven tenders operate furnaces in which cores are often baked.

With the mold made and the cores, if any, put inside, the next step is to pour the molten metal into the mold. A melter operates a furnace used to melt metal for castings. The actual pouring is customarily done by a pourer, although in some small foundries it is part of the molder's job. When the casting has cooled off, it is taken out of the mold by shake-out men and sent to the cleaning and finishing department. Sandblasters and tumbler operators run the various kinds of cleaning equipment. Chippers and grinders remove excess metal and finish castings. The casting may be placed in an annealing furnace to improve its physical properties; annealers run these furnaces. Casting inspectors then check finished castings for structural soundness and proper dimensions. Another group of workers are the foundry technicians—skilled workers having to do with quality control in the making of castings.

Among the many types of jobs associated with foundry work, three occupations—molder, coremaker, and patternmaker—stand out as especially significant. Molding and coremaking are relatively large occupations and include a high proportion of skilled jobs requiring apprenticeship or equivalent training. Although fewer workers are engaged in patternmaking, the skill needed is very high and apprenticeship is the normal method of entry. For the less skilled foundry jobs, persons without previous foundry experience may be hired directly or foundry laborers may be upgraded. The leading foundry occupations are discussed below.
Hand Molders

These foundry workers use mainly hand methods to prepare the sand molds into which metal is poured to make castings. A mold is made by packing and ramming prepared sand around a model or pattern of the desired casting and then removing the pattern, leaving in the sand a hollow space in the shape of the casting to be made. Molds for smaller castings are usually made on a workbench by bench molders; those for large and bulky castings are made on the foundry floor by floor molders. Skill requirements in this occupation vary considerably. An all-round hand molder (journeyman) makes widely varying kinds of molds. A less skilled molder does more repetitive work, specializing on a single kind of mold. Hand molders work mainly in jobbing foundries. In production foundries, where most of the molding is done by machine, some journeyman molders are employed in skilled, specialized molding jobs and in supervisory positions.

Completion of a 4-year apprenticeship, or the equivalent in experience, is needed to become a journeyman molder and thus to qualify for all-round hand molding and for the skilled specialized or supervisory jobs. Men with this training are also preferred for many kinds of machine molding. For the less skilled jobs, not more than 6 months of on-the-job training is usually required.

For a molding apprenticeship, an eighth grade education is usually the minimum, and many employers specify additional school work up to and including high school graduation. Eighth grade schooling, however, suffices for most jobs as learners of less skilled hand molding.

Physical standards for molding jobs take into account the need for continual standing and moving about, frequent lifting, good vision, and manual dexterity.

Hand molders are among the highest paid foundry workers. Average straight-time hourly earnings of male floor and bench molders in independent ferrous foundries in the summer of 1950, are shown in the following tabulation:

<table>
<thead>
<tr>
<th>City</th>
<th>Floor</th>
<th>Bench</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
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<td>$1.15</td>
</tr>
<tr>
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<td>1.68</td>
</tr>
<tr>
<td>Buffalo</td>
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<td>1.64</td>
</tr>
<tr>
<td>Chicago</td>
<td>1.76</td>
<td>1.74</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>1.70</td>
<td>1.60</td>
</tr>
<tr>
<td>Cleveland</td>
<td>1.83</td>
<td>1.76</td>
</tr>
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</tr>
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<td></td>
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<tr>
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</tr>
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<td>1.83</td>
<td>1.66</td>
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<td>1.61</td>
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<td>1.72</td>
</tr>
<tr>
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<td>1.72</td>
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<td>1.76</td>
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<td>St. Louis</td>
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<td>San Francisco</td>
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<td>1.85</td>
</tr>
<tr>
<td>Toledo</td>
<td>1.76</td>
<td>1.61</td>
</tr>
</tbody>
</table>

Hand molders with all-round training have good chances for promotion to supervisory jobs. Opportunities for advancement are much more limited for the less skilled hand molders.
Machine Molders
(D. O. T. 4-81.050; 6-81.010 and .020)

Machine molders are foundry workers who operate one of several types of machines which simplify and speed up the making of large quantities of identical sand molds for castings. The basic duties of a machine molder consist mainly of assembling the flask (molding box) and pattern on the machine table, filling the flask with prepared sand, and operating the machine by the properly timed use of its control levers and pedals. Machine molders sometimes are qualified journeyman molders who require little supervision and who set up and adjust their own machines. More commonly, however, the machine molder is a semi-skilled worker, whose duties are limited to operating the machine which is set up for him. Machine molders are employed mainly in production foundries which make large quantities of identical castings.

For molding machine jobs of the more difficult and responsible types, a 4-year molder apprenticeship or equivalent training is required. However, machine molding of the less skilled variety is ordinarily learned in from 30 to 90 days of on-the-job training. Average physical strength is needed.

Machine molders are generally among the highest paid foundry workers. Average straight-time hourly earnings of men operating molding machines in independent ferrous foundries in the summer of 1950, are shown in the following tabulation:

<table>
<thead>
<tr>
<th>City</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
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</tr>
<tr>
<td>Cleveland</td>
<td>$1.81</td>
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<td>Detroit</td>
<td>$1.95</td>
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<td>Indianapolis</td>
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<td>Newark-Jersey City</td>
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<td>St. Louis</td>
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<td>San Francisco</td>
<td>1.84</td>
</tr>
<tr>
<td>Toledo</td>
<td>2.03</td>
</tr>
</tbody>
</table>

A machine molder who has completed an apprenticeship or acquired other all-round molding experience is often in line for promotion to a supervisory job. A semiskilled machine molder, however, generally has much less chance for advancement.

Hand Coremakers
(D. O. T. 4-82.010)

These workers use hand methods to prepare the bodies of sand, or cores, which are placed in molds to form hollows or holes required in metal castings. A core is made by packing prepared sand into a hollow form (core box) so that the sand is compressed into the desired shape. Small cores are made on a workbench by bench coremakers; large and bulky cores are made on the foundry floor by floor coremakers. Skill requirements in this occupation differ considerably. All-round hand coremakers (journeymen) prepare a variety of larger or more intricate cores. The less skilled coremakers make the small and simple cores, frequently produced in large numbers, so the work is highly repetitive.

Journeyman hand coremakers usually work in
jobbing foundries. Some journeyman coremakers work in production foundries as supervisors or in skilled, specialized jobs. Semiskilled hand coremakers are generally employed in production foundries.

Completion of a 4-year apprenticeship, or the equivalent in experience is needed to become a journeyman coremaker. Molding and coremaking training is often combined in a single apprenticeship. For the less skilled jobs, only a few months of on-the-job training is usually required. For coremaking apprentices, an eighth grade education is usually the minimum, and many employers specify additional school work up to and including high-school graduation. Eighth grade schooling, however, suffices for most jobs as learners of less skilled hand coremaking.

Physical requirements for light coremaking are fairly modest, since the work is not strenuous; women are frequently employed in the less skilled coremaking jobs. Coremaking is generally somewhat safer than other foundry work.

Hand coremakers are among the better paid foundry workers. Average straight-time hourly earnings of male hand coremakers in independent ferrous foundries in the summer of 1950, are shown below:

<table>
<thead>
<tr>
<th>City</th>
<th>Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>$1.15</td>
</tr>
<tr>
<td>Boston</td>
<td>$1.67</td>
</tr>
<tr>
<td>Buffalo</td>
<td>$1.70</td>
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<td>Chicago</td>
<td>$1.76</td>
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<td>Cleveland</td>
<td>$1.86</td>
</tr>
<tr>
<td>Denver</td>
<td>$1.54</td>
</tr>
<tr>
<td>Detroit</td>
<td>$1.95</td>
</tr>
<tr>
<td>Hartford</td>
<td>$1.50</td>
</tr>
<tr>
<td>Houston</td>
<td>$1.57</td>
</tr>
<tr>
<td>Indianapolis</td>
<td>$1.60</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>$1.71</td>
</tr>
<tr>
<td>Minneapolis-St. Paul</td>
<td>$1.82</td>
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<td>Newark-Jersey City</td>
<td>$1.62</td>
</tr>
<tr>
<td>New York</td>
<td>$1.70</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>$1.92</td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>$1.73</td>
</tr>
<tr>
<td>Portland, Oreg</td>
<td>$1.78</td>
</tr>
<tr>
<td>St. Louis</td>
<td>$1.75</td>
</tr>
<tr>
<td>San Francisco</td>
<td>$1.84</td>
</tr>
<tr>
<td>Toledo</td>
<td>$1.85</td>
</tr>
</tbody>
</table>

A hand coremaker who has completed his apprenticeship or acquired equivalent, full-round experience may be promoted to a supervisory job.

Machine Coremakers

(D. O. T. 6-82.010, .020, and .030)

Machine coremakers operate several different types of machines which force prepared sand into specially shaped hollow forms to make sand cores. These cores are placed in molds to form hollow spaces required in the castings. The duties and skill of machine coremakers vary. Some workers are required to set up and adjust their own machines and do any necessary finishing operations on the cores; less skilled coremakers are more closely supervised, and the necessary adjusting of the machines is done for them. Machine coremakers are employed mainly in production foundries, where large quantities of identical castings are made.

Generally, for the less skilled machine-coremaker jobs only a brief period of on-the-job training is needed, and no special form of preparation is required. Persons without previous foundry experience may be hired directly, or foundry laborers or helpers may be upgraded to this work. However, a 3- or 4-year coremaker apprenticeship, or equivalent training, is sometimes needed for the more difficult and responsible machine-coremaking jobs. For many types of machine coremaking, little physical strength is needed, and some women are employed.
Patternmakers are the highly skilled craftsmen who construct patterns and core boxes for castings. They are classified, primarily, according to the kind of material they use in making patterns. Those who construct wooden patterns constitute about two-thirds of the total. Of the remainder, most are metal patternmakers, although there are a few who work with other materials, such as plaster.

To do his job properly, a patternmaker must understand general foundry practice. He works from blueprints and plans the pattern, taking into consideration the manner in which the object will be cast and the type of metal to be used. The wood patternmaker selects the appropriate wood stock and lays out the pattern, marking the design for each section on the proper piece of wood. Using power saws, he cuts each piece of wood roughly to width and length. He then shapes the rough pieces into their final form, using various woodworking machines—such as borers, lathes, planers, band saws, and sanders—as well as many small hand tools. Finally, he assembles the pattern segments by hand.

The duties of a metal patternmaker differ from those of a wood patternmaker principally in that metal and metalworking equipment are substituted for wood and woodworking equipment. Metal patternmakers prepare patterns from metal stock, or, more commonly, from rough castings made from an original wood pattern. To shape and finish their work, they use a variety of metalworking machines, including the engine lathe, drill press, milling machine, power hacksaw, grinder, and shaper. Apart from these differences, metal patternmaking is similar to work on wood patterns, requiring blueprint reading and lay-out.

Throughout his work the patternmaker carefully checks each dimension of the pattern. A high degree of accuracy is required, since any imperfection in the pattern will be reproduced in the castings made from it. Other duties of patternmakers include making core boxes (in much the same manner as patterns are constructed) and repairing patterns and core boxes.

Patternmaking is done in specially equipped pattern shops, which are of two types—independent and integrated. Independent pattern shops are separate establishments which make patterns for sale. An integrated shop may be operated in conjunction with a foundry which uses the patterns; on the other hand, it may be the pattern department of a plant that buys castings from a commercial foundry, to which it supplies appropriate patterns with each new order for castings.

Apprenticeship, or a similar program of on-the-job training, is the principal means of qualifying as a journeyman patternmaker. Because of the high degree of skill and the wide range of knowledge needed for patternmaking, it is very difficult to obtain the necessary training through informally picking up the trade. Good trade school courses in patternmaking provide useful preparation for the prospective apprentice, and may in some cases be credited toward completion of the apprentice period. However, these courses do not substitute for apprenticeship or other on-the-job training.

The usual apprenticeship period for patternmaking is 5 years, or about 10,000 working hours. At least 720 hours of classroom instruction in related technical subjects is normally provided during apprenticeship. Since wood and metal patternmaking differ in certain essential respects, there are separate apprenticeships for each type.

Patternmaking, although not strenuous, requires considerable standing and moving about. A high degree of manual dexterity is especially important because of the precise nature of many hand operations. For all practical purposes, this is entirely a man’s occupation.

Patternmaking is among the highest paid occupations in manufacturing. In independent pattern shops, union patternmakers in such large foundry centers as Chicago, Cleveland, and Detroit generally earn upward of $2 an hour straight-time, and some make as much as $3.50 an hour.
Average straight-time hourly earnings of patternmakers in independent ferrous foundries in the summer of 1950, are shown below:

<table>
<thead>
<tr>
<th>City</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo</td>
<td>$1.70</td>
</tr>
<tr>
<td>Chicago</td>
<td>2.10</td>
</tr>
<tr>
<td>Cleveland</td>
<td>2.28</td>
</tr>
<tr>
<td>Hartford</td>
<td>1.89</td>
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<tr>
<td>Indianapolis</td>
<td>2.08</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>2.32</td>
</tr>
</tbody>
</table>

An experienced patternmaker may be advanced to pattern lay-out man or pattern-room foreman.

Occasionally a journeyman may have the opportunity to start a small pattern shop of his own. When patternmaking employment is not available, journeymen patternmakers can find jobs in related fields. Wood patternmakers can qualify for nearly every kind of skilled woodworking jobs—cabinetmaking, for example. Metal patternmakers are suited for many types of machine shop work, including the jobs of machinist, machine tool operator, and lay-out man. (See: Machine Shop Occupations, p. 186.)

**Chippers and Grinders (Foundry)**

Chippers and grinders constitute a large group of workers—most of them semiskilled—in the cleaning and finishing departments of foundries. Chipping consists of removing the excess metal from castings by means of pneumatic hammers or hand hammers and chisels. In grinding, a mechanically powered abrasive wheel is used to smooth and finish castings. Although chipping and grinding may be separate occupations they are often combined in one job, especially in the smaller foundries. There are variations in skill requirements, depending on the intricacy of the castings on which work is done, the degree of precision required, and the amount of supervision given the worker. Chippers and grinders are employed in both jobbing and production foundries.

The basic duties of the chipper or grinder are generally learned in a brief period of on-the-job training, and no special form of preparation is needed. Persons without previous foundry experience may be hired directly, or foundry laborers may be upgraded to this work. Considerable experience in chipping and grinding is required, however, to qualify for the more intricate, precise, and responsible duties.

In many respects chipping and grinding involves strenuous work, and at least average strength is needed. Consequently, relatively few women are employed in this occupation, and they work only on small castings.

Average straight-time hourly earnings of male chippers and grinders in independent ferrous foundries in the summer of 1950, are shown in the following tabulation:

<table>
<thead>
<tr>
<th>City</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>$1.26</td>
</tr>
<tr>
<td>Buffalo</td>
<td>1.46</td>
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<tr>
<td>Chicago</td>
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<tr>
<td>Cleveland</td>
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</tr>
<tr>
<td>Denver</td>
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</tr>
<tr>
<td>Detroit</td>
<td>1.74</td>
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<tr>
<td>Hartford</td>
<td>1.33</td>
</tr>
<tr>
<td>Houston</td>
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</tr>
<tr>
<td>Indianapolis</td>
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</tr>
<tr>
<td>Los Angeles</td>
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</tr>
<tr>
<td>Milwaukee</td>
<td>$1.66</td>
</tr>
<tr>
<td>Minneapolis-St. Paul</td>
<td>1.40</td>
</tr>
<tr>
<td>Newark-Jersey City</td>
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<td>New York</td>
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<td>Philadelphia</td>
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<tr>
<td>Portland, Oreg.</td>
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<tr>
<td>St. Louis</td>
<td>1.62</td>
</tr>
<tr>
<td>San Francisco</td>
<td>1.53</td>
</tr>
<tr>
<td>Toledo</td>
<td>1.72</td>
</tr>
</tbody>
</table>
Castings Inspectors
(D. O. T. 6-82.920)

Casting inspectors are foundry workers who check finished castings for structural soundness and proper dimensions. The more skilled inspectors are able to read blueprints, to work on widely different types of castings, and to mark partially defective castings to show what should be done to salvage them. The less skilled do routine measuring and checking of large numbers of identical castings under close supervision. Castings inspectors are employed in both jobbing and production foundries.

Skilled inspector jobs are usually filled by promotion from lower-grade inspection jobs or from other cleaning and finishing occupations, such as that of chipper and grinder. For the less skilled work, previous foundry experience may not be needed. Physical requirements depend on the size of castings inspected and the availability of mechanical handling equipment. In the lighter types of inspection work some women are employed, mainly for the less skilled jobs. Skilled inspectors may be promoted to the jobs of chief inspector or cleaning room foreman.

Melters (Foundry)
(D. O. T. 4-91.351; .411, .441, .447, .571, and .572)

A foundry melter operates or directs the operation of a furnace used to melt metal for castings. He usually specializes on a particular type of furnace—cupola, open-hearth, electric, crucible, or reverberatory—and on one or two metals. Skill requirements in this occupation depend on the way the foundry is organized and the type of melting equipment used. Skilled melters need little supervision and are responsible for charging the furnace, controlling the furnace temperature and melting time, and determining from the appearance of the molten metal when it is ready for pouring. Less skilled melters work under close supervision of a foundry manager or an engineer and need use little independent judgment. Melters are employed in both production and jobbing foundries.

As a rule, there are no apprenticeships or other organized training programs provided for melters. The less skilled melting jobs are learned in a brief period of informal training. The usual way to get one of the more skilled jobs is to begin as a furnace helper or less skilled melter and gradually learn the trade. The more skilled melters must have some familiarity with general foundry practice, shop arithmetic, and certain practical aspects of chemistry and metallurgy. Since the duties of melters are in many respects strenuous, physical requirements are fairly high and normally only men are employed. Accidents to workers in the melting units tend to occur more frequently than to those in other departments of the foundry.
Foundry Technicians

(D. O. T. 4-86.170)

This is a group of skilled foundry occupations having to do with quality control in the making of castings. Included are workers with such specialized duties as the testing of molding and core-making sand, chemical analysis of metal, operation of machines which test the strength and hardness of castings, and the use of X-ray or magnetic apparatus to inspect the internal structure of castings.

In general, a high school education is a prerequisite, and employers may require additional technical schooling. However, most of the foundry technician’s duties are learned on the job. Physical strength is not ordinarily needed, and women are often employed. Foundry technicians may advance to supervisory positions in their various specialized fields.
Forge shop work is among the smaller fields of employment in metalworking. In late 1949, about 45,000 workers were employed in forge shop occupations. However, these are among the best-paid factory occupations and include a high proportion of skilled jobs. During the fifties, there will be many job opportunities for new workers in forge shops. Most openings will be for laborers or helpers; the more-skilled forge shop jobs are generally filled by upgrading experienced men.

Nature of Forge Shop Work

Forging is used to shape metal objects which are required to withstand great stress, such as automobile crankshafts and axles, locomotive wheels, and marine engine drive shafts. Steel is the main material used, but brass and other nonferrous metals are also forged.

In general, forgings are produced in machines which pound or squeeze heated metal into the desired shape. This is similar to the work done by the old-time blacksmiths, except that machine power is substituted for the blacksmith’s arm, and dies replace his hammer and anvil.

Forge shop jobs are found in a variety of industries. The largest group is in independent steel forgings plants, producing forgings for sale to other industries. Many workers, however, are employed in the forge departments of plants which use forged parts in their final products, such as automobiles, railroad equipment, hand tools, or machinery. A number of these workers are in forge shops operated as part of steel mills.

Employment of forge shop workers is concentrated mainly in the metalworking centers of the Midwest and Northeast. Forge shops are located near the steel producing centers, which provide steel for forgings, as well as near the metalworking plants which are the major users of forged products, such as automobiles, machinery, and railroad equipment. Accordingly, the bulk of forge shop jobs are found in the industrial centers of Michigan, Illinois, Ohio, Wisconsin, Pennsylvania, and New York.

Employment Outlook

The long-range trend of forge-shop employment is upward. This is indicated by chart 55 which shows production worker employment in the independent iron and steel forgings industry during the last half century. The upward trend reflects the growth of the whole economy as well as the great expansion of metalworking industries which are the users of forgings. It has also resulted from the development of improved forging methods, leading to wider use of forged parts. During wartime especially, the industry experienced great gains because of the critical importance of forged parts in many military products. In part, these gains have been retained in postwar conditions.

CHART 55

FORGE SHOP EMPLOYMENT HAS VARIED GREATLY, BUT TREND IS UPWARD

Employment in Independent Steel Forging Plants

<table>
<thead>
<tr>
<th>Year</th>
<th>Index</th>
</tr>
</thead>
<tbody>
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<td>1899</td>
<td>100</td>
</tr>
<tr>
<td>1904</td>
<td></td>
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<td>1944</td>
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</tr>
<tr>
<td>1945</td>
<td></td>
</tr>
<tr>
<td>1948</td>
<td></td>
</tr>
</tbody>
</table>

Source: Census of Manufactures, 1899-1937

United States Department of Labor
Bureau of Labor Statistics

1 Forge shop occupations, as used here, are those characteristic of the forging process, including operation of the forging hammers and presses, and preparing metal for forging, heat treating to remove the stresses resulting from the forging process, and the removal of excess metal and scale, and inspection. Not considered as employed in forge shop occupations are those workers who have machining, maintenance, custodial, or other nonforging jobs in forge shops.
periods. The chart also reveals that forging activity is extremely sensitive to the business cycle: relative to the economy as a whole, forging is especially hard hit during depressions. For example, by 1933, employment in independent iron and steel forge shops had dropped to about 40 percent of the 1929 level, while employment in manufacturing as a whole had dropped to about 70 percent of that level.

During the early fifties, the number of forge shop jobs is expected to rise substantially. Expanding defense requirements will greatly increase activity in the Nation's forge shops. In the long run, moderate growth is in prospect in this field. Most of the industries which use forged parts in their final products, such as automobiles, tractors, farm machinery and aircraft have generally favorable long-run prospects.

Most job openings will be for helpers and laborers, since the more skilled jobs are generally filled by upgrading experienced men. In addition to opportunities that may be created by any rise in employment, shifting of less skilled workers into other fields of work will create jobs for beginners. The need to replace older workers dropping out of the shops because of death or retirement or transferring to physically less-demanding forge shop work will provide promotional opportunities for experienced workers and will create additional vacancies in starting jobs.

Forge Shop Workers and Their Jobs

There are many different kinds of jobs in the metal forging process. The principal jobs are those having to do with the operation of the forging hammers and presses. These hammers and presses usually are run by crews of 2 or more, sometimes as many as 10 or 15. Operators and their crews generally specialize on a particular kind of forging hammer or press. Considerable strength and endurance are required for these jobs, in order to do the necessary heavy lifting and to withstand the noise, heat, and vibration typical of forge shops. Virtually all the workers are men.

In addition to the hammer and press crews, forge shops have many workers engaged in cleaning, finishing, or inspecting forgings, as well as laborers employed mainly in moving materials.

The more-skilled forge shop jobs, such as drop-hammer operator, are filled by promoting men from lower-rated jobs. For example, a man starts as a helper on a drop-hammer crew, advances to the job of heater, and then to hammer operator. Ordinarily this takes several years to achieve.

Earnings in forge shops are among the highest in industry. In July 1950, production workers in independent iron and steel forging plants earned an average of $1.76 an hour (including pay for overtime and night work). In the same month, the average for all manufacturing industries was about $1.46 an hour. In part, the level of forge shop earnings is accounted for by the prevalence of incentive pay; the generally difficult working conditions are also a factor in the wage scale. Earnings in certain occupations, such as that of hammer operator, range considerably higher. Recent earnings data for individual forging occupations are not available for most industries. However, in the automobile industry, in February 1950, average straight-time hourly earnings were $2.57 for hammermen (steam, medium); $2.08 for upsetters (3 inch and over); and $1.94 for heaters. Because some of these jobs require speed and stamina, older men are often unable to continue in the occupation and transfer to lower-rated, physically less-demanding forge shop jobs.

Forge shops are typically hot and noisy, and much of the work is strenuous. Accident frequency rates for forge shops are somewhat higher than the average for metalworking industries.

Most forge shop workers are union members. The leading unions in this field include the International Brotherhood of Blacksmiths, Drop Forgers and Helpers (AFL), the United Steelworkers of America (CIO), and the United Automobile, Aircraft and Agricultural Implement Workers of America (CIO).

Some of the more important forge shop occupations are briefly described below.
FORGE SHOP OCCUPATIONS

 Helpers (Hammer and Press Crews)
 (D. O. T. 6-88.713 and 8-93.71)

The basic entry job on hammer and press crew is that of helper. This worker assists the hammer or press operator in bringing the materials up to the machine and helping in manipulating the metal. On the smaller equipment, the job of helper is often combined with that of heater. It is important to note the generally modest educational requirement for forge shop jobs. Employers usually require no more than an eighth-grade education for helpers and other workers in entry occupations. With experience, these workers can rise to more skilled and better paid jobs.

Heaters
 (D. O. T. 6-88.732)

When a vacancy occurs, experienced and qualified helpers are upgraded to the job of heater. The heater prepares metal shapes for forging by heating the metal pieces in a furnace. His duties include operating the furnace and feeding fuel to it, controlling the temperature, placing the metal shapes in the furnace, taking them out when properly heated, and transferring them to the forging machine. A growing number of shops require heaters to have some technical knowledge of metallurgy. Experienced heaters are in line for promotion to higher-rated jobs on the hammer crews.

The hammersmith supervises a crew of men.  

Courtesy of National Archives
Hammersmiths

(D. O. T. 4-86.120)

The hammersmith operates a hammer equipped with unshaped (open) dies, used to pound heated metal into required shapes. (This is what the blacksmith does by hand.) This method is employed in forging objects which are too large for closed dies (shaped to form a particular object) or which are needed in quantities too small to justify the expense of making closed dies. The hammersmith supervises several men—for example, an assistant operator (or “hammer driver”), a heater, and one or more helpers assigned to his hammer. The work is generally considered more skilled than closed die forging. In addition to control of the hammer stroke and careful manipulation of the heated metal under the die, the job requires a knowledge of forging practice, blueprint reading, properties of metals, and shop arithmetic.

At least several years of forge shop experience in lower-grade jobs is required to become a hammersmith. It is usual to begin as a helper. An experienced helper, who shows the needed aptitudes, may be promoted to the job of heater, and thence to assistant operator. Hammersmiths are selected from among the more experienced assistants.

Drop-Hammer Operators

(D. O. T. 4-86.120)

A drop hammer is a kind of forging machine which pounds metal into various shapes between closed (shaped) dies. The operator directs the work of the heater and supervises any helpers assigned to his hammer. He may also direct his crew in setting up the hammer. The two principal types of hammers are steam and board. The operators of steam hammers are generally considered more skilled than those on board hammers. On both types of hammers, the skill required usually tends to increase with the size of the hammer and the complexity of the object to be forged. Men can transfer from one type of hammer to another only with an additional period of training. Because of their greater skill, steam-hammer operators can more readily transfer to board hammers than board-hammer operators to steam.

Drop-hammer operator jobs are filled by upgrading experienced heaters. Usually a minimum of 2 to 4 years’ experience in the forge shop is required.

Upsettermen

(D. O. T. 4-86.125)

The upsettermen in forge shops operate upsetter forging machines used to form metal between closed dies (shaped to make a particular object) which move horizontally, pressing the metal along its greatest length. This action causes the metal to spread along its other dimensions, until it takes on the required form. The upsetterman directs a small crew, consisting of a heater and helpers assigned to his machine. He must know how to control the heating operation, to adjust the machine's pressure on the metal, and to position the metal stock between the dies. In general, the larger the object forged, the greater the skill required. Several years’ work experience is generally needed to learn upset forging; heaters generally are upgraded to fill vacancies.
FORGE SHOP OCCUPATIONS

Forging-Press Operators

(D. O. T. 4-86.125)

These workers operate forging presses, which shape metal by squeezing it between either closed (shaped) or open (unshaped) dies. Open die press forging, which generally requires considerably more skill than closed die work, is used where a relatively small number of large pieces are required. In open die press forging, the operator shapes the heated metal by manipulating it under an unshaped die (making his job comparable in skill to that of the hammersmith). He usually supervises a crew of at least several workers. Closed die presses are mainly used where large quantities of relatively small forgings—either steel or nonferrous—are needed. The closed die-press operator may supervise a small crew or may work alone. Both kinds of press operators must know how to control the heating of the metal, to regulate the pressure of the machine, and to position the work in the dies. Duties may also include setting up the press.

To become an open die-press operator, the worker begins as a helper on a press crew and progresses to higher-rated jobs as vacancies occur; it usually takes at least several years to rise to the job of operator. Closed die work can be learned more quickly. Where crews are used, the worker starts as a helper. Where one man operates the press, inexperienced men, or workers in lower-rated jobs elsewhere in the shop, are assigned as trainees.

Other Forge Shop Workers

One of the larger groups of forge shop workers are inspectors. Some inspectors examine forged pieces for flaws and faulty workmanship while the forgings are still hot. Others inspect forgings after trimming, checking dimensions and appearance to determine whether required standards and specifications are met.

Another group of forge shop occupations is in the cleaning and finishing departments. Trimmers remove excess metal with a saw or trimming press. Chippers and grinders remove surplus metal and imperfections by means of pneumatic or hand hammers and chisels or by using a mechanically powered abrasive wheel. Blasters operate sandblasting or shotblasting equipment to clean and smooth forgings. Picklers dip forgings in an acid solution to remove scale. Heat treaters, by controlled heating and cooling of the forged pieces, alter the physical properties of forgings to produce a specified degree of hardness and strength.
OTHER METALWORKING OCCUPATIONS

Arc and Gas Welders

(D. O. T. 4-85.020, 030; 6-85.080)

Outlook Summary

Employment is expected to rise over the long run. During the early fifties, job openings should be particularly numerous.

Nature of Work

In electric arc and gas welding, metal parts are joined through the application of heat intense enough to melt the edges to be joined. The welder controls the melting by properly directing the heat, either from an electric arc or from a gas welding torch, and adds filler metal where necessary to complete the joint.

In hand arc welding, the most commonly used method, the welder "strikes" an arc by touching the metal part to be welded with an electrode and then withdrawing the electrode a short distance. The arc results when the electric circuit is broken by withdrawing the electrode making the current jump the gap between the metal to be welded and the electrode. The welder then guides the electrode along the joint to be welded, holding it at the proper arc length.

In gas welding, the welder directs the flame from a gas welding torch along the joint to be welded. The flame is usually produced by combustion of oxygen and acetylene or other fuel gases. The welder must know how to light and adjust the torch for various metals and kinds of welds.

Experienced arc and gas welders should be able to make various kinds of welds in different metals, work from different positions, and read welding symbols.

To a considerable extent, particularly in maintenance and repair work, welding is done by members of other crafts. The boilermaker, the structural steel worker, the machinist, and the automobile mechanic, all may be required to know and perform welding in their work. Typically, however, in production work, welding is done by workers who specialize in its application. No matter where he works, the skilled welder should have some practical knowledge of the fabricating and assembling operations in the field of work in which he is engaged. For example, a welder working in a shipyard should know in general how ships are put together, or one employed in a boiler shop should understand how boilers are assembled. If the welder moves into a type of work in which he is not experienced, some of the basic practices in the new field must be learned.

Training and Qualification

A course in welding methods, usually in public or private vocational schools, followed by extensive job experience, has been the common way for skilled welders to receive their training. During World War II, there were a number of "training-within-industry" programs which have been continued in areas where there is a fairly large demand for welders and training facilities in schools are not readily available. Formal apprenticeships in welding alone are not often found. Frequently, welders doing the simpler repetitive types of work are trained on the job, without any special instruction, in about 6 months. To become an all-round skilled welder, regular course instruction in welding is desirable, either in public or private vocational schools or in courses conducted by industrial firms to train their workers. Before enrolling in a private school, the prospective student should check with the local educational authorities about the quality of the instructions offered. The American Welding Society has issued codes of recommended standards for welding courses which provide for a minimum of 150 hours of actual welding practice under qualified instructors and not less than 20 hours of class instruction in welding theory. Experience has shown that a longer learning time is usually required.

Since a poor weld may have serious consequences in the failure of the completed product when in use, welders are usually required to have passed qualification tests established by the American
Welding Society. Requirements are administered by insurance companies, employers, and inspection agencies as specified by the applicable code. In addition, welders must be licensed to do certain types of construction work in some localities.

Where Employed

Welding jobs are found in a wide range of industries. Most welding jobs, however, are in production work in the metal products industries; the leading employers are those making machinery, automobiles, electrical equipment, ships, aircraft, boilers and tanks, and fabricated structural steel. Examples of places where welders are used mainly in maintenance work are railroad shops, electric power plants, street railway systems, paper mills, foundries, and chemical plants. A large number of welders work in local repair shops that either specialize in welding or do general metal repair work. Usually these are small shops, and very often they are owned and operated by individual welders, with perhaps several employees to assist. These shops serve mainly their local communities, repairing such things as farm equipment, automobile parts, and industrial machinery, and making welded products on a subcontract basis for local manufacturing plants.

Because of their wide employment among different industries, jobs for welders are found in all sections of the country. Many of the jobs are concentrated in the industrial centers in the Midwestern and Northeastern States, where the machinery, automobile, and electrical equipment plants are mainly located. Some companies often have openings in foreign countries for employment on pipeline work and similar construction.

Outlook

During the early fifties, there will be many openings for welders. Expanding defense requirements in such industries as aircraft, ordnance, machinery, iron and steel, and electrical equipment will substantially increase the need for welders. A very important consideration in the outlook for welders is the extent of shipbuilding and repair activity. At the World War II peak, 180,000 welders had jobs in the shipyards; this was twenty times the prewar (1940) total. Total employment in United States shipyards in August 1950 was less than 150,000—about a twelfth of the World War II peak of 1,700,000. Although no such expansion as occurred in World War II is expected, any large increase in shipyard activity would result in many jobs for welders.

In the long run, prospects are for a gradual growth in the number of jobs for arc and gas welders. The metalworking industries, which employ most of these workers, have a generally favorable long-run outlook. Moreover, new uses for welding are being found, and as a result of new developments in welding, more and more types of material can be welded. This should also mean an increase in the number of arc and gas welding jobs. The gains in employment, however, may not keep pace with the increase in amount of welding done, as techniques become more efficient, fewer man-hours are required to do a job. Especially in production work, new applications of welding methods will call for automatic welding machines which do not have to be operated by skilled hand welders.

Among the less skilled welders, there is considerable shifting of experienced workers into other occupations; this will create opportunities for newcomers. Death and retirement of experienced welders will also provide openings for newcomers; however, this will be a relatively less im-

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1 Estimate includes other types of welders and burners in addition to arc and gas welders as of December 1943.
important source of jobs than in many other occupations, since the welders are a comparatively young group of workers.

A few experienced, all-round welders will be able to establish their own welding repair and service shops. Prospects for such shops depend upon the situation in the particular community in which the shop is located. Before a new shop is opened the needs of the community and the competition to be faced should be carefully considered.

Earnings and Working Conditions

Recent information is not available on earnings of welders in most of the industries which employ them. Average straight-time hourly earnings of men in arc and gas welding jobs in machinery plants in November 1949, are shown in the accompanying tabulation.

Arc and gas welders in passenger car assembly plants received $1.70 an hour, straight-time, in February 1950. In petroleum refineries, average straight-time earnings were $2.02 an hour in September 1948. In the airframe industry in May-June 1949, average straight-time earnings of Class A hand welders (production) were $1.67 an hour, and $1.53 an hour for Class B hand welders (production).

Welders are subject to certain hazards in their work, but these can be almost entirely avoided by proper precautions. Without such precautions are welders may be exposed to minor skin burns and eye injuries and to electric shock. Similarly, gas welders are subject to the possibility of explosion and fire and, when welding is done in confined spaces, poisonous fumes or gas may be present. These hazards can be largely eliminated, however, by training in safety methods and by the use of proper equipment such as goggles and ventilating devices.

Where To Get Additional Information


Acetylene Burners

(D. O. T. 6-56.215)

Outlook Summary

Increasing employment in this relatively small field is anticipated during the early fifties.

Nature of Work

Acetylene burners (also referred to as “oxygen cutters”), use an oxyacetylene torch to cut or trim metal objects to the desired size or shape. The oxygen cutting equipment generally consists of a torch into which oxygen and acetylene gas are fed from hoses connected with the gas supply. The ignited acetylene, which serves as the fuel gas, heats the metal, and jets of oxygen do the actual cutting.

Torch tips, through which the flames are directed, come in various sizes, depending upon the nature of the cutting jobs. The operator prepares
for the cutting job by attaching the proper torch tip for the particular job, connecting the torch to the gas hoses, and regulating the flow of gases into the torch for the desired cutting flame. He then guides the torch manually along previously marked lines or, following a template or pattern, cuts through the metal. In some cases, he marks the lines on the metal himself, following blueprints or other instructions. In other cases, the cutting torch or torches are mounted on a machine which by electronic or mechanical means automatically follows the proper line of cut.

Training and Qualifications

Acetylene burners are semiskilled workers. Newcomers usually learn the work in a relatively short period of on-the-job training. Experienced acetylene gas welders can easily qualify for jobs as burners, if they desire, since theirs is a more skilled job and covers all the things that the burner has to know.

Where Employed

Acetylene burners are generally employed in plants where operations include cutting steel plates to size, removing metal from castings, trimming rough steel shapes, and cutting up scrap metal. Among the principal employers of acetylene burners are the shipbuilding, steel, machinery, fabricated structural steel, and boiler shop industries. Many are also employed by firms that prepare and sell scrap metal to be re-used in steel mills and foundries.

Outlook

The number of jobs for acetylene burners is expected to rise during the early fifties as a result of expanding military requirements in the industries employing these workers. A substantial revival of shipbuilding, for example, would result in many openings in this occupation. Over the longer run, increased use of oxygen cutting machines will hold down increases in employment of burners, even when metalworking activity is expanding. In addition to any increase in employment, replacement needs will provide some openings for new workers in this relatively small field.

See also Arc and Gas Welders, page 212.

Resistance Welders

(D. O. T. 6-85.016, .020, .030, .060, and .100)

Outlook Summary

There will be many openings for resistance welders during the early fifties.

Nature of Work

Resistance welders, unlike hand arc and gas welders, who use manual methods, are operators of resistance welding machines. These machines fuse metal part by bringing them together under heat and pressure. The pieces of metal to be joined are pressed between two electrodes through which electric current is passing. The parts being welded offer sufficient resistance to the flow of current to create intense heat, which, together with the pressure, fuses them together. The principal types of resistance welding machines are the spot, seam, projection, flash, and upset welding machines and portable spot welding guns. The supervisor, or in some cases the operator, sets the controls of the machine for the desired electric current and pressure. The operator mainly feeds and aligns the work, starts the machine, and then removes the work when it is finished. The machines that weld automobile bodies are large and highly automatic, while smaller and less-automatic machines are used to assemble such products as metal furniture.

Most resistance welding operators learn their work on the job in a relatively short time. The length of the learning period depends upon the scope of the duties. Some welding operators, following general directions, insert the proper electrodes and regulate and adjust the welding machine each time a different welding operation is begun. To do this, a welder should learn the meaning of welding symbols, the characteristics of different metals, and how to select and install the electrodes. In most welding jobs, however, the machine is set up and adjusted for the welding operator, and the welding is simple and repetitive. Beginners can learn these jobs in a month or two.
Where Employed

Resistance welding operators are employed almost entirely in metal-working industries, particularly in plants assembling large quantities of products made of sheet metal and intended for the final consumer rather than as equipment to be used in factories. Thus, most of the jobs are in the industries making automobiles, aircraft, machinery, ordnance, electrical household appliances, refrigerators, metal furniture, and similar products. Some are also employed in machinery, industrial electrical equipment, and aircraft plants. Because metalworking employment is concentrated in the Midwest and Northeast, most of the jobs are located in these regions.

Outlook

There will be many openings for resistance welders during the early fifties. Expanding defense requirements in many industries which employ large numbers of resistance welders will result in rising employment in this occupation.

Over the longer run, a gradual upward trend in employment is in prospect. Opportunities for these workers depend upon prospects in the metalworking industries and the extent to which resistance welding becomes widely used. The metalworking industries, which employ most of the workers in the occupation, are expected to increase their activity over the long run. In recent years, rapid progress has been made in improving resistance welding methods and in spreading its use to more products. For example, only during the thirties did welding become extensively used in assembling automobiles, although now it is a very important part of the process. About 15,000 welders were employed in passenger car plants in 1950, of which over two-thirds were resistance welders. Further gains in the use of resistance welding are expected. The resulting rise in the employment of machine welders will be limited, however, by a trend toward the use of more rapid and highly automatic machines. There is likely to be a sizable number of job openings, however, because, as is the case in many semi-skilled occupations, transfer of experienced workers to other fields is relatively common.

Earnings and Working Conditions

Earnings usually range somewhat below those of arc welders and skilled machine-tool operators. In February 1950, average straight-time hourly earnings in passenger automobile plants were: gun welders, $1.64; spot welders, $1.62; and machine welders, $1.57.

The hazards connected with resistance welding are not great, and generally the working conditions compare favorably with those in other metalworking operations.

Where To Get Additional Information


Assemblers (Machinery Manufacturing)

(D. O. T. 4-75.120; 6-78.632)

Outlook Summary

This occupation will provide many job opportunities for new workers during the fifties.

Nature of Work

These workers assemble machinery parts to form complete units, such as a machine tool or Diesel engine, or subassemblies such as a gear box or fuel pump. Floor assemblers put together heavy machinery or equipment on shop floors, fitting and finishing parts with hand and power tools and fastening them together with bolts, screws, or rivets. Bench assemblers assemble machinery parts into subassemblies or small complete units while working at a bench. Skilled assemblers work on the more complex machines and subassemblies with little or no supervision. They must know how to read blueprints and how to use precision measuring instruments and various hand and power tools, such as scrapers, chisels, files, and drill presses. The less-skilled assemblers do repetitive operations under close supervision and are generally not responsible for the final assembling of complex jobs.
OTHER METALWORKING OCCUPATIONS

Where Employed

Assemblers are employed in a wide variety of nonelectrical machinery plants, including those which make machine tools, pumping equipment, tractors, refrigerators, business machines, and internal combustion engines.

Assemblers work in machinery plants throughout the country. Most of the jobs for these workers are concentrated in the Midwest and Northeast, particularly in Ohio, Illinois, Pennsylvania, Michigan, New York, and Wisconsin.

Training and Qualifications

For the more-skilled assembling jobs, machinists and others with experience are usually employed. Inexperienced workers may be hired as trainees or helpers and trained on the job to do the less-skilled assembling.

Assemblers usually specialize on one type of machinery or equipment. Often they cannot readily transfer to assembly of other products, or even of similar products in other plants, without additional training.

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Bench assemblers fit together and assemble small machinery parts into complete units or subassemblies.

Much of the work in bench assembling is relatively light, and women are often employed in the less-skilled jobs.

Outlook

The number of jobs for assemblers is expected to rise substantially during the early fifties as the machinery industries expand to meet defense requirements. The outlook, in the longer run, is for continued growth in employment. The machinery industries which employ these workers have had a long-range upward trend in employment; in July 1950, production workers in nonelectrical machinery manufacture totaled about 1,000,000, which was over 50 percent above the 1929 level.

In addition to the new openings that may be created by the expected increase in employment, replacement needs will provide a considerable number of job opportunities for new workers. This is a relatively large occupation—about 100,000 jobs in the fall of 1949. Death and retirement of experienced workers should provide approximately 1,500 to 2,500 job openings annually. Moreover, shifting into other occupations is common among the less-skilled assemblers and many job opportunities will be created in this way. Re-
placements will also be needed for assemblers called up for military service.

Although the long-range outlook is generally favorable, it should be noted that machinery manufacturing industries are extremely sensitive to the business cycle and to changing military needs; the past trend of employment, while upward, has been marked by extreme ups and downs. Compared to manufacturing as a whole, the machinery industries are particularly hard hit during depressions. Between 1929 and 1932, for example, the number of wage earners in the nonelectrical machinery industries dropped by about 55 percent while manufacturing employment as a whole declined by only 38 percent.

Earnings and Working Conditions

Earnings of assemblers vary widely, depending on their skill grade, the type of product assembled, the size and location of the plant in which they are employed, and whether they are paid on an incentive basis. Average straight-time hourly earnings of male assemblers in machinery plants in November 1949, for selected large cities are shown in the accompanying tabulation. These earnings exclude premium pay for overtime and night work.

Most assemblers are members of unions. There are several labor organizations in the field, including the International Association of Machinists (Ind.), the International Union of Electrical, Radio and Machine Workers of America (CIO), and the United Automobile Aircraft and Agricultural Implement Workers of America (CIO).

Working conditions for assemblers are usually good compared with factory work in general. Their places of work, generally, are relatively clean, well-lighted, and free from dust.

See also Machine Shop occupations, p. 186.

Inspectors (Machinery Manufacturing)

(D. O. T. 4–78.671; 6–78.671)

Outlook Summary

Rising employment is expected in this occupation during the first part of the fifties.

Duties and Training

These workers examine complete units of machinery (such as turret lathes), subassemblies (such as starter mechanisms), or individual metal parts. They look for various defects, checking dimensions and appearance against required standards and specifications. The more skilled inspectors work with little or no supervision and examine either a variety of parts or relatively complex units. They must be able to read blueprints and interpret specifications. Often they are required to use such measuring devices as calipers, gages, and micrometers. Skilled inspectors usually must have a general knowledge of machining and other metalworking processes. The less skilled inspectors inspect large numbers of identical parts or relatively simple products under close supervision. Often they use specially prepared gages and other measuring instruments which greatly simplify inspection.

Where Employed

Inspectors are employed in a wide variety of nonelectrical machinery plants, including those which make machine tools, tractors, refrigerators, internal combustion engines, and business machines.

They work in machinery plants throughout the country. Most of the jobs for these workers are concentrated in industrial centers of the Midwest and Northeast, particularly Ohio, Illinois, Pennsylvania, Michigan, New York, and Wisconsin.

Training and Qualifications

Skilled inspectors are obtained from the ranks of metal-processing workers, such as machine tool operators, or by upgrading less-skilled inspectors. Inexperienced workers are often hired for the less-skilled jobs and taught to do repetitive inspection in a brief period of on-the-job training. The work is not strenuous and many women are employed as inspectors. Because of the nature of the work, good eyesight is generally required.

Inspectors usually specialize on one type of product; often they cannot readily transfer to in-
spection of other products, or even similar products in other plants, without additional training.

**Outlook**

The number of jobs for inspectors is expected to rise substantially during the early fifties as the machinery industries expand to meet defense requirements. In late 1949, machinery plants employed about 30,000 inspectors. The outlook, in the longer run, is for continued growth in employment. The machinery industries which employ these workers have had a long-range upward trend in employment; in July 1950, production workers in nonelectrical machinery manufacture totaled about 1,000,000 which was over 50 percent above the 1929 level.

In addition to the new jobs that will be created by increases in employment, replacement needs will provide job opportunities for new workers. Death and retirement of experienced inspectors should provide about 500 to 700 job openings annually. Moreover, shifting into other occupations is common among the less skilled inspectors and job opportunities will be created in this way. Replacements will also be needed for workers called up for military service.

Although long-range employment prospects are generally favorable, it should be noted that machinery manufacturing is extremely sensitive to the business cycle; the past trend of employment, while upward, has been marked by extreme fluctuations. Compared to manufacturing as a whole, the machinery industries are particularly hard hit during depressions.

**Earnings and Working Conditions**

Earnings of inspectors vary considerably, depending on their skill, grade, the type of product inspected, and the size and location of the plant in which they are employed. Average straight-time hourly earnings of male inspectors in machinery plants in selected large cities in November 1949 are shown in the following tabulation. These earnings exclude premium pay for overtime and night work.

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Most inspectors are members of unions. There are several labor organizations in the field. Among such organizations are the International Association of Machinists (AFL), the International Union of Electrical, Radio and Machine Workers (CIO), and the United Automobile, Aircraft and Agricultural Implement Workers of America (CIO).

Working conditions for inspectors are usually good compared with factory work in general. Their places of work, generally, are relatively clean, well-lighted, and free from dust.

*See also* Machine Shop Occupations, page 186.
Outlook Summary

Long-run prospects are for little change in the employment of blacksmiths. Replacement needs will provide some opportunities for new workers.

Nature of Work

Blacksmiths use mainly hand methods to shape and repair metal articles and parts. They heat metal in a forge and hand-hammer the metal on an anvil into the desired shape. They also forge-weld metal by heating the pieces and hammering them together; sharpen tools such as chisels, drills, and picks by heating them and hammering the cutting edges to proper shape; and heat-treat metal articles to improve their physical properties.

Where Employed

Most blacksmiths work in small shops which repair farm and garden equipment, tools, automobile parts, and household articles. Often these shops perform other services, such as welding and tool dressing; a few shoe horses. Many blacksmiths are self-employed, operating their own shops.

Other blacksmiths are employed in maintenance and repair departments in metalworking plants, in railroad repair shops, and in coal and metal mining.

Blacksmiths are found in all parts of the country, many in small rural communities as well as in large industrial centers.
Training and Qualifications

Some workers enter this occupation through apprenticeship, others by picking up the trade while working as laborers or helpers in blacksmith shops. The apprenticeship period is generally 3 or 4 years and customarily includes blueprint reading, training in the use of tools and equipment, heat-treating metal, forging methods, and welding.

Considerable physical strength is required in order to pound metal into shape and to handle heavy metal parts.

Outlook

There will be a small number of openings for new workers in this occupation. Few young men have entered the occupation in the last several decades.

A large proportion of the men now engaged in the trade are of relatively advanced age, nearing the time when they will have to be replaced. Openings for new workers will occur because of this replacement demand rather than because of expanding employment.

Prospects for those entering the occupation are for continued employment over a long period. About 40,000 blacksmiths were employed in 1940, substantially fewer than 20 or 30 years before. However, there has been little change in employment in recent years and no further decline is anticipated. The number of blacksmiths working in small repair shops is expected to remain stable because of the diversified demands for their services and the importance of blacksmithing in local communities. Since blacksmiths employed in manufacturing plants, railroads, and mines generally do maintenance work, which tends to be fairly steady, there should not be much fluctuation in the number of jobs for these workers.

Boilermakers

(D. O. T. 4-83.100)

Outlook Summary

The number of boilermakers is expected to rise during the early fifties as a result of expanding defense requirements. Over the longer run, a moderate downward trend in employment is likely. Replacement needs, however, will provide openings for new workers.

Nature of Work

Boilermakers fabricate, assemble, and repair boilers, tanks, vats, smoke stacks, and similar products made of heavy steel plate. Their work involves such duties as planning and laying out work from blueprints or specifications; cutting plate to size and shape with power shears or acetylene burners; shaping plates on power presses; assembling parts by bolting, riveting, or welding; and calking seams and rivet heads. Many men qualified as all-round boilermakers, however, specialize in a single boiler-shop function, such as welding. Some of the most skilled boilermakers do only lay-out work—marking the steel plates to show other workers where the metal is to be sheared, welded, bent, or otherwise fabricated.

Where Employed

Boilermakers are employed in railroad repair shops, construction projects, boiler repair shops, and electric power plants throughout the country; in boiler shop products plants concentrated in the Great Lakes, Middle Atlantic, and Pacific Coast areas; in coastal shipyards; and in the oil refining areas of Texas, Pennsylvania, California, New York, and other States. Other industries employing boilermakers include steel, chemicals, and machinery.

Training and Qualifications

To become an all-round boilermaker, a 4-year apprenticeship or equivalent on-the-job training is usually required. Welders, helpers, and other boiler-shop workers sometimes have the opportunity to learn the trade without serving an apprenticeship. Much of the boilermaker's work is fairly strenuous and at least average physical strength is needed.

Outlook

The number of jobs for boilermakers is expected to rise during the early fifties as a result of expand-
ing defense requirements. A substantial revival of shipbuilding, for example, would result in many openings in this occupation. Over the longer run, however, prospects are not as favorable. There has been a downward trend in boilermaker employment over the last three decades. In 1940, the Census counted about 33,000 boilermakers in the labor force (employed or seeking work); this was only about half the number reported in 1920. In early 1950, the number of boilermakers employed was somewhat higher than prewar, but below the wartime peak, when many boilermakers were working in shipyards. Many of these wartime workers had been quickly trained in some part of boilermaking and were not all-round boilermakers. After being released from the shipyards at the end of the war, many of these less-skilled men went into other lines of work.

In railroad repair shops—the leading source of jobs for boilermakers in peacetime—employment of these workers has decreased steadily since World War II. Class I railroads employed an average of about 13,500 boilermakers in 1946; in 1948, they employed about 12,000. In June 1950, the number was about 9,800—about the prewar level.

There have been two main factors responsible for the decline in employment in this occupation. One has been the general tendency in boilermaking operations to utilize specialized workers (such as welders) to do the various parts of the boilermaker job, thereby reducing the need for all-round boilermakers. The other has been the specific trend toward less boilermaking work in the construction and repair of railroad equipment; this is a direct result of the increasing use of Diesel and electric locomotives in place of steam locomotives. In contrast to work on steam locomotives, relatively few boilermakers are used in making and repairing the Diesel and electric types. Both factors are expected to continue to operate in the future, so that further declines in the number of boilermaking jobs is likely over the long run.

In spite of the expected drop in the number of jobs, over the long run there should be opportunities for a number of new workers to enter this occupation. A high proportion of the experienced boilermakers are older men who will be leaving the labor force; deaths and retirements during the 1950–60 decade may total something in the order of 10,000, or nearly a third of the number of experienced boilermakers in 1940. Other replacements will be necessary for men shifting to jobs in other fields or entering military service. This indicates that replacement needs may be considerably greater than any probable reduction in employment. Moreover, men trained in all-round boilermaking will have some opportunities to get specialized boilermaking jobs, since they are preferred by most employers to the men qualified in only one part of the work.

Earnings and Working Conditions

Earnings of boilermakers vary among the industries in which they are employed. In September 1949, the wage rate for boilermakers working for steam railroads was generally about $1.74 an hour. In construction work, in July 1949, the average hourly wage rate of union journeyman boilermakers in 77 cities was $2.39. Recent wage data are not available for boilermakers employed in other industries.

Boilermaking tends to be more hazardous than most other metalworking occupations. The injury frequency rate in the boiler-shop-products industry is considerably higher than the average for manufacturing industries as a whole.

Boilermakers are generally unionized. A large number are members of the International Brotherhood of Boilermakers, Iron Shipbuilders and Helpers of America (AFL); others have been organized by industrial unions, such as the United Steelworkers of America (CIO) and the Industrial Union of Marine and Shipbuilding Workers of America (CIO).

See also Arc and Gas Welders, page 212. Railroad shop trades, page 426.
OTHER METALWORKING OCCUPATIONS

Millwrights

(D. O. T. 5-78.100)

Outlook Summary

Long-run prospects are for a fairly stable level of employment in this occupation. Some increase is probable during the early fifties as new plants and equipment are added to meet expanding defense needs.

Nature of Work

The job of a millwright is to install, dismantle, move, and set up heavy machinery and industrial equipment. Millwrights also prepare the platforms on which machines are mounted and help plan the location of new equipment in the plant. They sometimes perform some of the duties of industrial machinery repairmen in addition to their regular work. They should have considerable knowledge of the structure and operation of the equipment on which they work. Millwrights usually specialize on particular types of industrial machinery, such as paper-mill machinery or machine tools.

Where Employed

Millwrights are employed in most manufacturing plants which use heavy machinery and equipment. Many of these workers are in the metalworking industries, such as machinery, automobiles, and iron and steel. Automobile plants alone employed about 4,000 in early 1950. Other large groups are employed in various nonmetal industries, including pulp-and-paper mills, sawmills, and flour mills. Some millwrights are employed by building contractors in the installation of machinery and equipment in new factory buildings. A small number work for machinery manufacturers who do the installation of their machinery in customers’ plants.

Millwrights work in every State. However, most of the millwright jobs are in the major industrial areas of the Midwest and Northeast, with Michigan, Ohio, Pennsylvania, New York, and Illinois the leading States.

Training and Qualifications

Entry into this occupation is usually through a millwright apprenticeship or equivalent on-the-job training. The apprenticeship period is generally 4 years and the training customarily includes blueprint reading; use of hoisting equipment; installation, assembly, and repair of industrial machinery and equipment; and acetylene burning. However, inexperienced workers may be hired as helpers or laborers and pick up the occupation while working.

Outlook

Some increase in the number of millwrights is probable during the early fifties, as new plants and equipment are added to meet expanding defense needs. In late 1949, the number of millwrights was well above prewar (1940), when about 40,000 were employed. A major factor in the high postwar level of employment of millwrights has been the large expenditure made by industry for new plants and equipment during the last few years.

The outlook in the longer-run is for a fairly stable level of employment in this occupation. Although new plant and equipment expenditures may fall off somewhat, employment is expected to hold up fairly well. These workers have continuing functions in plants using heavy equipment, in connection with repair and rearrangement of the equipment. Moreover, the growing mechanization of industry has a tendency to expand the need for millwrights. Job opportunities for new workers will result mainly from the need to replace experienced millwrights who switch to other jobs, retire, or die. Death and retirement alone may create about 1,000 openings each year.

Earnings and Working Conditions

Recent information on wages for most industries employing millwrights is not available. However, average straight-time hourly earnings for millwrights employed in passenger car manufacturing plants in February 1950, were $1.80. In a wage agreement made in July 1948 between the United States Steel Corp. and the United Steelworkers of America (CIO), a standard hourly rate of $1.77 was specified for millwrights in iron and steel plants.

Millwrights are generally unionized. Their un-
ion affiliation varies according to the industry in which they are employed. Some of the more important unions include the International Association of Machinists (Ind.); United Steelworkers of America (CIO); United Automobile Aircraft and Agricultural Implement Workers of America, International Union (CIO); International Brotherhood of Carpenters and Joiners (AFL); and International Brotherhood of Pulp Sulphite and Paper Mill Workers (AFL).

See also Industrial Machinery Repairmen, p. 180.

Riveters, Pneumatic (Manufacturing)

(D. O. T. 4-84.060; 6-95.080 and .082)

Outlook Summary

Employment of riveters is expected to decline gradually over the long run. However, prospects in the early fifties are more favorable.

Nature of Work

These workers use riveting equipment which is driven by compressed air to fasten together metal parts. Pneumatic hammers are most commonly used, although specialized pneumatic-riveting machines are used in some manufacturing plants. Where heavy steel plates have to be fastened, as in ship construction, the large rivets which are used must be heated before they are hammered. In hot riveting, the riveter is assisted by a rivet heater and a worker usually called a bucker who backs up the rivet while it is being hammered by the riveter. Rivet heaters are not needed in cold-riveting and some pneumatic-riveting equipment, especially in aircraft plants, can be operated by the riveter alone.

Pneumatic riveters who are employed in manufacturing industries are found mainly in plants making aircraft, industrial cars and trucks, and agricultural equipment; boilermaking shops; locomotive and car-building and repairing shops; and shipyards.

The more skilled riveters do many types of work; they must be able to read blueprints, use riveting hammers of varied types and sizes, and select appropriate hammers, dies, and rivets. Some of the more skilled riveting in certain industries, boilermaking and shipbuilding, for example, is done by journeymen qualified in other occupations, such as structural iron workers, boilermakers, and sheet metal workers. However, most riveters in manufacturing plants do repetitive work which does not call for the skills of the all-round riveter.

The less skilled pneumatic riveters are generally trained in several months on the job. Boilermakers, sheet metal workers, and other journeymen who do skilled riveting have had formal apprenticeships in their trade or the equivalent in experience.

Outlook

During the early fifties, there will be many openings for new workers in this occupation to meet the needs of the expanding aircraft and other defense industries employing riveters. Other openings will be created in the event that shipbuilding and repairing are greatly expanded as a matter of national policy.

The long-run outlook is for a gradual decline in the number of riveters. This will result mostly from the substitution of welding for riveting in the fabrication of many products. Welding has been replacing riveting in recent years, and this trend is expected to continue in the future, particularly in the shipbuilding and boilermaking industries. In addition, the development of specialized high speed riveting equipment, especially in the aircraft industry, will permit more work to be done by fewer riveters. However, there will be some job openings for new workers to replace experienced men who leave this occupation.

Earnings and Working Conditions

In airframe plants in May–June 1949, average straight-time hourly earnings of riveters were $1.43 for Class A workers and $1.24 for Class B.

Riveting is noisy work, and much of it is done in cramped positions (for example, inside aircraft fuselages).

See also Aircraft Manufacturing Occupations, p. 273, and Shipbuilding and Ship Repairing Occupations, p. 259.
OTHER TRADES AND INDUSTRIAL OCCUPATIONS

Armature Winders

(D. O. T. 6-99.011)

Outlook Summary

Upward trend in employment, but not many openings in this small, semiskilled occupation.

Nature of Work

Armature winders fit wires into the slots of armature cores of electric motors and generators. The armature is the moving part of a motor and generator. It consists of a metallic core and wire coils through which electric current flows. The armature winder may wind the wire coils onto the core by hand, using a coil winding machine, or by inserting previously prepared wire coils into the slots of the armature core. He may also be required to cut and pack insulating material around and in the armature core.

Armature winders are employed in plants which manufacture small motors and generators. These plants make large quantities of standard motors and generators, so that armature winding is mainly repetitive, and can be learned in a few months of on-the-job training. In motor-repair shops and in the manufacture of the larger specially designed motors and generators, motor repairmen or all-round assemblers do most of the armature winding as part of their broader jobs, and only a few armature winders are employed. A large share of the armature winders are women.

Employment in the occupation is largely concentrated in a number of electrical equipment manufacturing centers, such as Schenectady, N. Y.; Pittsburgh, Pa.; and St. Louis, Mo.

Outlook

Long-run prospects are for rising employment in this occupation. Output of motors and generators will tend to increase because of the growing use of electrical equipment both in homes and in industry generally. Military requirements will probably increase the output of motors and generators. This will result in a moderate rise in the number of armature winders needed, particularly during the early fifties. In addition to openings that will arise from increase in employment, there will be opportunities resulting from replacement needs. Withdrawal from this occupation is usually at a rate higher than from many other industrial occupations because a large proportion of the workers are women, many of whom leave the labor force when they marry. The total number of openings will be limited, however, by the small size of the occupation—a total of several thousand were employed throughout the country in mid-1950.

Bakers

(D. O. T. 4-01.100 to .800; 4-02.151, .311, and .321)

Outlook Summary

A moderate upward trend is likely in the number of bakers employed. Most new workers will enter the trade through apprenticeship.

Nature of Work

Bakers are skilled workers capable of performing all or several of the steps in the process of making bakery products. These products include bread, rolls, biscuits, cookies, cakes, pies, pastries, pretzels, crackers, and doughnuts. Some bakers make a wide variety of products; others specialize on one product, for example, bread bakers, cake bakers, and pastry bakers. Many journeyman bakers specialize on one operation; although qualified to do all-round work, they are in such specialized jobs as benchman, ovenman, and decorator. However, many other workers performing a single operation are not considered bakers, because they are skilled in only that operation and lack the training and experience necessary to do the other tasks of the baker's trade. Some bakers
specialize in baking along nationality-product lines such as Hebrew, French, or Scandinavian.

In neighborhood shops and other specialty shops where most of the work is done by hand, bakers ordinarily make a wide range of products and perform all stages of the work, frequently with the assistance of helpers and apprentices. In many of the larger plants, specialization has been adopted to such an extent that fully qualified bakers are found chiefly in supervisory positions or in skilled jobs making specialty products. Bakers working for hotels, restaurants, and institutions are generally all-round workers. But even in these large establishments, there is considerable specialization.

Bakeries may be either "hand" or "machine" shops. Most hand work is found in small establishments. However, some machines are used in nearly all shops. Large baking plants, such as the wholesale bread or biscuit plants, are highly mechanized.

The baker's work can be roughly divided into three phases: first, preparing the dough or batter, by mixing the ingredients and dividing, kneading, and shaping the material; second, the actual baking operations, which involve closely watching and regulating the ovens; and finally, finishing the freshly baked items by adding fillings, icings, and decorations.

Other duties of bakers may include ordering supplies, estimating the costs of materials and labor, and planning baking schedules. Frequently, they supervise other workers.

Where Employed

Because of the perishability of their products, most bakeries, large and small, sell primarily within a limited area. (The principal exceptions are plants making "dry" products, such as cookies, crackers, cones, and pretzels.) As a result, employment of bakers is widely spread throughout the country. However, certain areas, and particularly large cities in the North and East, have the great majority of the jobs.

The greatest number of bakers who do all-round work are in small shops. Many of these bakers own and operate their own bakeries. A considerable proportion of the all-round bakers are employed in the big bread, cracker, and cake plants. Other bakers have jobs in restaurants, hotels, and institutions.

Training and Qualifications

A baker generally learns his trade through a 3- or 4-year apprenticeship. An agreement between the union and employer regulates the conditions of apprenticeship. It provides that the apprentice must be given all-round training in the department in which he is employed, such as the bread or the cake department. Some small shops offer an advantage in apprentice training since it is possible to work on a wide variety of products.

Outlook

Long-run prospects are for some growth in the number of jobs for bakers. In the past, the trend has been markedly upward. Between 1920 and 1930, the number of bakers rose by more than 40 percent, reflecting increased consumer preference for baked foods as well as continuation of a trend toward purchasing these foods rather than making them at home. In the 1930-40 decade, there was further growth in the occupation, but at a very much lower rate. About 144,000 persons reported their occupation as that of baker in the 1940 Census of Population; this figure probably includes, however, a number of less skilled bakery workers as well as journeyman bakers.

On the basis of past trends and expected future growth in population, some further rise in con-
sumption of bakery products is indicated, provided that general business conditions are favorable. Increasing mechanization of bakeries, however, may tend to reduce the number of all-round bakers needed. Mechanization makes it possible to substitute less skilled men for journeymen bakers and also raises output per worker. On the other hand, journeymen will continue to be employed in the production of hand-made specialty products (such as fragile pastries and decorated cakes which cannot be made by machines) and in supervisory jobs in mechanized bakeries.

Another factor tending to raise employment in this occupation is a probable reduction of the workweek; some bakeries are on a 48-hour week, but the 40-hour week is being more widely adopted. Replacement needs will probably provide more openings for new workers than the expected gradual rise in employment. Death and retirement of experienced workers may provide about 2,000 to 3,000 jobs annually during the next decade. Other job opportunities will also result from the need to replace bakers who shift to other types of work or who are called up for military service.

**Earnings and Working Conditions**

Earnings of journeymen vary considerably, depending upon skill, the kind of bakery in which employed, and area. About half of all bakery workers are union members, most of whom belong to the Bakery and Confectionery Workers' International Union of America (AFL).

In spite of the large amount of mechanization, most baking jobs still require some strenuous work. Baking shops are often unreasonably hot. Bakers often work nights and on Sundays and holidays. Baking is not particularly hazardous when compared with other manufacturing industries. In 1949, the baking industry had 14.8 disabling injuries for each million employee hours worked as compared to 15.0 for manufacturing as a whole.

**Where To Get Additional Information**


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**Costume Jewelry Workers**

(D. O. T. 4–72.300 to .599; 6–72.300 to .599)

**Outlook Summary**

Opportunities for beginners to learn skilled jobs will be limited in the early fifties. Many openings in unskilled and semiskilled jobs because of high turn-over. Employment falls off heavily during depressions. Little increase in employment in the long run.

**Nature of Work**

Costume jewelry consists of medium- and low-priced rings, pins, bracelets, necklaces, earrings, chains, fraternal emblems, religious jewelry, and other ornaments. Most costume jewelry is stamped out by machine on a mass production basis, using semiskilled and unskilled operators, although some pieces are cast rather than stamped. Only about a fourth of the workers in costume jewelry manufacturing plants are skilled. The skilled workers design pieces of jewelry and make up samples, make molds and dies, do engraving, stone setting, fine casting, soldering, or bench work.

Costume jewelry manufacturers employed 22,300 production workers in 1947. Eighty of the 860 firms in the industry had more than two-thirds of the employees. About half of the workers are women, employed primarily in semiskilled and unskilled occupations. The main costume jewelry production centers are the Providence-Attleboro area in Rhode Island and Massachusetts, and the New York City area. The next largest production center is the Chicago area.

**How To Enter**

Semiskilled and unskilled operators learn their jobs through short training periods on the job. Skilled workers in costume jewelry plants have similar skills and get the same type of training as the skilled workers in precious jewelry shops. (See p. 181.) Opportunities for becoming a skilled worker, however, are not as good as in precious jewelry shops, where much of the jewelry is handmade. Some workers in costume jewelry plants were trained in precious jewelry shops. A
few public and private trade schools teach these trades. Employers occasionally send their trainees to day or evening classes in these trade schools, and consider the time spent as part of their working hours; in a few instances the employer pays the tuition.

Employment Outlook

Several thousand semiskilled and unskilled workers will be hired each year during the early fifties to replace employees who leave their jobs. Turn-over will be high because women make up a high proportion of the work force, because it will be easier to find other types of work in a generally tight labor market, and because some workers will be entering the Armed Forces. Seasonal ups and downs in the industry also add to the total turn-over. Opportunities for beginners in the skilled trades will be much more limited. With the exception of jewelry tool and die makers there are enough workers now in training for skilled jobs to take care of any needs that may arise. During the next several years employment will probably expand slightly.

Over the long run, there probably will be only a slight increase in employment. Although buying of costume jewelry is expected to increase, owing to growth in population and rising incomes, greater productivity per worker will enable factories to expand output without hiring more workers.

During late spring and early summer when work is slack, many employees are laid off, particularly among the semiskilled and unskilled workers. Employers usually try to keep their skilled workers employed throughout the year.

Earnings and Working Conditions

Skilled workers in a great many medium- and low-priced jewelry plants in the Providence-Attleboro area in mid-1949 had an average base rate of $1.51 an hour; semiskilled workers, 99 cents; and unskilled workers, 75 cents. There are additional incentive payments which may increase earnings in the rush seasons by as much as 10 to 30 percent.

Many workers in the skilled tool trades are organized by the International Association of Machinists. The Playthings, Jewelry, and Novelty Workers International Union (CIO) and the International Jewelry Workers' Union (AFL) represent many of the industry's remaining skilled and semiskilled workers.

Where To Go for More Information

The following organizations may be helpful in providing information on employment opportunities, working conditions, and earnings:

- New England Manufacturing Jewelers' and Silver-smiths' Association,
  Sheraton-Biltmore Hotel,
  Providence, R. I.
- International Jewelry Workers' Union, AFL,
  551 5th Ave., Suite 825,
  New York 17, N. Y.

Electroplaters

(D. O. T. 4-74.010)

Outlook Summary

Prospects are for little change in the number of these jobs; a small number of new workers will find jobs each year as replacements for those leaving the trade.

Nature of the Work

Platers work in electroplating shops, where objects, usually of metal, are given a relatively thin coating of nickel, silver, gold, chromium, tin, or zinc. These coatings are usually applied for ornamentation or for protection against corrosion. Typical electroplated products include automobile bumpers and hardware, cigarette lighters, plated silverware, costume jewelry, plumbing fixtures, electrical appliances, and bearings. The plating is done by immersing the article in a liquid solution containing the plating metal, through which an electric current is passed.

The plater must first make sure that the articles to be plated have been properly cleaned and otherwise prepared for plating. He must know the characteristics of the metal being plated, the type and thickness of metal coating to be applied, and the area of the surface to be plated. He can then judge the proper type and strength of solution to use, the electric current strength, and the posi-
Electroplating is done by immersing an article in a liquid solution containing the plating metal and passing an electric current through the solution.

Electroplating shops are found throughout the country, but many are concentrated near the centers of metalworking industry in the Northeast-Midwest, and, to a lesser extent, California.

Training and Qualifications

Plating is learned on the job. The training may be through an apprenticeship, ordinarily of 3 years, or through general work experience (in such less-skilled jobs as plater’s helper or tank operator) which usually takes a longer time. The best place to learn the trade is in a job shop, because of the great variety of work done. High school courses in physics and chemistry are helpful in learning the work. Advanced courses in these and similar subjects is often considered almost indispensable for promotion to supervisory positions.

Outlook

In mid-1950 there were an estimated 8,000 to 10,000 electroplaters employed throughout the country. It is likely that there will not be any substantial increase or decrease in the number of jobs over the long run. A small number of job openings will result from the need to replace those platers who die, retire, or shift to other lines of work. The use of electroplating is closely tied to general business conditions, however, and slumps in business activity cause temporary declines in the employment of platers.

Plating should continue to have an important place in the production of the many metal products where it is now used. There is no marked trend toward substituting other finishing methods for plating. Neither are there any important technological changes in prospect that would greatly
reduce the number of platers needed in electroplating processes. Many of the larger shops use automatic conveying devices to carry the plated articles through the plating tanks and other parts of the process, and this development may be extended to additional plants. This equipment tends more to displace many of the helpers and laborers from the plating process than the skilled platers who direct it. However, as greater mechanization occurs in some of the larger plants, there is a tendency to have chemical engineers direct the plating operations and to use platers as foremen.

Earnings and Working Conditions

Recent earnings data are not available for many of the industries in which platers are important. In February 1950, platers employed in automobile manufacturing plants had average straight-time earnings of $1.59 an hour.

Plating work involves certain hazards, because strongly acid, alkaline, or poisonous solutions are used, and there may be noxious fumes. Injury from contact with chemicals can be avoided with reasonable care, however, and fumes eliminated by proper ventilation. Use of protective clothing and of respirators provide additional safeguards.

Many platers are members of trade unions. Some belong to the Metal Polishers, Buffers, Platers and Helpers Union (AFL), while others are covered by the United Automobile, Aircraft and Agricultural Implement Workers (CIO) and other industrial unions which organize all the workers in a plant rather than only those in particular occupations.

Instrument Makers

(D. O. T. 4-75.130; 5-08.912; 5-08.866)

Outlook Summary

Small but growing field. Most openings will be for men with experience as machinists, tool makers, or machine-tool operators; a few without this experience will enter through apprenticeships.

Nature of Work

Instrument makers are skilled mechanics who build scientific and industrial instruments. The principal types of instruments include optical, electrical, mechanical, aeronautical, electronic, and gyroscopic. Microscopes and cameras are common types of optical instruments, but there are many other specialized kinds. Electrical instruments measure voltage, amperage, or other characteristics of electricity. Mechanical instruments include those used to record, measure, or control such things as liquid level, temperature, density, and acidity. Among aeronautical instruments are those used in navigation, and those which indicate air speed and altitude. Gyroscopic devices aid in stabilizing aircraft and ships. Electronic instruments perform a variety of industrial functions, such as inspecting and counting products. In addition, there are many other types of instruments, including meteorological, biological, geophysical, and specialized military and scientific devices.

Instrument makers construct instruments by making parts and assembling them into the finished product. Some make experimental or pilot models which will be put into regular production. Others turn out instruments, of which only a few are made, to fill special orders. In a few cases, they produce relatively standard instruments, but in large-scale production the work is broken down and assigned to less skilled workers, such as machine-tool operators and assemblers. For work in scientific laboratories, instrument makers build instruments to fit specific research jobs.

In producing instrument parts these workers use machine tools, such as lathes and grinding machines, and a variety of hand tools. High-precision work is required. Instrument makers work with various metals, and may also fabricate other materials. Their work may include the making of cutting tools, dies, and other attachments used in shaping metal. They assemble the parts into complete instruments, which are often very complex. Finally, they may use testing equipment to check on the operation of the finished instruments. The distinguishing feature of the instrument maker's job, setting him apart from other metal craftsmen, is that he must be able to construct instruments from start to finish. Machinists or machine-tool operators may make parts, but they do not turn out complete instruments.

There is considerable variation in skill require-
ments in this occupation. Some instrument makers, particularly in scientific laboratories, construct instruments from rough sketches and oral instructions, and may contribute to instrument design. Many others work under close supervision and follow detailed blueprints. Instrument makers often specialize in making one broad class of instruments, such as optical, electrical, or mechanical. In scientific laboratories and in some manufacturing shops, they are often required to turn out a wide range of instruments.

Training and Qualifications

There are two main kinds of training for instrument makers. Usually, trainees are drawn from the ranks of experienced tool and die makers, machinists, or skilled machine-tool operators. Working, at first, under close supervision and doing the simpler jobs in the instrument shop, these men usually need at least 2 years to qualify as instrument makers. On the other hand some shops provide instrument-making apprenticeships for which previous experience is not required. These apprenticeships, which generally cover 4 years, include not only shop training, but also classroom work in related technical subjects, such as mathematics, physics, and blueprint reading. Those who enter this field should have considerable mechanical aptitude and superior manual dexterity. They should be suited for work requiring close and continuous concentration, because of the precision needed in making parts and because of the intricacy of many instruments. High school graduation is generally required for apprenticeships and trainee jobs. Courses in mathematics, science, and machine shop work are considered useful preparation for these jobs. For electrical-instrument making, some technical schooling in electricity and electronics is often very desirable.

As the instrument maker’s skill improves and as he broadens his knowledge of the field, he may advance to increasingly responsible jobs. It takes 10 to 15 years’ experience to rise to the top-skill level. Advancement may be more rapid during the fifties, because of the increasing need for these workers. A first class workman must possess considerable inventiveness in order to construct new types of instruments. Supervision of less experienced workers may be an important part of his job.

Where Employed

The great majority of instrument makers are employed by firms manufacturing instruments for sale. In this field, most instrument makers work for large firms, where they mainly construct pilot models of new types of instruments. With smaller firms, instrument makers are likely to be engaged in producing special types of instruments required in small quantities.

In the Federal Government, the principal employers of instrument makers include the Army, Navy, Air Force, Bureau of Standards, Coast and Geodetic Survey, and other technical agencies. University and other private research laboratories use instrument makers to produce the special devices required in scientific research. Generally, only larger laboratories have their own instrument makers, and then only one or two.

The main centers of instrument making are in and around a few large cities such as New York City, Rochester (N. Y.), Chicago, Philadelphia, Cleveland, Washington (D. C.), Baltimore, and Pittsburgh. Among the leading States are New Jersey, New York, Illinois, Pennsylvania, Connecticut, Ohio, California, Michigan, Maryland, and Massachusetts.

Outlook

The number of jobs in this field will continue to grow during the fifties. However, the number of openings for new workers will not be large in any one year because of the small size of the occupation—probably not over 5,000 were employed at the beginning of 1950.

Both private and public organizations will be employing additional instrument makers during the fifties. The development of new and of improved instruments for industrial and military purposes will be of vital importance to defense. Instrument makers are used in the continuous development of aircraft, naval vessels, ordnance, and other war materials. However, even without military requirements, our constantly advancing technology requires a corresponding development of instruments.

Prospects are that the output of instruments will rise. There has been a trend toward more extensive use of instruments in a great variety of industries, including petroleum, chemicals,
rubber, paper, and food-processing. Instruments used in industry today perform essential operations that cannot be done by human workers. The tendency has been to make increasing use of instruments in industrial operations as well as to require new and more complex types.

Another source of stepped-up demand for instruments will be the Nation’s many research laboratories. Research in biology and medicine, chemistry, physics, meteorology, astronomy, and other fields utilizes a great variety of instruments. The development of atomic energy has required vast numbers of instruments, many of them completely new devices. It seems likely that research activity will continue to grow and with it the demand for instruments in research.

As a result of expected expansion in this field, there should be some increase in the number of jobs for these craftsmen. Although gains in output are in prospect, the number of jobs may not increase proportionately, since these workers are used mainly in the development of new instruments and in the production of instruments to special order, rather than in the mass production of standardized devices.

Most openings for new workers will go, as in the past, to those with experience as tool and die makers, machinists, and skilled machine-tool operators. There will also be some apprentice openings for young men without this experience.

In the future there may be some increased specialization, so that more work will be done by less skilled men working under the direction of all-round instrument makers. This development has been occurring over a period of years and seems likely to continue. Nevertheless, since such a large part of instrument making is in connection with the development of new or very special types of instruments, the possibilities for specialization are limited and there should continue to be a growing number of jobs for all-round men. Moreover, there will always be a need for all-round mechanics to make instruments needed in such small numbers that mass production techniques are impractical. Some openings for new workers will occur as replacements are needed for those who die or retire or shift to other fields of work.

**Earnings and Working Conditions**

Earnings of instrument makers vary greatly, partly because of difference in skill. Typical straight-time hourly earnings in manufacturing plants, however, ranged from $1.70 to $2 in 1949. In the Federal Government, annual salaries ranged from $2,200 (for the lowest grade helpers and learners) to $6,400 (for higher level supervisory jobs). Instrument makers at grades comparable to journeymen earned from $3,000 to $5,600 a year in the Federal Service.

In general, instrument making shops are clean and well lighted, in order to facilitate precision work. Serious accidents are uncommon, and heavy lifting usually is not required. Part of the work is done at benches and part at machines in the shop. Noise is not great, since the machines used are generally small and not in continuous operation.

**Painters (Manufacturing)**

*(D. O. T. 7-16.210, 9-16.90)*

**Outlook Summary**

This semiskilled occupation offers many job openings for new workers.

**Nature of the Work**

These are semiskilled workers employed in manufacturing plants. They paint various kinds of manufactured products on a mass-production basis. These products include automobiles and automotive parts, furniture, electrical equipment, farm machines and tractors, and many other manufactured items. The painters use spray guns, or hand brushes; in some cases, they dip the articles to be coated into a paint mixture. (This work should not be confused with that of skilled hand painters employed in some manufacturing processes and in construction and maintenance work.) In 1940, upwards of 60,000 were employed in this occupation; about 8 percent of the total were women. In mid-1950, over 5,000 were employed in automobile and truck assembly plants alone.

There is no formal training for this work. Ex-
Experience on the job is necessary to qualify as a painter in a manufacturing plant. Two weeks of experience may be sufficient for some jobs; a few jobs may take up to a year to learn.

Anyone going into this work should have the ability to stand on his feet for long periods of time, good lungs, a steady hand, strong fingers, and a good eye to see that there is a smooth surface on the articles being painted. He must not be bored by having to paint the same kind of objects over and over again.

_Earnings_

Recent earnings are not available for painters in most manufacturing industries which employ these workers. However, in February 1950, in passenger automobile manufacturing plants, average straight-time hourly earnings for lacquer or enamel sprayers were $1.75, and for miscellaneous sprayers $1.58. In September 1949, straight-time average hourly earnings for sprayers in wood furniture manufacturing plants varied from less than $1 an hour, in North Carolina and Virginia, to $1.39 in Grand Rapids, $1.44 in Jamestown, New York, and $1.59 in Los Angeles.

Where They Work

Painters are employed in many different industries. Most of them, however, work in plants which produce furniture, store fixtures, electrical machinery and equipment, agricultural machinery and tractors, aircraft and parts, and automobiles and automobile parts.

Outlook

Some increase is likely in the number of these workers during the fifties. The industries which employ most of the painters have generally favorable production prospects, so that there should be some gradual expansion in the amount of product painting to be done. However, most openings for new workers will arise from replacement needs. Death and retirement of experienced workers will create some openings. However, as in many other semiskilled fields workers do not feel closely attached to the occupation and often shift into other kinds of jobs; this results in many opportunities for newcomers. Replacements will also be needed for workers called up for military service.

**Precision Lens Grinders and Polishers**

(D. O. T. 5-08.071 and .081; 7-08.028)

_Outlook Summary_

Few beginners will be taken on for training in this small occupation during the early fifties. Long-run employment trend generally upward.

_Nature of Work_

These workers grind and polish optical elements—lenses, mirrors, prisms, and optical flats—for binoculars, microscopes, range finders, photographic equipment, and other highly accurate optical instruments, such as spectographs and contour projectors used in inspection of many precision products. The degree of skill required for this type of work varies widely. The final operations call for working to very close tolerances and are handled by highly skilled craftsmen with years of experience. Some of the final polishing and grinding is done by hand and some is done on machines. The rough grinding and polishing is done on machines by semiskilled workers. Few of the latter become skilled craftsmen.

Most precision optical workers are employed in factories making optical instruments; others in such Government establishments as arsenals and navy yards, in small custom shops, and in a limited number of precision instrument repair shops. Some highly skilled workers are in business for themselves, doing custom work for various industries. In most factories the work is on a mass-production basis, and the bulk of the workers are semiskilled. However, some factories, as well as custom shops, produce optical elements in small numbers on special order; in such places practically all the workers are highly skilled, able to work to close tolerances and to perform all the various operations.
Qualifications

To become a skilled precision optical worker, it is necessary to complete a 3- or 4-year apprenticeship or equivalent all-round on-the-job training. Learners usually are assigned to the rougher operations first and are set to work on the final polishing and correction of lenses only toward the end of their training program. To handle the most difficult and precise operations requires years of experience after completion of an apprenticeship. Semiskilled production-line work can usually be learned in a few months. Experience on the production line does not qualify a person as a skilled all-round worker, although it may shorten the necessary apprenticeship period.

Outlook

A limited number of men will be trained as skilled precision lens grinders and polishers in the early fifties. There will be training opportunities in the larger plants producing precision optical lenses, prisms, and optical instruments. There will also be openings in some small shops specializing in custom-ordered lenses and instruments. Altogether, only a few men will have a chance to become craftsmen in this small trade.

The larger optical lens plants have many more semiskilled grinders and polishers than skilled workers, since the latter are needed only as supervisors, in final polishing, and for custom-order work. A number of workers will be taken on for semiskilled jobs in the early fifties, as lens manufacturers expand their production to meet military requirements. Most of the semiskilled workers will not learn the skills required to qualify for the few openings which will arise for skilled craftsmen and supervisors. When production of precision optical instruments was greatly expanded during World War II, almost all of the increased employment was among semiskilled production workers who did repetitive work requiring little training. For this reason only a small number of those trained during the war are able to qualify as skilled lens grinders and polishers, who learn the trade by working on every type of operation in lens making.

Over the long run most openings for skilled lens grinders and polishers will occur as craftsmen die, retire, or leave the occupation for other reasons. Employment is likely to increase slightly, owing to increasing use of precision optical instruments in such fields as scientific laboratories, eye-testing, and inspection devices used in manufacturing machinery and other products built to close tolerances. Moreover, new uses for precision optical instruments continue to arise.

What job openings arise will be mainly in New York State, where the large, long-established precision optical manufacturing firms are concentrated, and, to a lesser extent, in some other Eastern Seaboard States and California. Chicago is also emerging as a center for optics. Opportunities, particularly for skilled men, may be found near some of the universities and scientific and industrial research centers where custom shops are generally located.

Earnings

Hourly rates of pay for skilled precision lens grinders and polishers ranged from about $1.60 to $2 an hour in early 1950. Semiskilled workers had lower rates of pay.
Watch and Clock Factory Workers

Outlook Summary

Number of openings arising from turn-over and from slight expansion of employment in the early fifties. Most vacancies in semiskilled and unskilled jobs. Little increase in employment expected over the long run.

Nature of the Industry

The watch and clock industry of the United States is made up of the following three distinct branches:

1. Companies producing clocks and inexpensive nonjeweled (clock-type) watches.

A large proportion of the mechanical clocks and all of the inexpensive watches made in this country are produced by four companies. Their main plants are located in LaSalle and Peru, Ill.; and Bristol, New Haven, Guilford, Waterbury, and Middlebury, Conn. These companies perform every step in clock and watch manufacturing from fabricating parts through final assembling. The four big clock companies, a number of smaller mechanical clock manufacturers, and several electrical equipment companies manufacture electric clocks.

2. Companies manufacturing jeweled watches.

Four other companies produce all the jeweled watches made in this country. (In early 1950, one of these was shut down, at least temporarily.) The main plants of these firms are located in Long Island and New York City; Lancaster, Pa.; Elgin, Ill.; and Waltham, Mass. Three of these companies manufacture all their own parts with the exception of jewels; the fourth imports some of its watch parts from its subsidiary in Switzerland. Less than a third of all jeweled watches sold in this country in 1948 were made by these companies.

3. Companies which import jeweled watch movements from Switzerland and put them into watch cases.

About 150 companies, located mainly around New York City, are engaged in this importing-assembling-marketing business. Most of these are very small shops, but there are several which employ up to a few hundred people. They produced about two-thirds of all jeweled watches sold in the United States in 1948. Complete watch movements are imported from Switzerland, but some minor adjustments are generally necessary after the movement is inserted into the watch case. Comparatively few production workers are needed for these operations and only a very small proportion have to be highly skilled.

The watch and clock industry in the United States employed about 27,600 production workers in October 1949. The eight big manufacturers employed about two-thirds of this total. Less than 4,000 production workers were employed by the importing-assembling firms. States having the largest number of production workers (in 1947) were Connecticut, Illinois, Massachusetts, New York, and Pennsylvania. Most of the jobs are semiskilled, and are generally held by women. Only a small proportion of the workers have jobs which take years to learn. The proportion of skilled workers is considerably higher in the plants producing jeweled watches than in those making clocks and inexpensive watches.

Nature of Work

There are many specialized jobs in watch and clock factories. The typical plant has many departments (spring, dial, plate, etc.) and five major types of workers: (1) machine operators who make the various parts; (2) parts finishers, whose work is done both by machine and by hand; (3) assemblers; (4) final finishers, timers, and adjusters; and (5) inspectors and supervisors. In the factories which make electric clocks, there are other workers who specialize on electric motors. Most of the workers are semiskilled, and a very large number are women. The work differs somewhat from one plant to another, depending on the kind of timepiece made and also on the method of production. A few watchmakers (watch repairmen) are employed in the factories, but they generally work in the service departments on watches sent in by customers for repair. They are rarely used in the production departments.
How To Enter

Almost all skilled craftsmen in watch and clock manufacturing learn their trades through work experience and training on-the-job. Beginners are most often hired for one of the simpler semiskilled jobs, which they can usually learn to do well in a few months. Operators of some of the machines used in watch manufacturing have to train for about a year until they reach their maximum output. At least 2 or 3 years and sometimes as much as 6 years' training are needed to learn the skilled trades thoroughly. As a rule, work on the jeweled watches requires more skill than work on clock-type watches. Work on the cheaper watches in turn requires more skill than work on ordinary clocks.

It is very important that persons considering this field have good vision with or without glasses as well as a high degree of manual dexterity, for even the semiskilled jobs often require work on very small parts. Some of the large manufacturing companies have testing programs for job applicants to discover just how much visual and mechanical skill the individual possesses. Such tests are useful in determining what people are suited to this type of work and also what particular type of factory job would be most satisfactory.

Outlook

There will be a number of openings in this industry during the early fifties. The industry will produce military equipment in addition to civilian clocks and watches, and turn-over will probably rise as jobs become more plentiful throughout the economy. Most of the turn-over will be among the semiskilled workers, many of whom are young women who work for several years and then drop out because of family responsibilities.

Opportunities for skilled workers will be limited in the early fifties. Some of the jeweled watch manufacturing plants, where most of the skilled production workers are employed, have been mechanizing more of the operations to be able to make increasing use of semiskilled rather than skilled operators.

Over the long run also, employment in the whole industry is not likely to rise much provided tariff rates on imported jeweled watches remain at early 1950 levels. Although the demand for watches and clocks is expected to increase considerably, improved production methods will make it possible to produce many more clocks and watches with a work force of about the same size as in late 1950. However, if the tariff rates increase sharply, the number of imported jeweled watches would drop. Production and employment in the jeweled watch factories of the United States would probably rise considerably.

Earnings and Working Conditions

Average weekly earnings of production workers in the watch and clock industry in October 1949 were about $51. Highly skilled workers earned much more than this amount.

Many workers in clock-type watch factories belong to the Playthings, Jewelry and Novelty Workers International Union (CIO). Production workers employed in three of the domestic plants manufacturing jeweled watches are members of the American Watch Workers Union (Ind.). Some employees of firms which import and assemble watches belong to the International Jewelry Workers Union (AFL).

See also Watch Repairmen, page 184.

Dental Technicians

(D. O. T. 0-50.06)

Outlook Summary

Field will be overcrowded with newly trained workers through the early fifties. Employment is likely to increase gradually over long run.

Nature of Work

Dental technicians (sometimes called dental mechanics) make or repair dentures, bridges, inlays, crowns, and other dental restorations, according to dentists' specifications. Technicians range in skill from semiskilled assistants in such jobs as plasterman, polisher, finisher, and packer, to highly skilled technicians such as set-up men, head casters, designers, and carvers. Technicians usually specialize in one of five major types of work: (1) rubber or acrylic (plastic) dentures; (2) gold crowns and bridges; (3) gold castings; (4) non-
precious metal castings: (5) ceramic (handmade porcelain work). However, in small laboratories they may have to do two or more of these types of work. Since dentures and the other restorations are made for individual patients, each must be especially designed and handled as a separate job.

Approximately 24,000 dental technicians were employed in 1950. Most of them worked in commercial dental laboratories—small shops which make up various types of dental restorations on special order from dentists. A few thousand were employed directly by dentists. Very few women are employed in this trade, although some were taken on temporarily during the war. In 1949 there were over 5,000 commercial dental laboratories in operation. Laboratories vary in size. The majority are very small, employing one to five men. Few laboratories have over 25 workers, while the very largest employed not more than 300. Virtually all dental laboratories are owned by men trained as dental technicians.

**How To Enter**

On-the-job training in dental laboratories is the most practical and efficient way of learning this craft. As a rule, dental laboratories prefer to train their own workers. Three to five years' work experience is needed to qualify as a senior technician. During this period the technician learns how to build the various types of dentures, taking into account the structural problems involved in their design. He must learn how to plan dentures so they will not put undue stress or strain on existing teeth. He also learns such techniques as coloring porcelain teeth so that they match the patient's real ones. Casting metal parts of dentures is one of the more difficult operations that must be mastered if one is to become a fully qualified all-round dental technician. There are some schools offering formal courses, but few of them give training that will be acceptable to most employers. However, some employers take on graduates from trade schools as advanced apprentices. Three dental colleges now offer courses in dental technology which are approved by the American Dental Association and the number doing so may increase. It is very important that prospective dental technicians possess a high degree of both artistic and mechanical ability.

**Outlook**

It will be difficult for persons trained in trade schools to get jobs in the early fifties. In mid-1950 there was a surplus of persons who had been trained during the past 3 years, and many more were being trained. Employment of dental technicians was more than 50 percent higher in 1950 than in 1941, but the gain in employment was mostly accounted for by workers trained by the dental laboratories. At a result, many of the thousands trained in trade schools have been unable to get jobs in the field. Because most dental laboratories prefer to train their own workers, it probably will continue to be hard for trade school graduates to find jobs in this field. However, some newcomers will be taken on, mainly to meet replacement needs. In addition to deaths, retirements, and shifts to other jobs, men will leave the occupation for military service.

Employment probably will increase over the long run. In response to a growing realization of the value of dental care, there will probably be a gradual increase in the number of dental technicians. In addition, there will be several hundred job openings each year as a result of deaths and retirements. Dental technicians have a good chance of steady employment over a long period.

Although technicians are employed in all parts of the country, the majority of jobs are in the larger cities. More than half the dental technicians employed in 1949 were in the following eight States: New York, Ohio, Illinois, New Jersey, California, Minnesota, Massachusetts, and Pennsylvania. In small communities, dentists frequently send their work out of town. Some enterprising and highly skilled technicians will be able to set up their own laboratories in smaller localities and get the local trade.

**Earnings and Working Conditions**

Earnings in 1948 for experienced workers generally ranged from $200 to $300 a month. Some highly skilled men made much more. Hourly rates for beginners were from 50 to 60 cents; for skilled operators $1.25 to $1.80. Since the work falls off during the summer in most areas, annual earnings may be reduced by short lay-offs in that season. Earnings of self-employed technicians vary considerably, depending not only upon the...
location of the laboratory and the individual's skill, but also upon the number of men working for him. There is some union organization among dental technicians in the larger laboratories and dental offices in the big cities in the east, midwest, and in California, but only a very small proportion of technicians are members of unions.

Where To Go for More Information

For more information on job opportunities, training, and other questions, write to:

Dental Laboratories Institute of America,
7 South Dearborn St.,
Chicago 3, Ill.

Dry Cleaners and Spotters
(D. O. T. 5-57.110 and 5-57.310)

Outlook Summary

Limited number of opportunities for plant helpers to be promoted to skilled dry cleaner positions in early fifties. More opportunities to become spotters. Slowly increasing employment over the long run.

Nature of Work

Dry cleaners operate machines which wash garments in dry-cleaning solvents. This involves determining the proper amount of solvent and the proper detergent mixture to be used for various fabrics, regulating the time each garment must remain in the machine, and filtering the solvent to remove lint and other insoluble matter.

A dry cleaner's main duty is to operate machines which wash garments in dry-cleaning solvents.

Most plants have only one dry cleaner. In some large plants, one skilled man supervises a small number of helpers in the operation of several dry cleaning machines. Many dry cleaners own their own plants. This is ordinarily a man's occupation. A good many of the workers are Negroes.

Spotters are employed in dry-cleaning establishments to remove spots from garments by applying moisture and chemical solutions. They determine the nature of each spot, select the proper solvent for the material and the spot, and remove the stain by special techniques. They may prepare their own solutions or use standard ones. Spotters may also wash or direct the washing of dirty garments in soap solution before attempting to remove spots (called wet cleaning).

In very small plants all spotting is done by one individual. In most plants, however, there are two types of spotters: silk and wool spotters. Wool spotters are not as skilled as silk spotters, because they work with garments which have a coarser texture and are more color-fast. In a number of plants, spotting, particularly wool spotting, is done by Negro workers.

An estimated 30,000 dry cleaners and 40,000 spotters worked in dry cleaning plants in 1949. There were between 24,000 and 25,000 separate plants. Dry cleaning employment is widespread throughout the country with considerable concentration in the bigger cities.

How To Enter

From 9 months to as much as 3 years of on-the-job training is needed to qualify as a silk spotter. In the course of his training, the silk spotter learns wool spotting, wet cleaning, and dry cleaning. The training is generally of an informal nature,
but a few plants have regular 3-year apprenticeship programs. To become a wool spotter requires only 3 months to a year of work experience.

Working as a helper is the usual way of learning how to be a dry cleaner. The length of time it takes to learn the job varies: it may take from 6 months to as much as 2 years for a man to be classed as a fully qualified dry cleaner. Helpers in both occupations are usually taken on just before the busy seasons beginning in early March and late August.

Outlook

Employment of dry cleaners and spotters is expected to remain at about the 1949 level for the next several years. Turn-over in these trades, however, will create a few thousand openings, a large majority of them in spotter jobs. The vacancies will be filled almost entirely by workers already employed in dry-cleaning plants. Inexperienced workers who wish to become dry cleaners or spotters will have to take helper jobs and learn these operations by working with experienced employees. Since turn-over is high among helpers in dry-cleaning plants, openings for beginners will be fairly plentiful.

Over the longer run, employment of dry cleaners and spotters probably will rise slowly. More and more people will recognize the importance of wearing clean well-pressed clothes. An increasing proportion of the population will continue to enter the white collar occupations which require wearing clothes of the types which must be dry cleaned. Increasingly, garment manufacturers are using nonwashable materials and water-repellent fabrics, which must be cleaned and treated by dry cleaners. In addition, it is becoming more common to have dry-cleaning firms clean rugs, draperies, and upholstery. Moreover, as the population grows and per capita income rises, people spend more money on cleaning.

Earnings and Working Conditions

Typical earnings of dry cleaners employed in the larger plants in various parts of the country in mid-1949, ranged from $40 to $60 a week, according to a survey. In the larger cities, experienced men employed on a piece-work basis, could make somewhat more. Average weekly earnings of wool spotters ranged from $30 to $60 a week. Silk spotters made between $45 and $75. Workers in the smaller towns earned less than those in cities. Many States have laws which specify the minimum rates which dry-cleaning plants can pay. The average workweek is 40 to 45 hours, although during the busy spring and fall seasons, overtime is common. There is some unionization in this field, primarily in the larger cities. Two unions which represent the greatest number of workers are: International Association of Cleaning and Dye House Workers (AFL), and the Amalgamated Clothing Workers of America (CIO).

Spotters have to stand on their feet all day in a hot damp place, using chemicals that have unpleasant odors. Dry cleaners face additional hazards from the cleaning solvents they use in the machines. Because petroleum solvents are slightly inflammable they require special handling to prevent fires. Synthetic solvents give off fumes which may be harmful in large amounts. However, some of the newer machines are equipped with automatic locks that will not open until all the fumes have been drawn out by special suction fans.
Where To Go for More Information

For more information on job opportunities, earnings, or training courses, the following organization may be helpful:

National Institute of Cleaning and Dyeing, 8001 Georgia Ave., Silver Spring, Md.

The following publication provides useful information to people interested in going into their own dry-cleaning business:


Meat Cutters

(D. O. T. 5-58.100)

Outlook Summary

A few thousand job openings for trainees each year during the early fifties. Over the longer run, rising consumption of meat will hold the employment of meat cutters at about the 1949 level or possibly cause a gradual increase, despite technological developments in cutting and selling meat.

Nature of Work

Meat cutters carve pieces of meat from animal carcasses, or from precut quarters of beef, lamb, veal, or pork—using a knife, saw, or cleaver. They may also dress fish and poultry and make sausage, meat loaf, and other special products. An important part of the meat cutter’s job is knowing the quality of the meat he handles, and knowing the different cuts of meat. The meat cutter in the retail store usually acts as a sales clerk in addition to cutting meat. He displays and sells meat and suggests various cuts to the customer. If he is a proprietor of a small shop or a manager of a meat department in a large, independently owned store, the meat cutter buys and prices the meat.

Where Employed

Meat cutters work in retail meat markets, in grocery stores with meat departments, in wholesale supply houses, and, to some extent, in hotels and restaurants. The bulk of them are employed in grocery stores and meat markets. However, wholesale supply houses hire many meat cutters to divide whole carcasses into quarters for meat retailers who request this service, or to carve steaks, chops, roasts, etc., for restaurants, hotels, and institutions. Some of the larger hotels and restaurants employ their own meat cutters instead of following the usual procedure of buying precut meats.

Training and Qualifications

The meat cutter learns his trade on the job, usually in 2 or 3 years’ time. Chain stores, and some of the larger independent meat markets and grocery stores have definite training programs, including many regular apprenticeships. But many meat cutters pick up the trade as butchers’ helpers or as part-time workers in butcher shops. Vocational schools in some cities offer instruction in meat cutting, but only a few provide training acceptable to most employers. Even in these cases school training must be followed by a period of work experience before a man is considered a fully qualified meat cutter.

Outlook

There should be at least a few thousand trainee openings each year in this large occupation during the early fifties. These openings will be mainly to replace meat cutters who die, retire, or change to other jobs. Meat consumption is expected to remain at high levels in this period, and there will not be much change from the 1949 employment of meat cutters. Self-service meat departments have been widely introduced in recent years. This development will continue, but there has as yet been no indication that it will tend to reduce substantially the employment of meat cutters. Self-service for meat has been mainly used in the larger, supermarket type stores, and such departments are not likely to be established in many of the smaller, independently owned stores, where the
volume of sales is lower and direct contact with the customer is important.

Over the longer run, the total consumption of meat should continue to grow, as a result of increasing population and higher per capita consumption. This gain in consumption should offset the effects of such technological changes as self-service, precut meats, and meat-cutting machines. As a result, the employment of meat cutters should at least be held at present levels, with a possible gradual growth in the number of jobs.

Earnings

In the larger cities, experienced meat cutters typically made between $60 and $85 for a 40- to 48-hour week in 1949. But in the small cities and towns throughout the country, they made less and frequently worked longer hours. Managers of meat departments in stores often earn considerably more than the meat cutters. There are many such supervisory jobs in relation to the total employment of meat cutters.

Although the hourly pay of the average meat cutter is lower than that of some other skilled workers, his annual earnings are comparatively good. His work goes on steadily the year round without much seasonal slack in activity.

Many meat cutters look forward to eventually opening their own meat markets or combination grocery and meat stores. Earnings of such proprietors vary widely, depending on the size of the store, its location, and other factors. However, there are many more small stores than large ones.

Optical Mechanics (Ophthalmic)

(D. O. T. 5–08.010)

Outlook Summary

Limited number of openings for beginners in this small occupation through the early fifties. Number of workers will increase over long run.

Nature of Work

Optical mechanics (or opticians) are of two main types—lens grinders, who grind and polish surfaces of lenses used in eyeglasses; and benchmen, whose duties include cutting the edge of the lens to desired shape and size and inserting it in the frame or rimless mountings. Much of the work is precise, and it may require workers to be on their feet for extended periods of time.

Most lens grinders work for wholesale optical distributors. A few are employed in retail shops, but the tendency is for such shops not to do surface grinding but to send their work to a wholesale house. On the other hand, sizable numbers of benchmen work for optometrists and retail dispensers as well as for wholesale establishments. Those employed in retail shops often combine work in edging and fitting lenses with the actual dispensing of eyeglasses to customers. A good many optical mechanics who have the necessary capital are in business for themselves.

Training and Other Qualifications

Two or 3 years’ training and experience in the trade are necessary to become a fairly satisfactory surface grinder or benchman, and longer—perhaps 2 more years—to become fully qualified. Some shops have formal apprenticeship programs which include a definite training schedule. Typically, these programs call for 8,000 hours of experience and instruction on such operations as hand sphere grinding, and surface lens inspections for lens grinders and on lay-out and mounting for benchmen. In other shops, the work is learned informally on the job over a period of years. Wholesale shops generally provide the best opportunity to acquire all-round skill and knowledge. Connecticut is the only State which licenses optical mechanics, but California, New York, Florida, and South Carolina as well as Connecticut have legal requirements as to who may dispense eyeglasses.

Outlook

A limited number of beginners will be hired as helpers and apprentices in this small occupation in the early fifties. According to one estimate, in 1949 there were about 7,500 mechanics working...
in wholesale optical shops and no more than 1,500 in retail prescription shops. Employment in 1949 was about twice as high as during the late 1930’s.

For the next several years at least, it is expected that there will be an ample supply of mechanics. In most shops enough men are being trained to provide replacements for mechanics who die, retire, or leave their jobs for other reasons. In addition, graduates of trade schools teaching this type of work will be seeking jobs. Highly skilled men will, of course, be able to find positions. Men who wish to establish their own businesses will need a great deal of experience in this field and at least $8,000 to $10,000.

Employment in this field probably will increase over the long run. The number of eyeglass wearers will continue to increase—owing to the growing proportion of old people in the population and growing general awareness of the importance of good vision. More and more schools and employers have eye-testing programs and are encouraging people with defective vision to wear glasses. The increasing number of eyeglasses in use will tend to bring about employment of more optical mechanics, but this may be somewhat offset by the introduction of improved mechanical methods of grinding lenses. Experienced optical mechanics are assured generally favorable employment conditions for many years. Sales of eyeglasses hold up relatively well during declines in general business activity.

Optical mechanics are employed in big and medium-sized communities all over the United States. People in rural communities usually get their glasses in the nearest town or city.

Where To Go for Additional Information

Optical Wholesalers National Association,
Times Building,
New York 18, N. Y.

See also Precision Lens Grinders and Polishers, page 233.
The industrial power of the United States rests largely on iron and steel. It is estimated that over a billion tons of steel are in use in America today—14,500 pounds of steel in some form for each person in the country. Half of the world's output is produced in the United States; the per capita output of steel in this country in 1947 was estimated at eight times the average for the entire world. With its more than 600,000 wage and salary workers in mid-1950, the iron and steel industry is one of the Nation's largest manufacturing industries. The more than 300 iron and steel plants have a great variety of jobs, a large number of which are found in no other industry. Many of the jobs are skilled, and, compared with manufacturing generally, earnings are high. It is expected that the iron and steel industry will hire many thousands of new workers during the 1950-60 decade.

The Iron and Steel Industry and Its Products

The iron and steel industry consists of plants engaged in several different kinds of activities: manufacturing pig iron from iron ore in blast furnaces; converting this pig iron, along with iron and steel scrap, into steel; and rolling or drawing the steel into basic shapes, such as plates, sheets, strips, rods, bars, rails, and structural shapes. In many of the plants, manufacturing processes are carried beyond the rolling stage to produce finished products. The mining of the raw materials is classified as a separate industry, although many mines are owned by steel companies. Also excluded are plants which are mainly engaged in casting, stamping, forging, or machining steel purchased from steel-producing companies.

Only a small percentage of the products of iron and steel plants, such as rail, wire, and nails, can be used directly without further manufacturing. The bulk of the products shipped from steel plants such as sheets, bars, plates, and strips are further fabricated in plants in other industries into hundreds of different products. The leading steel-using industries are automobiles, construction and building materials, machinery, railroads, containers, and petroleum. About 5 percent of the steel is exported.

Sheet steel is made into such things as automobile bodies and metal furniture. Bars are used in making various automobile and machinery parts, as well as to reinforce concrete in building construction. Plates may go into the making of railroad cars, ships, bridges, and heavy machines.

CHART 56

Employment in Iron and Steel Industry

Production Workers in Blast Furnaces, Steel Works, and Rolling Mills

Thousands

1939 40 41 42 43 44 45 46 47 48 49

United States Department of Labor
Bureau of Labor Statistics

*Data for years 1947-1949 not strictly comparable with previous years.
Strips are manufactured into such products as razor blades, license plates, and toys. Tinplate is used primarily for making containers, of which the tin can is best known.

Plants in this industry are typically large. They range in size from a few plants with fewer than 100 workers to several with over 20,000. In 1947, more than two-thirds of all the employees in this industry worked in plants which had over 2,500 wage and salary workers each. Steel companies differ in their degree of completeness of operation. Fully integrated companies mine their own raw materials, produce pig iron, make steel, and roll and finish steel products. Semi-integrated companies make no pig iron; they produce steel from purchased pig iron or scrap and make semifinished and finished products. A third group, the nonintegrated companies, purchase steel for their rolling and finishing operations. A fourth type of plant is the merchant blast furnace which produces pig iron for sale to semiintegrated steel companies and to iron and steel foundries.

The fully integrated companies produce the great bulk of the steel and employ most of the workers. Steel plants have been located with reference to several important factors. One is the location of coal, iron ore, and other raw materials; a second factor is nearness to the markets for steel. Since steel markets and the various raw materials are rarely found in one place, good transportation facilities are essential in plant location.

The steel industry is concentrated mainly in the northern and eastern parts of the United States. The Pittsburgh-Youngstown area is the leading steel center. Farther east, there are large plants in Buffalo, N. Y., Johnstown, and Bethlehem, Pa., and Sparrows Point, near Baltimore, Md. The Great Lakes region has many important steel centers, particularly in the Chicago and Cleveland areas. Much of the steelmaking in the South is done in the Birmingham area. As a result of the Government's wartime expansion program, steel capacity has been increased greatly in the Far West, which previously had only a few small plants; large new mills were built in Geneva, Utah and Fontana, Calif. As chart 57 indicates, about three-fourths of the workers in the industry were employed in five States (Pennsylvania, Ohio, Indiana, Illinois, and New York) in 1947; Pennsylvania alone had more than a third of the workers.

Employment Outlook

It is expected that the iron and steel industry will hire many thousands of new workers during the 1950-60 decade. A substantial increase in steel capacity is in prospect during the fifties, in order to meet expanding defense requirement. As a result, steel employment will increase. Thousands of other job openings will arise from replacement needs. Because of the great size of the steel industry's labor force, normal death and retirement alone should provide approximately 12,000 to 15,000 job openings annually during the fifties. Also important as a source of jobs is the shifting each year of thousands of steelworkers to other fields of employment. Other replacements will be needed for the workers who will enter the Armed Forces.

Although replacement needs appear to be the main factor in the longer run job outlook, it is
necessary to take a closer look at future employment trends in steel, since a drastic change in the industry’s employment level, if one should occur, might greatly outweigh replacement needs. The first factor to be considered in the long-run employment outlook is the trend in the production of steel.

A glance at chart 58 reveals some fundamental facts about the economics of steel production. It is apparent that there have been very wide fluctuations in steel output over the years. To a high degree, these fluctuations are associated with changes in general business conditions. The main uses of steel are in “durable goods” activities, such as automobile production, construction, and machinery manufacture. These activities are extremely sensitive to the business cycle, and, as a result, steel is a “feast or famine” industry; relative to the economy as a whole, steel is especially hard hit during depressions, but in boom times its situation is particularly favorable. How great these variations can be is shown by the drop of 75 percent in steel production between 1929 and 1932 and by the rise of 67 percent between 1939 and 1948.

Business cycles are not the only causes of sharp fluctuations in steel activity. Wartime, with its tremendous requirements for steel (for ships, aircraft, ordnance, and new factories and production equipment) leads to a sharp rise in steel output,
followed by a decline (somewhat less abrupt) with the coming of peace. A glance at the charted trend in steel output during the two world wars illustrates this point.

Chart 58 shows more, however, than great variability in the activity of the steel industry; it also reveals a long-range upward trend in production and capacity. Although the growth of the United States population has been a factor in this rise, a much more important cause has been the great increase in the use of steel in our economy. A few figures illustrate this fact: between 1898 and 1948, the population of the United States doubled but steel production increased 780 percent; and per capita steel output rose 340 percent over the period. The growth in per capita output has been the result primarily of the rise of great steel-using industries—automobiles, construction, railroads, containers, petroleum, electrical appliances, and machinery manufacturing.

During 1947 and 1948, steel production was at extremely high levels, closely approaching the wartime peak. In spite of near-record output, however, the demand for steel exceeded the supply and very marked shortages of certain steel products (mainly sheet and strip) persisted through these years. By mid-1949, the shortage had disappeared; steel production declined as general business conditions moved down from peak levels and as many steel-using industries finished working off their postwar backlog of orders.

However, in the fall of 1950, steel production rose to record levels, because of heavy defense requirements and the upturn in civilian demand. In the fall of 1950, the industry was planning to make substantial additions to steel capacity.

The future level of steel production in the long run is most difficult to gage, tied in as closely as it is with the state of the whole economy and with defense requirements. However, it seems clear from the past trend, and from the factors responsible for this trend, that the long-range movement will be upward. The principal steel-using industries have generally favorable long-run prospects and the industrial economy of the United States undoubtedly has great potentialities for further growth.

Another aspect of the steel production outlook should be briefly considered. The rapidly growing output and expanding range of uses of aluminum and plastics have raised a question as to the chances of these materials being extensively substituted for steel. Careful study of this possibility suggests that the demand for steel is not likely to be seriously affected by the use of these substitutes.

An upward trend in steel production will not necessarily mean an increase in the number of steelworking jobs. In appraising future employment trends, it is necessary to go beyond the problem of the production outlook and to look into the factors which might change the number of workers needed to produce a given quantity of steel.

One of the factors influencing worker productivity is the product mix, the kind of steel products made in the mills. The lighter steel products (sheet strip, tin plate, etc.) require more man-hours per ton to produce than do the heavier products (plate, bars, structural shapes). Shifts in the relative importance of the two classes of products may greatly affect the number of tons produced per man-hour. Thus, with a relatively large increase in the number of tons produced per worker between 1941 and 1944, and practically no change in total man-hours worked, steel output was increased by about a twelfth. This was largely accounted for by the shift in emphasis from light to heavy products occasioned by the war.

After allowing for the effects of a varying product mix, however, we still find a great increase in output per man-hour in the steel industry. The primary reason for this is that major technological developments in steelmaking have occurred; these developments have sharply reduced the amount of work needed to produce a given amount of steel. Between 1929 and 1939, man-hour output in the iron and steel industry rose by about a third. In part, this was caused by a series of minor technical advances, and by some major advances, of which the principal one was the introduction of continuous rolling (described in a later section of this report).

In spite of the sharp rise in productivity, however, steel employment in 1939 was slightly above the 1929 level, even though output in 1939 was almost 11 million tons less than in 1929. What happened was that a drastic reduction in the workweek more than offset the other factors. In 1929, the standard workweek in the steel industry was nearly 55 hours; by 1939, the 40-hour week was generally in effect.
There is good reason to believe that the future will bring substantial further increases in the productivity of the steel labor force. Past trends in man-hour output are one indication of what may occur in the future. Moreover, there are several important technological developments in steelmaking now in various stages of application. Coal washing removes impurities from coal, which speeds up the operation of the coking ovens and improves the quality of the coke; the higher-grade coke steps up blast furnace output. Greatly increased air pressure has been used in blast furnaces to obtain increased production of pig iron. Feeding oxygen into open hearth and electric furnaces is reported to have reduced melting time in steelmaking. Continuous casting, still on an experimental basis, introduces short cuts in steelmaking by eliminating several reheating and rolling operations. There is some question as to the extent to which these and other technical advances will be found suited to general adoption throughout the industry. The degree to which steelmaking employment may be affected by use of these methods is also not clear. Moreover, some technological developments, having to do with the improvement of the quality of steel, may require more rather than fewer workers in some operations, particularly in the maintenance of added equipment. All in all, however, an upward trend in man-hour output in the steel industry seems most likely.

To sum up the analysis of the employment outlook in the iron and steel industry, it is expected that many thousands of new workers will be needed during the early fifties, as industry produces at record levels to meet heavy defense requirements and strong civilian demand. Longer range prospects are for the output of steel to continue its long-run rise. But gains in production are likely to be offset by increases in worker productivity, so that no substantial long-run increase in employment is anticipated. The iron and steel industry will, however, hire thousands of workers each year to replace employees who die, retire, or shift to other industries.

**Steelworkers and Their Jobs**

Four thousand or more separate and distinct jobs are found in the plants and offices of the iron and steel industry. Because this is a highly mechanized industry, a large share of the jobs will have to do with the operation of a great variety of machines and equipment. Another large group of workers is employed in the maintenance departments of the steel plants, keeping this machinery and equipment in good operating condition. The highly technical nature of steelmaking also requires technically trained personnel, such as engineers, chemists, and metallurgists. Finally there are the many administrative and clerical jobs.

The estimated percentage distribution of all employees in the industry by departments in 1940 is shown in the following tabulation.

<table>
<thead>
<tr>
<th>Department</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke ovens</td>
<td>2.4</td>
</tr>
<tr>
<td>Blast furnaces</td>
<td>3.8</td>
</tr>
<tr>
<td>Steel furnaces</td>
<td>7.7</td>
</tr>
<tr>
<td>Rolling</td>
<td>29.8</td>
</tr>
<tr>
<td>Finishing</td>
<td>11.8</td>
</tr>
<tr>
<td>Clerical and sales</td>
<td>4.7</td>
</tr>
<tr>
<td>Maintenance, service, and miscellaneous</td>
<td>39.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

The working force of the industry is predominantly male, reflecting in part the hot, strenuous nature of much of the production work. Women are employed largely in the administrative offices of the steel companies. About 2 percent of the plant workers are women, who are mainly in the less physically demanding plant jobs, such as sorting and inspecting tinplate and nails. The proportion of Negroes in iron and steel plants is higher than in most manufacturing industries; they constitute about an eighth of the plant workers. While a large number work on the labor gang and in other unskilled jobs, many are employed in semiskilled and skilled occupations.

Earnings in iron and steel plants are among the highest in industry. In July 1950, earnings of production workers in these plants averaged $67.83 for a workweek of 39.9 hours. This compares with average earnings of production workers in all manufacturing industries of $59.21 for an average workweek of 40.5 hours, in the same month.

In the fall of 1949, agreements between the United Steelworkers of America (CIO) and the major steel companies provided company-paid retirement and disability pensions for iron and steel workers generally. These pensions amount to at least $100 a month (including social security).
for workers who retire at the age of 65 after 25 years of service, and somewhat less for those who retire with less than 25 years of service. Other benefits of the agreements include paid-up life insurance, hospitalization, and sick benefits; these insurance provisions are financed in part by deductions from the workers' wages.

Because steel mills are spread over wide areas and have many different operating and maintenance units, working conditions vary greatly. Employees working around blast furnaces and steel furnaces must be able to stand considerable heat. Many of the rolling mills are hot and noisy. Much of the work around the coke ovens is heavy and is accompanied by exposure to heat, dirt, and fumes. On the other hand, maintenance units, such as machine shops, are often relatively clean and cool. Because some processes have to be operated continuously, many workers are on night shifts and many work week-ends.

Steel companies generally conduct safety programs among their workers and equip machinery with protective devices to prevent accidents. Steel plants have become relatively safe places to work; the frequency of disabling injuries is less than half the average for manufacturing industries as a whole.

All but a small percentage of plant workers in the iron and steel industry are members of the United Steelworkers of America (CIO).

Processing Occupations

The bulk of the workers in the iron and steel industry are employed in the many processing operations involved in converting iron ore into finished and semifinished steel products or shapes. Making steel requires three main successive steps: (1) iron is first smelted from iron ore in blast furnaces; (2) then it is converted into steel in steel furnaces; and (3) finally the steel is rolled and finished in steel mills (see chart 59).

In order to provide a picture of steelmaking jobs we will follow the operations carried on in a fully integrated plant, giving brief descriptions of important occupations as they fit into the production process.

Ore Docks and Stockyards

Ore is brought to plants on the Great Lakes and other waterways mainly by ship from mines in Minnesota and Michigan. Giant electric unloaders empty the ore from the vessels; the huge cranes dip down into the holds of the ships, lifting as much as 17 tons of ore at one time. A bucket operator, working in a compartment located in the arm of the crane, rides down into the hold and controls the movement of the unloading mechanism. Ore bridge operators manipulate electric controls to operate ore bridges (huge conveyors) which carry ore and other raw materials from the unloading dock or stockyards to the stock house.

Coking Ovens

Steel companies use coke rather than coal in their furnace operations. Coke is produced by baking coal in ovens lined with intensely hot gas pipes, but with no flame coming in contact with the coal or coke. The baking removes volatile gases and other impurities from the coal, preventing such impurities from later entering the molten iron in the blast furnace. The coke plant consists of a series of ovens arranged side by side in groups or "batteries." An oven has a door on each end, and openings on top through which the coal is fed, or "charged." A heater (D. O. T. 4-56.010) operates a battery of ovens, checking gages, regulating temperature controls, and supervising helpers. When the coal has been converted into coke and the coke is ready to be emptied from the oven, the pusher operator (D. O. T. 6-56.030) brings his crane into place behind the oven. At a signal from the door machine operator, who has removed the door on one side of the battery, the pusher operator opens the door on his side of the oven, shoves out the long arm of his crane, and pushes out the entire contents of the oven into a waiting coke car on a track on the other side. Quencher carmen (D. O. T. 6-56.040) operate electrically driven locomotives which move the coke cars to quencher towers where the coke is sprayed with water. Then, after pass-
ing over a screen to remove dust and very small lumps, the coke is taken by conveyors to the blast furnace.

Blast Furnaces

The first step in making steel is that of converting iron ore into a metallic iron called “pig iron.” This process consists of charging alternate layers of coke, iron ore, and limestone into a blast furnace and blowing a blast of very hot air up through the mass. The air blast burns the coke, generating heat and gases which melt the charge and promote the necessary chemical reactions. The gases formed by the combustion of the coke combine with and remove the oxygen from the ore; at the same time, the molten limestone combines with earthy matter in the ore, forming scum, or “slag.” With the oxygen and slag removed, molten iron is left.

A blast furnace works continuously, 24 hours a day, seven days a week, until it has to be shut down for repairs. Every 4 to 6 hours the molten iron is run off or “tapped.” Iron ore, coke, and limestone are charged continuously into the top of the furnace. These raw materials are stored nearby in a stock house below the furnace level. Here larrymen (D. O. T. 7-40.050) load “larry cars” with ore, limestone, and coke from the bins (weighing all materials and following prearranged schedules). Then they convey the load through a tunnel to skip cars, which run up inclined double tracks to the top of the blast furnace. Here the skips dump their contents into the furnace. The skip cars are operated by skipmen (D. O. T. 5-73.550) stationed on the ground below. Stove tenders (D. O. T. 6-91.311) and their assistants operate the huge brick-lined stoves which heat air for the blast furnace. They reg-

CHART 59
ulate valves which control the flow of air into the furnace; at regular intervals they let cold air into stoves already heated and gas flame into those to be heated.

Blowers (D. O. T. 4–91.311) supervise the whole blast-furnace operation, including charging and tapping of the furnace, air blast, furnace heat, and quantity and quality of iron produced. Blowers carefully check the metal in the furnace, sampling the molten iron and slag and sending the samples to the laboratory where metallurgists make exacting tests and report their findings back to the blower. Keepers, (D. O. T. 4–91.321) under the direction of the blower, are responsible for the tapping of the furnace. They supervise their helpers and cinder snappers in lining troughs and runners through which the molten iron and slag is run off. In integrated steel plants, the molten iron runs down the trough into giant ladles and is taken directly in its liquid state to the steel furnace. Where iron is produced for shipment or for later use somewhere in the plant, it is cast into bars, or “pigs,” by means of a casting machine. The pig casting machine consists of a series of molds, mounted on a slowly moving chain. Iron pourers operate electrically controlled cranes, tapping the hot metal ladles and pouring the molten metal into the molds.

Steel Furnaces

The second major step in steelmaking is to convert the iron into molten steel. About nine-tenths of the steel is produced in open hearth furnaces; smaller quantities of special purpose steel are made in Bessemer converters and electric furnaces. Open hearth steel is produced by adding pig iron from the blast furnace to steel scrap and limestone and heating the mixture in a furnace. The “open hearth” is so named because the molten steel lies on the hearth, or floor, of the furnace and is exposed to the flame. The furnaces range in capacity from about 50 to 250 tons of steel at one making or “heat.”

A melter (D. O. T. 4–91.444) is in charge of the operation of a group of open hearth furnaces and is responsible for the quality of the steel produced. Each heat of steel is made to definite specifications, so that specific instructions must be followed each time the furnace is charged. The melter must have a practical knowledge of metallurgy; by varying the proportion of the different materials in the furnace and by adding such elements as carbon, manganese, phosphorus, or sulphur, he makes the steel to order. Melter’s helpers of different ranks (first (D. O. T. 4–91.445), second (D. O. T. 6–91.183), and third) work under the direction of the melter; a first helper is in charge of one open hearth furnace. These helpers regulate furnace temperatures, take samples for laboratory tests, and direct the charging of various materials. Charging machine operators (D. O. T. 6–91.181) run electrically controlled machines which pick up boxes full of limestone, scrap, and other materials; push the boxes through the open furnace doors, and dump the materials into the furnaces. Charging floor cranemen (D. O. T. 5–73.030), operating large overhead cranes, pick up ladles full of molten iron (which has been brought over from the blast furnaces) and pour the contents into the furnaces. In the various charging operations, door operators, by throwing electric switches, open and close the furnace doors.

After eight to twelve hours, the heat of steel is ready to be “tapped,” that is, removed from the furnace. Helpers, assisted by a crew of cinder pitmen, knock out a plug at the back of the furnace, allowing the molten metal to flow into a ladle which is just large enough to hold the heat
of steel, so that the slag which floats to the top, overflows into a smaller ladle.

The liquid steel is then poured from the ladle into ingot molds. A ladle craneman (D. O. T. 5–73.030), directed by the pourer (or castingman) (D. O. T. 4–91.651), operates an overhead crane; the crane picks up the ladle and moves it over a long line of ingot molds (hollow cast iron forms) standing on flat-bottom cars. The pourer works a stopper on the bottom of the ladle to pour steel into the molds.

As soon as the steel in the ingot molds has solidified sufficiently, ingot strippers (D. O. T. 5–73.010 and 5–73.020) remove the molds from the ingots. They operate a crane-like machine which grasps lugs on top of the mold and pulls off the mold, leaving the stripped ingot standing to cool.

In addition to the open hearth furnaces, steel is made in Bessemer converters and in electric furnaces. In the Bessemer process, steel is produced by blowing air up through molten pig iron, the oxygen in the air burning away or combining with impurities in the iron. No fuel other than the oxygen present in the air is needed, because the chemical reaction resulting from the combustion of oxygen produces sufficient heat. The converter, a pear-shaped steel vessel lined with fire brick, is tilted horizontally to receive its charge of molten iron. The converter is swung slowly upward, and at the same time air is forced into the molten iron. This is a spectacular process; 30-foot flames and showers of sparks shoot out of the top of the converter.

A blower (D. O. T. 5–92.302) is in charge of the operation of the Bessemer converter. He directs a regulator (D. O. T. 6–91.381) in charging the converter and starting the air blast. During the blast, the blower determines the condition of the steel by observing the color and character of the flame. He shuts off the blast at the right moment and tilts the converter. He directs the regulator in pouring the metal from the converter into a ladle for teeming into ingots.

Highest quality steels are generally produced in electric furnaces, in which melting and refining can be most closely controlled. Electric furnaces are steel shells lined with heat resisting brick. Carbon electrodes project through the roof of the furnace; a powerful electric current “arcing” from one to the other provides heat for refining. The raw material is usually selected steel scrap, although Bessemer or open-hearth steel may be used. During refining, impurities are carried into the slag and the required alloys are added.

Rolling and Finishing

The final step in the production of steel is shaping. The three principal methods of shaping metal in steel plants are casting, forging, and rolling. Casting, done in foundries, consists of pouring molten metal into a sand mold and letting it harden into the shape of the mold. Forging involves heating the metal to soften it and then pounding or squeezing the metal into the desired shape. While a considerable amount of forge shop and foundry work is carried on in steel plants, the bulk is done in other industries. (Descriptions of foundry and forge shop occupations and processes are included in this handbook; see pages 196 and 207).

Rolling is the principal method of shaping steel; it is estimated that four-fifths of all steel products pass through a rolling mill at some stage of their manufacture. The purpose of rolling is to improve the quality of the steel as well as to form it into desired shapes. In passing between the rolls, the steel is squeezed longer or flatter, in much the same way as pie crust is kneaded and rolled out by a cook.

Before the ingots are rolled, they are heated to the required uniform temperature; the heating is done in large furnaces called “soaking pits.” A heater controls the soaking pit operation. He directs helpers in heating the ingot to the temperature specified by the plant metallurgical division and, by observing the color of the steel, determines when it is ready for rolling. A crane­man lifts the ingot from the soaking pit and deposits it on a flat-bottom steel carriage, on which the ingot is brought to the semifinishing mill.

In the semifinishing mills, ingots are rolled into blooms, slabs, and billets. These forms are generally square or rectangular in shape. Blooms are more than six inches wide and six inches thick. Slabs are rolled wider and thinner than blooms. Billets are the smallest of the three. Later, in the finishing mills, blooms, slabs, and billets are made into finished steel products.

The rolling of blooms illustrates the semifinishing process. In the blooming mill, as in other rolling mills, the steel is moved along on a con-
veyor. After the ingot has been weighed, a whistle is sounded telling the roller (D. O. T. 5-92.301), the man in charge of the mill, that the ingot is on the conveyor. Roll engineers operate the conveyor, controlling direction and speed. The ingot comes along the conveyor until it is caught between two rollers, which turn in opposite directions like a clothes wringer; this pulls the hot steel through the roll, making it thinner and longer. No sooner is it through, than the rolls revolve in the opposite direction and the ingot is brought back through the rolls. This is repeated, and each time the rolls are brought a little closer together, so that after each “pass” through the rolls, the ingot is flatter and longer. Every round trip or two the ingot is turned on its side, so that the sides are also rolled.

A roller operates the mill, working in a glass-enclosed “pulpit” above the conveyor. His duties, which appear to consist principally of moving levers and pushing buttons, look relatively simple, but actually the quality of the product depends to a large extent upon his skill. One of his principal duties is to regulate the distance between the rolls after each pass. This requires long experience and a knowledge of steel properties. (Too much pressure on the roll may result in cracks in the steel or may strain its tensile strength; too little pressure may result in too long a rolling period, so that the steel may cool below proper rolling temperature.) A manipulator (D. O. T. 4-88.012) sits in the pulpit with the roller and operates some of the controls. After perhaps 20 passes, the ingot is sent along the conveyor to a
place where shearmen (D. O. T. 6–88.064) use heavy hydraulic blades to trim and cut the steel into bloom-size sections.

The principle of rolling is essentially similar in all mills and the occupations in various kinds of rolling mills resemble fairly closely those in the blooming mills. (Incidentally, the word "mill," as it is used in the steel industry, may mean an entire plant, one department of that plant, or just one stand of rolls.) Blooms and other semifinished products are further processed by rolling and other finishing operations in the various special finishing mills. Making railroad rails is one example. In a rail mill, the bloom goes through a number of stands of rolls, beginning with a "roughing mill," which has three rollers. The middle roll revolves in a direction opposite from the upper and lower rolls. With this arrangement the bloom can be rolled in both directions without reversing the direction of the rolls. All that is necessary is that the whole conveying table be lifted on the return, so that while the direction of the movement of the bloom is reversed, the direction of the rolls is not. In this mill, operated by a rougher (a kind of roller), the bloom becomes narrower and longer, coming out in the rough shape of a rail. Levermen, (D. O. T. 6–88.032), operate the tables raising and lowering the blooms. Guide setters position the iron guards that direct the partly finished rails into their proper niches between the rolls. From the roughing roll, the steel goes through five or more other stands equipped with grooved rolls. In each stand, the steel becomes longer and more like a finished rail. Hot sawmen (D. O. T. 6–88.652) operate circular saws which cut the rails to proper length.

One of the outstanding improvements in steel technology, introduced nearly 25 years ago, is continuous rolling. Briefly, this consists of arranging in tandem a number of rolling-mill units, so that finished steel products can be made without breaking the continuity of the operation. Continuous hot strip mills are a good example of this process. Slabs from the semifinishing mills are reheated. Then they are passed through roughing stands where they are reduced in thickness and increased in length. The steel then passes through a series of rolling stands, each driven separately and perfectly timed to roll the strip faster and faster as it becomes thinner and longer. As it races from the last stand, the long strip of steel may be cut up automatically into sheets, which are cooled and stacked in piles, or it may be mechanically wound onto reels. Rollers (D. O. T. 5–92.301) are in general charge of all strip rolling and related operations. Pulpit men (D. O. T. 4–88.012) (speed operators) set up, adjust, and coordinate the speeds of the different mill stands to maintain proper tension of the strip. Coilers, by means of electrical controls, operate the machines which coil the hot strip coming from the mill.

One of the many finishing operations done in steel plants is the making of tinplate. Tinplate is actually steel with a thin coating of tin. The oldest method of tinplating consists of dipping steel sheets in a bath of molten tin. For this process the sheet steel must be carefully prepared. The sheets are first cleaned in acid baths by picklers. These sheets are then passed through a cold reduction mill, where they are given a smooth, fine surface. Cold reduction is generally done on a tandem mill. In each set of rolls, powerful pressure makes the strip thinner and longer. After leaving the last roll, the steel is coiled on a reel. Since this operation tends to make the strip hard and brittle, it is softened and made more ductile in an annealing furnace. The coiled strip is then sheared into sheets. The sheets are passed through tanks containing molten tin and then cleaned and polished by passing them through a series of flannel-covered rolls.

A recent innovation is electrolytic tin plating. In this process, steel goes through a tank containing a tin solution charged with electric current. Action of the electricity causes a coating of tin to be deposited on the steel.

Both sides of the tin-plated steel sheet are carefully inspected for defects and sorted by thickness. Many of the inspectors and sorters are women.

Another specialized steel product made in finishing mills is wire. Wire is drawn from a rod, which is rolled from a billet in a rod mill. The wire drawing process consists of drawing or pulling a rod through a series of dies; the hole of each successive die is smaller than the rod or wire passing through. After each trip through a die, the rod or wire loses some of its thickness, but is lengthened proportionately. Wire drawers (D. O.
Inspecting and sorting tinplate is one of the few plant jobs open to women in steel mills. T. 4–88.511) use tongs to pull a tapered rod through the die hole. Then the tapered end is fastened to a reel which starts to turn, pulling the rod through the die and also winding the wire onto the reel. Continuous wire drawing, similar in principle to continuous rolling, is also used to make wire. The wire is drawn, without interruption, through a series of dies, becoming thinner and longer as it goes through each die.

Large quantities of pipe and tube are made in the finishing mills of steel plants. There are two principal types made: welded and seamless. Welded pipe is made from “skelp” (narrow, flat strip steel) hot-rolled in a special mill and then reheated in a small furnace. A butt welder (D.O. T. 4–88.341) grasps the white-hot skelp with a pair of tongs and pulls it through a “welding bell,” which is a funnel-shaped die. He then drops the tongs in a trough, where the tongs are gripped by a moving chain, drawing the skelp through the
As the skelp enters the wide end of the bell it is curled until the two edges come together in the shape of a pipe. As the pipe comes out of the small end of the bell, its edges are automatically welded. The pipe then passes through sizing rolls which make it perfectly round and of the exact diameter desired.

In the manufacture of seamless pipe and tube, a solid round steel bar first is heated to rolling temperature. **Piercer operators** run “piercing machines” which consist of two barrel-like rolls, having between them a long bar with a bullet-shaped nose, called a “piercer.” As the bar moves lengthwise through the rolls, the piercer goes through the entire length of the bar, forming a hollow tube without seams. While the rough tube is still hot, it goes through a number of other rolls which straighten it and make its diameter and wall thickness to specifications. Afterwards the tube is cut in lengths and carefully inspected and tested. **Rollers (D. O. T. 4-88.313)** operate the seamless pipe mills; they control the pressure of the rolls, which determines length of pipe and thickness of the pipe wall.

**Qualifications, Training, and Advancement in Processing Jobs**

Steel plant workers generally are hired at the factory gate or are referred by public employment offices. New workers for processing jobs are nearly always brought in at the unskilled level, either as laborers or as learners in one of the operating units. Openings in higher-rated jobs are filled by upgrading. Training for processing occupations is almost entirely on the job, with the worker progressively moving to operations requiring greater skill as he acquires experience and “know how.” A craneman, for example, is first taught how to operate relatively simple cranes and advances in several steps to cranes much more difficult to run, such as the hot metal cranes.

Generally, steel companies prefer that new employees have some high school training. To help advance in their work, many workers take part-time courses in such subjects as chemistry, physics, and metallurgy. In many cases, this training is provided by the steel companies and may be done within the plant. Other workers take evening courses in high schools, trade schools, and universities in their communities or enroll in correspondence courses.

Workers in the various operating units usually advance along fairly well defined lines of promotion within their departments. Both seniority and performance on the job are factors in upgrading. Advancement is apt to be more rapid during periods when the mills are operating at capacity and there are shortages of skilled steel workers. The following illustrate possible lines of advancement in the various operating units:

To become a blast furnace blower, a worker may start as a laborer, advancing to cinder snapper, keeper’s helper, keeper, blower’s helper, and finally blower. In the open hearth departments, a man may begin by doing general clean-up work around the furnace and then advance to door operator, cinder pitman, third helper, second helper, first helper, and eventually, to melter. A possible line of progression for a roller in a finishing mill might be pitman, roll hand, manipulator, rougher, and finish roller. To reach these skilled jobs, such as blower, melter, and roller (which are among the highest-rated steelmaking jobs), takes a minimum of 4 or 5 years, but usually a much longer time is required.
Earnings in Processing Jobs

Earnings vary considerably among the many processing occupations. The table on page 254 shows standard hourly rates in selected occupations as specified in the wage agreement effective July 16, 1948, between the United Steelworkers (CIO) and the steel producing subsidiaries of the United States Steel Corp. (the largest single steel company). These earnings are representative of those throughout industry. Workers paid on an incentive basis (estimated at about 40 to 50 percent of the workers) generally earn more than these standard hourly rates. However, the standard rate serves as a guaranteed minimum for the incentive worker.

*Not including the Tennessee Coal, Iron, and Railroad Co.

Mechanical, Transportation, and Plant Service Occupations

Large numbers of workers are required in steel mills to maintain and repair machinery and equipment; to provide power, steam and water; to move material and supplies; and to perform a variety of other maintenance and service operations.

In the machine shops, machinists and machine tool operators make and repair metal parts for machinery or equipment. Die makers use machine tools to construct dies used in wire and cold-drawing units. (See p. 186 for information on duties, training, earnings, working conditions, and job opportunities in other industries in these machine shop occupations.) Roll turners (D. O. T. 4-78.011) use lathes, grinders, and other machine tools to finish steel rolls to desired shape and size for use in the rolling mills.

Millwrights install and help maintain mechanical equipment. They dismantle machinery and replace defective parts. Their most important function is to set up new machinery and equipment. Electricians install electric wiring and fixtures and hook up electrically operated equipment. Electrical repairmen keep wiring, motors, switches, and electrical equipment in good operating condition and make repairs when equipment breaks down.

Refractory bricklayers (D. O. T. 5-24.130) repair and rebuild the brickwork in furnaces, soaking pits, and coke ovens. Pipefitters lay out, install, and repair piping, valves, pumps, and compressors. Boilermakers test, repair, and rebuild various types of pressure vessels such as heating units, locomotive boilers, storage tanks, stationary boilers, and condensers. Locomotive engineers and other train crew members operate steam, Diesel, or electric locomotive-driven trains used to transport materials and products in the vast yards of iron and steel plants. Skilled workers run the various boilers, turbines, switchboards, and pumps in the power plants which provide the large amounts of electric power needed in steelmaking.

Many workers are employed in the labor gangs to load and unload materials and do a variety of clean-up operations. Other maintenance and service occupations found in steel plants include carpenter, craneman, oiler and greaser, janitor, and guard.

Detailed descriptions of the duties, training, working conditions, and job prospects in many of the mechanical, transportation, and service occupations, such as boilermaker, bricklayer, carpenter, electrician, millwright, and pipefitter are included in this handbook. See index for page numbers.

Experienced craftsmen, such as machinists, boilermakers, pipefitters, and electricians, are sometimes hired directly by steel companies. Generally, however, openings in the skilled maintenance occupations are filled from within. Most steel plants conduct some type of apprentice training program to meet the needs of their maintenance shops. The apprenticeship programs usually cover 3 or 4 years, including mainly shop training in various parts of the particular jobs. In addition, classroom instruction in related technical subjects is generally given, either in the plant or in local vocational schools.

Qualifications for apprentices vary among companies. Generally, the apprentice must be a high school or vocational school graduate and must be able to provide character references. In most cases, the minimum age is 18 years; usually an upper age limit of 26 or 30 is specified. Some
companies give aptitude tests to applicants for apprenticeship to determine their suitability for the trade. Apprentices are chosen from among those who apply directly to the plant; they are also selected from among qualified young workers already employed in other plant jobs. Preference is often given to those who have a member of their family working for the company. The following occupations are among those most often included in apprentice training programs in iron and steel plants: boilermaker, bricklayer, carpenter, electrician, machinist, pipefitter, roll turner, and tool and die maker.

Semiskilled maintenance jobs are generally filled by upgrading laborers or helpers. Unskilled laborers on the labor gang are normally hired at the gate. Some of these workers stay in labor jobs indefinitely; others advance to higher-rated maintenance or processing jobs.

Earnings in Mechanical, Transportation, and Plant Service Occupations

Earnings vary considerably among the many maintenance and service occupations. The following table shows standard hourly rates in selected occupations as specified in the wage agreement effective July 16, 1948, between the United Steelworkers (CIO) and the steel producing subsidiaries of the United States Steel Corp.

<table>
<thead>
<tr>
<th>Job title</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power station operator</td>
<td>$1.950</td>
</tr>
<tr>
<td>Tool maker</td>
<td>1.950</td>
</tr>
<tr>
<td>Electrician, first class</td>
<td>1.860</td>
</tr>
<tr>
<td>Machinist</td>
<td>1.860</td>
</tr>
<tr>
<td>Boilermaker</td>
<td>1.815</td>
</tr>
<tr>
<td>Bricklayer, A</td>
<td>1.815</td>
</tr>
<tr>
<td>Roll turner</td>
<td>1.815</td>
</tr>
<tr>
<td>Millwright</td>
<td>1.770</td>
</tr>
<tr>
<td>Rigger, A</td>
<td>1.770</td>
</tr>
<tr>
<td>Welder, A</td>
<td>1.770</td>
</tr>
<tr>
<td>Pipefitter</td>
<td>1.725</td>
</tr>
<tr>
<td>Carpenter</td>
<td>1.725</td>
</tr>
<tr>
<td>Electrical repairman, A</td>
<td>1.680</td>
</tr>
<tr>
<td>Locomotive engineer</td>
<td>1.635</td>
</tr>
<tr>
<td>Painter, A</td>
<td>1.635</td>
</tr>
<tr>
<td>Switchman</td>
<td>1.455</td>
</tr>
<tr>
<td>Oilier and greaser, mill oilier</td>
<td>1.410</td>
</tr>
<tr>
<td>Carpenter helper</td>
<td>1.365</td>
</tr>
<tr>
<td>Bricklayer helper</td>
<td>1.275</td>
</tr>
<tr>
<td>Painter helper</td>
<td>1.230</td>
</tr>
<tr>
<td>Janitor and sweeper</td>
<td>1.185</td>
</tr>
</tbody>
</table>

1 Not including the Tennessee Coal, Iron, and Railroad Co.

Technical and Office Occupations

Until now we have discussed the large groups of skilled, semiskilled, and unskilled workers employed in the processing and maintenance departments. Because of the technical nature of steelmaking and because many of the operations are highly mechanized, a considerable force of professional and technical personnel is also needed. The estimated 8,000 engineers constitute the largest group of these employees.

The principal work of mechanical engineers in iron and steel plants is in the design, construction, and operation of mill machinery and material-handling apparatus. Many mechanical engineers work in operating units where their jobs include, for example, determination of roll size and contour, rolling pressures, and operating speeds. Others are responsible for plant and equipment maintenance. Metallurgical engineers work in laboratories, where they have the important task of testing and controlling the quality of the steel during its manufacture. Civil engineers are engaged in the lay-out, construction, and maintenance of the steel plant and its utilities, equipment, and roads. Electrical engineers design, lay out, and supervise operation of electrical generating and distribution facilities which provide the power essential in modern steel mill operation. They also are concerned with the operation of electrical machinery and control equipment. (For a much more detailed description of the engineering field see page 79.) Chemists as well as metallurgists work in the laboratories, making chemical analyses of steel and raw materials used in steel manufacture. Laboratory technicians do routine testing and assist chemists and metallurgists. Draftsmen prepare working plans and detailed drawings required in plant construction and maintenance.

Many steel companies recruit engineers and other technically trained personnel by sending representatives to colleges and universities each year to interview graduating students. Some
companies have formal training programs for college trained engineers in which the trainees are rotated through the various operating and maintenance divisions to give them a broad picture of steelmaking operations before assignment to a particular department. In other companies, the newly hired engineer is assigned directly to a specific research, operating, or maintenance unit. It is important to note that many of the top executives in the industry have engineering backgrounds.

A large number of workers are employed in such activities as purchasing materials, shipping, selling steel products, accounting, personnel work, and record keeping. Engineering graduates are usually hired for selling jobs and are often given additional training at the plant in order to help them understand the technical requirements of buyers of steel products. Clerks, bookkeepers, accountants, typists, stenographers, personnel workers, traffic managers, and purchasing agents are included among the many kinds of workers found in administrative offices of steel companies. There are also many clerical workers in operating departments, doing such jobs as keeping production records. Discussion of many of these administrative and clerical jobs can be found in this handbook. See index for page numbers.
SHIPBUILDING AND SHIP REPAIRING OCCUPATIONS

Shipbuilding and ship repairing, one of the Nation's oldest industries, has had marked fluctuations in activity and employment, especially during the decades of the two world wars. At the peak of World War II, more than 1,700,000 workers had jobs in shipyards; by June 1950, the number had shrunk to 135,000.

The employment outlook in shipyards is uncertain, because it depends largely on public policy with respect to the shipbuilding and merchant marine industries. What the policy may be in the future cannot be foreseen. However, in mid-1950 the employment trend was reversed. In view of the military procurement program, employment is expected to rise substantially during the early fifties. Compared to most other industries, shipbuilding has a very high proportion of skilled jobs; about half of the production workers in a shipyard are in skilled or supervisory positions.

Nature of the Industry

This industry consists of yards which repair ships, yards which build them, and yards which do both building and repair. The yard may be privately owned or it may be a naval shipyard. In peacetime, all commercial vessels and about half the naval craft are built in privately owned shipyards. In wartime, naval shipyards are so busy with the maintenance, servicing, and repair of the fleet that they leave practically all building to the private yards and also assign to them a large number of naval vessels for repair or conversion.

Shipbuilding is much like construction work. Generally, ships are built on a custom basis, each vessel being a distinct job. In peacetime years, even the biggest yard has only a few ships under construction at the same time, and each unit may be of an entirely different type.

There are a large number of private yards which do ship repairing, but only a small number build new ships. As of January 1, 1949, there were 13 private shipyards in the country engaged in the construction of combatant vessels or seagoing commercial ships: 10 on the Atlantic Coast, 2 on the Gulf Coast, and 1 on the Great Lakes. At the beginning of 1949, there were 10 naval shipyards: 6 on the Atlantic Coast and 4 on the Pacific. Five of these naval yards were building new ships at that time.

The great expansion during World War II, including the influx of many new organizations without prior shipbuilding experience, brought a great dispersion of facilities and jobs. Now, however, the industry and its jobs are once again to be found generally where they were before the war.

Chart 60 shows that, taking all yards together, jobs are located almost entirely along the coasts. They are heavily concentrated in the North Atlantic coastal area (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, parts of New York and Pennsylvania, and Rhode Island). Nearly half the industry's employment was in this region in early 1950. Another 16 percent or so in the Atlantic area to the south (parts of Georgia and North Carolina, South Carolina, and Virginia) brought employment on the whole of the Atlantic Coast to nearly two-thirds of all shipbuilding jobs in the country. By way of contrast, the Pacific Coast (California, Oregon, and Washington) afforded somewhat less than a fourth of all jobs. About 7 percent of the jobs were found in the remaining area of importance, the Gulf States (Alabama, Florida, parts of Georgia and Louisiana, Mississippi, and Texas).

Employment Trends and Outlook

Among the more striking facts in the history of merchant shipbuilding in the United States are, first, that new construction has fluctuated greatly from year to year; second, that over the last 100 years there has been no upward trend in building. This failure to increase contrasts sharply with the expansion which occurred in most other industries, as would be expected in a country experiencing population and economic growth. There has, however, been a growing need for repair work, to service and maintain a growing merchant marine.

The annual volume of naval construction, usually smaller than that of commercial building, has shown a tendency to rise only moderately over
the years; naval servicing and repair needs have tended upward much more. On balance, the long-run trend in total demand for new construction during peacetime has been fairly level over the last few decades, while that for repair work has risen.

Foreign competition in a world market has been a factor of great importance in the ups and downs of American shipping and shipbuilding. In the years immediately preceding World War I, our shipbuilders were having unusual difficulty meeting this competition, and operations were at a low level when war broke out in Europe. Increasing demands upon our shipping and shipbuilding industries followed, especially after our own entry into the war made it necessary to move abroad and supply unprecedented numbers of troops. Through great efforts, the industry managed to construct the heavy volume of tonnage required to meet these growing needs. Between 1914 and the peak year of 1919, the number of jobs increased from 65,000 to 484,000, including 71,000 in naval shipyards (chart 61).

The situation clearly demonstrated how greatly the Nation's security depended upon our shipping capacity. There developed a greater appreciation of the need for maintaining, in peacetime, good-sized multipurpose merchant and naval fleets, and a shipbuilding industry readily expandable in case of war. This would mean maintaining at all times a core of experienced managers, engineers, and craftsmen, who could maintain and improve the technical "know how."

When World War I ended, few new ships were ordered, because there was a large surplus of both commercial and naval vessels. From the 1919

CHART 60

NEARLY TWO-THIRDS OF SHIPYARD JOBS ARE ON THE ATLANTIC COAST

23.6%

GREAT LAKES

2.2%

INLAND

1.9%

GULF

47.8%

NORTH ATLANTIC

16.1%

SOUTH ATLANTIC

8.4%

WASH. D.C.

UNITED STATES DEPARTMENT OF LABOR

BUREAU OF LABOR STATISTICS

Percentages indicate average share of total shipbuilding and repair employment — 1st 9 months of 1949
SHIPYARD EMPLOYMENT SHOWS SHARP CONTRASTS BETWEEN WAR AND PEACE

Thousands of Workers

1800 - 1600 - 1400 - 1200 - 1000 - 800 - 600 - 400 - 200 - 0

DISTRIBUTION OF JOBS
Private and Navy

General view of an aircraft carrier under construction.
high of 484,000 workers (private and Naval shipyards), employment dropped to about 90,000 by 1923, and even this volume of employment could not be maintained, shrinking to 70,000 by 1928. With new construction falling and the tonnage of the merchant fleet in use holding at about double that before the war, an increasing share of the business was in the form of repair work. The depression brought employment in private and naval yards down to a low of 57,000 in 1933, despite the Merchant Marine Act of 1928 designed to bolster the industry.

The Merchant Marine Act of 1928 and a similarly entitled act of 1936 established policies of Government aid, principally in the form of subsidies. With the work done directly by the Navy and that done for the Navy by private yards already bulking large in the total building and repair picture, the effect of the latter act in particular has tended to make Government and Government-subsidized activity the overwhelming share of all shipbuilding work, both in most years of peace and in years of war.

Stimulated by Government action, mainly naval construction contracts, and by the improvement in general business conditions, private and naval shipyard employment increased from 57,000 in 1933 to over 100,000 in 1937. Two years later World War II broke out in Europe and shipbuilding employment increased rapidly, more than tripling between 1939 and 1941. The really spectacular shipbuilding expansion of World War II, one of the most dramatic in all industrial history, came after the attack on Pearl Harbor. By December 1943, the number of workers in private and naval shipyards had reached an all-time high of 1,723,000. The war had made of one of the smaller manufacturing industries one of the largest.

The decline from this peak was even sharper than the rise to it. By the summer of 1945, while the war with Japan was still going on, shipyard employment in private and naval shipyards had fallen to around 1,100,000, a drop from the peak of over a third, and by the end of 1946 it had dropped another 850,000 to about 250,000. After 1946, employment in the shipbuilding industry drifted more or less steadily downward to a level of 135,000 workers in June 1950. Nevertheless, 4 years after the war there were still more jobs, both in private and in naval shipyards, than at almost any time in the 1920's and 1930's. A reversal of the downward trend occurred in mid-1950, as employment began to climb as a result of the defense program. About half the jobs were in naval shipyards.

The employment outlook for shipyard workers is difficult to determine. Shipbuilding is one of the few industries regarding which this would be true even if we assumed full employment in the economy generally. The discussion above has indicated that employment levels in shipbuilding depend principally upon the amount and character of new construction and reconstruction carried on, and upon the size and composition of the naval and merchant fleets requiring servicing and repair. It has also brought out the importance of Government policy in determining the level of activity in the industry. More so than in most other industries, many of the factors which determine the magnitude and nature of its activity are unforeseeable or difficult to evaluate in advance. For example, international political and economic developments influence both the business decisions of American shippers and shipbuilders, and the decisions of Congress which affect shipping and shipbuilding, notably the shipbuilding program of the Navy and the Federal program of subsidy to private shipbuilding.

There has been a wide range of proposals set forth as to the size of the shipbuilding industry to be maintained. A number of bills introduced in recent sessions of Congress set forth as National policy the maintenance of a minimum level of employment in ship construction. Nevertheless, there was an almost continuous decrease in employment since World War II. In mid-1950, however, a reversal of this trend occurred. A substantial increase in employment in the early fifties is expected in view of our expanding defense program.

A big factor in job openings in almost any industry is the replacement need arising from quits, deaths, and retirements. There is some evidence that there was, in mid-1950, a heavier proportion of older workers in the Nation's private yards than there has ever been; this should be reflected in a somewhat higher annual rate of loss from deaths and retirements.
The basic characteristics of shipyards and their work force are the same regardless of whether they are private or naval yards, or whether they concentrate on building or repair. Every yard of any size offers employment to skilled workers in a wide variety of crafts, principally metalworking, woodworking, and the kind usually designated as "building trades." Of the workers directly engaged in building ships, about half are skilled workers or supervisors. About 40 percent are semiskilled and about 10 percent unskilled. Few industries have such a high proportion of skilled workers.

**Earnings and Working Conditions**

Average hourly and weekly earnings of shipyard workers tend to be higher than those of most other manufacturing workers, reflecting in part the large proportion of skilled workers in shipbuilding. In July 1950, production workers in private shipbuilding and repair average $64.00 for an average workweek of 37.8 hours, or about $1.69 an hour. The corresponding averages for all manufacturing were $59.21 for 40.5 hours of work, or about $1.46 an hour.

How much workers earn during a year depends, of course, on how steadily they are employed. Shipbuilding and repair work, in private yards in particular, tend to fluctuate more than many other kinds of manufacturing activity. Within the space of a single year, individual yards may experience sharp ups and downs, while other industries are operating at a relatively even pace. In the same yard, workers in some jobs or divisions may be laid off, while those in other operations are recalled. Some fluctuations could not be completely eliminated even with a very heavy continuous building program in each yard. Repair business is inherently spasmodic. When a ship comes in for repair work there is a great rush of activity to get it back into operation as quickly as possible; then a slack period may follow, and men are laid off. Weather is another factor making for irregularity in employment in shipbuilding, since bad weather hampers the outdoor work around the yards.

In addition to being subject to month-to-month fluctuations, the industry has been and may well continue to be subject to ups and downs over a period of years. A year or two of relatively high-level activity has often been followed by a 1- or 2-year lull. Nevertheless, workers tend to stick to the industry. When it is possible to do so, they offset pay losses in slack periods by working in other industries.

Building and repairing ships, like construction work, necessitates some arduous and even hazardous work. There are, of course, many differences in working conditions among jobs and departments. Many jobs require considerable heavy work; others are hard on the eyes. Some work must be done under conditions of extreme heat, cold, dampness, poor ventilation or drafts. Shipyard employees frequently work high above the ground, or in cramped and prone positions.

Moving heavy equipment, burning and welding, working on small platforms, going up and down ladders, and many other aspects of shipbuilding operations make for many accidents to mechanics and their crews. Falls are a common source of injury, since much of the work is done above ground and deck levels.

Much has been done to improve working conditions and make the many dangerous or uncomfortable conditions in shipbuilding as safe and pleasant as possible. Special campaigns, standing yard committees on safety and health, and protective devices on machines have all contributed toward keeping down the number of accidents. These efforts have aided in bringing the disabling-injury rate down to about 26 for each million man-hours worked in the private shipbuilding industry in 1949. This rate is over 50 percent greater than that for manufacturing as a whole, but well below that in construction. The injury rate in naval shipyards is lower.

A number of unions organize shipbuilding workers. Along the Atlantic Coast the bulk of workers are represented by the Industrial Union of Marine and Shipbuilding Workers of America, CIO. On the Pacific Coast, AFL metal trades unions predominate bargaining as a group. This arrangement includes, in addition to the regular
AFL metal trades unions, AFL groups usually designated as "building trades unions," and the large, unaffiliated International Association of Machinists. There are also a number of small unaffiliated unions in the field, usually single-yard organizations.

**How To Enter the Field**

Methods of entry into the principal shipbuilding occupations vary. For professional engineering and for drafting jobs, as well as for most office and clerical positions, the training and qualifications required are similar to those in other industries. Further information may be found in this Handbook, in the reports on engineers, draftsmen, clerical occupations, accountants, etc.

To enter most of the skilled occupations, a person must ordinarily obtain training and experience within the industry as an apprentice, handyman, or helper.

*Apprenticeship* in shipyards, as in other industries, generally covers a 4-year period and includes both supervised work and classroom instruction in related technical subjects, such as blueprint reading and shop arithmetic. In selecting young men for apprenticeship, employers consider their records in school and their physical condition. Apprentices are nearly always required to have had a high school education or equivalent, preferably along mathematical and technical lines. Minimum and maximum age provisions for apprentices are common.
Handymen occupy a position between that of helper and of journeyman mechanic. Some of them are in reality trainees for journeymen jobs, without benefit of formal apprenticeship arrangement. Unless the handyman is a recognized learner, he is expected to master and perform independently only a limited number of tasks.

Helpers are among the least skilled shipbuilding workers. They may assist handymen or work under journeymen mechanics. Generally, they learn elementary tasks only, related to the less skilled, usually repetitive operations. As in the case of handymen, however, the so-called helper may also really be a learner, under a more or less informal arrangement, and the training is then more extensive. Preference in filling handyman vacancies is frequently given to helpers.

Information on job opportunities in a particular locality may be obtained from several different sources. An applicant may go to the nearest office of his State employment service, or to any yard in the neighborhood. Unions and employer associations may be of some assistance. If neither is present locally, an applicant may write for information to national headquarters of such organizations as:

- Industrial Union of Marine and Shipbuilding Workers, CIO, 534 Cooper St., Camden, N. J.
- AFL Metal Trades Department, 901 Massachusetts Ave., NW., Washington 1, D. C.
- International Association of Machinists, Ind., Ninth St. and Mt. Vernon Pl., NW., Washington 1, D. C.
- Shipbuilders Council of America, 21 West St., New York 6, N. Y.

The Shipbuilders Council is the principal employer association. For naval shipyard positions, information can be obtained from the nearest shipyard, or from the nearest regional office of the United Civil Service Commission.

### Jobs in the Industry

Shipbuilding is done in six principal broad steps: planning and design, making forms for hull sections, fabricating metal sections from the forms, hull construction, engineering, and outfitting. Once the flow of production is sufficiently under way, several operations may be in process at the same time. The major engineering and outfitting tasks must await the completion of hull construction. The assembled hull is launched and transferred to another location for equipping. Shipbuilding operations are summarized in chart 62.

The tabulation below shows the occupational distribution of production workers employed on new construction in private yards in two periods for which data are available. In both periods, the leading occupations were machinists, welders, and shipfitters, and this is likely to be true today. As for the relative importance of the different occupations, such shifts as those indicated for machinists and welders in particular probably reflect the wartime building program.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Percent of total</th>
<th>August 1936</th>
<th>June 1943</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinists</td>
<td>10.9</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Welders</td>
<td>4.3</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>Shipfitters</td>
<td>3.9</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td>Sheet-metal workers</td>
<td>3.6</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Electricians</td>
<td>3.4</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Chippers and calkers</td>
<td>2.7</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Painters</td>
<td>2.5</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Pipe fitters</td>
<td>2.4</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>Carpenters and shipwrights</td>
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<td>Joiners</td>
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<td>Riveters</td>
<td>.8</td>
<td>.2</td>
<td></td>
</tr>
<tr>
<td>Coppersmiths</td>
<td>.7</td>
<td>.2</td>
<td></td>
</tr>
<tr>
<td>Anglesmiths and blacksmiths</td>
<td>.5</td>
<td>.6</td>
<td></td>
</tr>
<tr>
<td>Boilersmiths</td>
<td>.5</td>
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<tr>
<td>All other occupations</td>
<td>61.0</td>
<td>60.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
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### Planning and Design Jobs

After a purchaser indicates to a shipbuilder or design specialist what kind of ship he wants, detailed plans are drawn, incorporating his desires as to size, capacity, speed, and numerous other features. This may involve a tremendous amount of research, calculating, and drafting by professional naval architects and marine engineers and related workers. Draftsmen, for example, under the guidance of the architects and engineers, make the detailed drawings required. Other employees do laboratory work or prepare blueprints. From 10 to 15 percent of the industry's work force are found in professional, technical, and office jobs—

many of them in planning and design work. For further discussion of naval architects and marine engineers, see mechanical engineers, page 84; for draftsmen, see page 99.

**Form-Making Jobs**

After plans are approved, they are sent to the various departments. Among the first to start operating is the mold loft. Here are made wood or paper patterns, called "molds" or "templates", for almost every structural part of the ship. These forms correspond exactly to plates and shapes such as will make up the completed hull. Some of these pieces and standard parts—pipe fittings, propellers, and steering gear, for example—may be ordered from manufacturers who specialize in such items. Only a very small portion of the shipyard's total work force are engaged in preparing molds. The principal occupation in this operation is that of loftsmen.

In making the templates, loftsmen (D. O. T. 5-17.210) draw the ship's lines to full size on the large loft floor. Using hand and machine woodworking tools, they then construct the molds for individual parts in conformity with the floor lay-outs. On the molds themselves, loft workers make lines and other markings to guide the workers who later fabricate the parts. These lines and markings help identify the parts and indicate the work to be done to plates or shapes before being fitted on the ship. In some yards, loftsmen specialize in particular mold loft operations.

Since they work from dimensions and small-scale drawings given them by the drafting room, loftsmen must be able to read blueprints; they must know mechanical drawing and drafting procedures. Having only two-dimensional plans at their disposal, they must be able to visualize the three-dimensional shapes of parts from such plans. They must be able to do at least simple carpentry tasks and know how to use carpenters' tools and machines. In addition, they must be able to direct helpers.

Hiring and promotion policies vary among the yards. A minimum condition to becoming a loftsmen is a year's experience as a mold loft handyman. More often a regular 4-year apprenticeship or equivalent training is required. Loftsmen may advance to supervisory jobs in the department.

**Fabricating Jobs**

The next step in shipbuilding is to make metal parts from the templates fashioned in the mold loft. This is done in the fabricating shop or "steel mill." Metal is cut, shaped, punched, and drilled, as indicated by the templates. Metal workers of many types are engaged in the work, including anglemiths, blacksmiths, burners, machine operators, machinists, welders, and lay-out men, along with their helpers and apprentices. Roughly a fourth of the industry's workers are engaged primarily in fabrication. Many jobs in this operation are similar to metalworking jobs in other industries. A detailed description of duties, training, working conditions, and job prospects in many metalworking occupations are included in this handbook. See index for page numbers.

**Hull Construction Jobs**

Hull assembly begins after enough parts have been fabricated in the yard or received from man-
It is this operation that most people have in mind when they think of shipbuilding, for it is principally the hull-in-construction which meets our eyes as we pass by a yard.

Assembling is done on a shipway, a platform specially built and equipped for hull construction. The first step in erecting the hull is laying the keel, the backbone of the ship’s frame that runs along the bottom of the hull the full length of the ship. Keel-laying is carried out principally by gangs of erectors. The hull is built outward and upward from the keel. Cranemen, under the direction of erectors, lift prefabricated plates and shapes into place as erection progresses. There erectors fasten these structural parts temporarily. Shipfitters, assisted by “service men” (burners, tack welders, and chippers), follow, to see that all pieces are in the exact spot called for in the blueprints and re-fasten them accordingly—again temporarily. Final fastening is done by welders, riveters, and related workers.

With the hull built, the ship is ready for the often dramatic ceremony of launching. This job of transferring the ship to the water involves a substantial construction task in itself. Heavy timber runways and other structures are built, and steel tie plates are attached at appropriate points to keep the ship from sliding into the water. These are later burned through to permit the ship, and with it virtually the whole launching structure, to slide or be hydraulically rammed into the water. The ship is then towed to a new location for equipping.

Roughly a third of the production workers in ship construction work on hull construction. In repair work, on the other hand, a smaller proportion of the workers are engaged in this operation. Many of the jobs in hull construction are also found in other industries. These include such occupations as welder, burner, and riveter, which are described elsewhere in this handbook. Two occupations in this operation which are distinctive to shipbuilding are shipfitter and erector.

Shipfitters (D. O. T. 4-84.012), sometimes called “fitters” or “assemblers”, constitute one of the largest occupations in the industry. Working from blueprints, these workers mark the structural parts to show their location in the hull, assemble the parts to be fitted, and direct the work of making these parts secure enough for further handling by other workers in the job of final installation. Sometimes the blueprint dimensions will not fit or it may not have been possible to predetermine the lay-outs at all in the mold loft. In such cases, shipfitters prepare molds or templates on the spot.

Shipfitting is a skilled operation in which ability both to measure and work to close tolerances is essential. All shipfitters must be familiar with shipfitting practices and know ship structure and terminology, but men in the trade are frequently classified in various grades according to experience, ability, and seniority. The greatest responsibility is, of course, on the top-grade men who frequently specialize in a particular phase of the work. Lower-ranking men usually have their tasks organized and closely directed by their supervisors.

The proportion of shipfitters needed in different types of work varies considerably. In repair work, where the job consists principally of fitting replacement parts, a relatively simple task, there were only two or three shipfitters for every 100 repair workers in 1943; in most ship construction work 4 to 5 percent of the employees were shipfitters.

Minimum training required for entry into this occupation is a year’s experience as a handyman on hull construction. More often a regular 4-year apprenticeship or equivalent is required.

Erectors (D. O. T. 6-84.115) work in gangs. Their job is to get all the steel parts onto the ship, when and where they are needed, for temporary fastening. Their usual tasks include attaching the member to be erected to a crane (using rigging such as hooks or chains) and directing the crane operator, by hand signals, in lifting the part and in placing it where indicated by a shipfitter. One or more members of the gang then work the member roughly into position with bars, pins, and sledges and see that it is bolted down to await final fastening by rigging and welding crews.

The erector must know the procedure for putting various sizes and weights of assemblies into place and how to use a wide range of rigging gear. He must know ship structure and terminology. For plate erection and for setting units in welded construction, in particular, especially well-qualified gangs are needed. Jobs are filled primarily by promotion of handymen and helpers already.
working in erection gangs; the main promotional opportunity for an erector is to become a lead man. Erectors make up a very small proportion of the shipbuilding work force. They numbered probably no more than one or two thousand in 1941, which was a good shipbuilding year, and the number in 1949 was considerably smaller.

Another group of workers employed in hull construction are calkers and chippers. Calkers and chippers make up about 2 or 3 percent of the work force in the shipbuilding industry. On steel hulls, chipping and calking are sometimes handled by the same workers. Chipping is generally considered to be a less-skilled job than calking.

In chipping, the worker chips, trims, levels, or otherwise cuts to size metal plates and parts with tools powered by a pneumatic hammer. To do the required cutting or gouging, the worker selects the tool, puts it into the hammer socket, and carefully guides the tool, free-hand or along lines marked out by other workers. Additional duties may include cleaning slag out of flame-gouged joints prior to their being welded, testing tanks and compartments to see if they are air-tight or liquid-tight, oiling and maintaining pneumatic hammers, and grinding chipping tools.

In metal calking, the worker, using hand or air-powered tools, tightens rivet heads, seams, and joints in order to close leaks in tanks and ship sections and make them water- or air-tight. Wood calking is an entirely different operation. This job consists of filling in seams in hull planking to make them water-tight. Among the calking materials used are cotton, oakum, rosin, and white pitch.

Some yards hire inexperienced workers and train them for these jobs; others hire only experienced men. If the experience has been gained in other industries, some retraining in shipyard methods and terminology is necessary. There is also a considerable amount of upgrading into this occupation, particularly of members of the riveting gangs. Sometimes calkers or chippers are promoted to better-paying combination chipper-calker jobs. It is also possible for calkers, chippers, and chipper-calkers to advance to such positions as lead man and to the still higher level of departmental quarterman (supervisor).

Engineering Jobs

Engineering is the important, highly complicated operation—one of the most intricate in shipbuilding—of installing engines, boilers, and other heavy equipment. Craftsmen, such as machinists and pipe fitters, prepare equipment for installation. (For further discussion of pipefitters, see plumbers and pipefitters, p. 389.) Riggers do the hoisting, using cables, chains, and other tackle, and direct crane operators in lifting and lowering the equipment into the assigned spaces aboard ship. The machinists, pipe fitters, and others then complete the installation on-ship. Engineering jobs taken together make up perhaps 10 to 15 percent of the industry’s total production jobs. Machinists are almost always the largest single occupation in engineering departments.

There are two groups of machinists in the shipbuilding and repair industry. One group is known by such titles as “outside,” “installation,” or “marine machinists,” or “marine engineers.” The remaining group of machinists working in the shipbuilding industry have duties similar to machinists employed in other industries. (Description of their work, training, employment outlook, and earnings is included in this handbook, see p. 186.)

The main job of the outside machinists (D. O. T. 4–75.150) is to line up accurately for installation
the units which make up a ship’s propulsion and auxiliary machinery, steering apparatus, and piping. These units may have been previously positioned, on a temporary basis, by other workers, e.g., riggers. The machinists fasten the units on prepared bases or directly at designated ship locations. They lay out holes for burning, the holes being used for passing connecting items (such as shafting and high-pressure steam lines) through bulkheads, decks, and other vessel surfaces. Additional duties include constructing floor and working spaces in engine and boiler rooms and testing and inspecting installed machinery and equipment for proper functioning during dock and sea trials. These and other tasks involve working to close tolerances and exact, vibrationless alignments; fine measuring and aligning gages and instruments are used. Naval installation specifications are particularly stringent.

The occupation is one of the highest-skilled in the industry. Workers are often classified in various grades based on experience, ability, and seniority. All top-grade men must be able to work to close accuracy with machinist’s hand tools and do precision checking with delicate instruments. Unless machinery and equipment locations are laid out by departmental supervisors, all machinists must be able to read and interpret blueprints.

Workers are either trained by apprenticeship or are advanced to journeyman status on the basis of experience, especially experience as handymen in the type of installation work done by machinists. Precision experience in naval construction is a decided advantage in advancing to a machinist’s job.

Outfitting Jobs

Outfitting is the job of making a vessel livable and equipping it for carrying cargo. Bare compartments must be transformed into living and working quarters. Carpenters and joiners build and install such equipment as bunks, lockers, and cabinets. Electricians install lighting and communications systems. Sheet-metal workers construct ventilating systems. Painters go over the entire ship. Riggers install the wide assortment of cargo-moving equipment needed. A fifth of the production workers are in the industry’s outfitting departments, with larger proportions in naval and repair operations.

The work of carpenters, electricians, sheet-metal workers, and painters in this industry is similar to that done in construction and other industries. Discussion of these occupations is included elsewhere in the handbook. See index for page numbers.

Riggers are a small but important group of workers employed in outfitting, as well as in other shipbuilding operations. They are employed in all types of ship construction and in repair work. There are two categories of riggers. The biggest group, known simply as “riggers,” work primarily on the complex job of hoisting aboard heavy equipment (such as boilers, rudders, and machinery) and putting it into position for final installation by other workers. The smaller group includes “ship riggers,” who work in the fabricating shops, making and assembling the ship’s rigging, and “stage riggers,” who, in some shipyards, put up the staging, scaffolding, ladders, and guard rails needed in assembling the hull. Both ship and stage riggers may install rigging aboard ship.

To hoist a piece of equipment aboard ship, riggers (D. O. T. 5–88.040) determine what hoisting equipment is needed, secure the equipment with cables, slings, ropes, or chains, and direct crane operators by hand signals in the actual hoisting. They get on-the-spot advice from the installation workers, e.g., advice from pipe fitters on pipes, from machinists on engine parts. Usually, riggers with the most experience and skill handle expensive machinery. Sometimes these men are called “machinery riggers.”

Ship riggers (D. O. T. 5–05.570), using mostly hand tools, cut and splice wire cables and rope and attach various types of fittings to the rigging. They also make wooden and rope assemblies, such as Jacob’s ladders, and install canvas covers on boats, hatches, and guns. As has been indicated, ship riggers work both in the fabricating shops and on rigging the ship.

The stage rigger—really a carpenter—is responsible for providing such items as working platforms, hand rails, gangways, and ladders. He designs and cuts the lumber for scaffolding and staging, erects the pieces himself if they are light, and directs others if the pieces are too heavy to
handle alone. When the stage rigger installs ladders, hand rails, and walkways aboard ship, he frequently needs the services of welders. Additional responsibilities may include maintenance and repair of the temporary equipment he erects, such as staging and scaffolding. Stage riggers may also shore up structures and prepare the shipways for a launching.

Sometimes so-called riggers also do ship rigging and even stage rigging as described above. Duties ascribed to ship riggers in this report may be handled by other groups of workers entirely. The fabrication jobs, for example, may be done by cable splicers, loft riggers, and wiremen.

Job requirements with respect to skills and experience may be very limited or very comprehensive, depending on the yard and the worker’s specific assignments. This is true especially for ship riggers. Among the more difficult requirements for most ship rigger jobs are experience with all types of rigging used on ships, all kinds of wire cable or rope splices, and all methods of rigging.

There are few formal training programs for riggers. Experience received as handymen and helpers in all kinds of rigging work is about the best qualification for classification as a journeyman rigger. Rigging experience in other industries is helpful, but most openings are filled by promotion from within. Foremen and subforemen, such as lead men, are likewise drawn largely, if not exclusively, from within the ranks.

Ship Repair Jobs

Ships arriving in port frequently need repairs and service which cannot be made by their regular crews but require the specially trained workers of the ship repair industry. Sometimes the repairs to be made are simple and can be done by one or two men in a few hours. More serious trouble, such as an engine breakdown, may keep a rather large group of men busy for a week or more. Ship conversion and modernization are also classed as repair work.

All repairs except those affecting the underside of the ship can be made alongside a pier or when the ship is at anchor. Underside or bottom repairs and servicing, such as replacing propellers or cleaning the hull, are done in a dock, most commonly a “floating dry dock.” This is a structure which can be submerged; the ship is located over it, and the water pumped out, giving workmen access to working platforms around the ship. Other types of structures used for repair jobs are graving docks and marine railways. A graving dock is a walled and floored excavation at the water’s edge with a gate. The dock space is flooded, the gate opened, the ship brought in, the gate closed and the water pumped out. A marine railway is used for smaller vessels. It consists of a cradle which rests on rollers on an inclined track extending out into the water. The ship is made fast to the cradle out in the water and ship and cradle are pulled onto land with winches and chains.

Repair work calls for the same type of skilled workers as does new construction, although in different proportions. However, some kinds of workers are needed in ship repair in very small numbers, if at all. For example, few designing experts, draftsmen, and mold loft and fabricating workers are required in ordinary repair work—although more may be needed in ship conversion and modernization. On the other hand, repair work calls for a much higher proportion of engineering craftsmen than does building. This is because the greatest volume of repair work is done on engines and other moving parts. Moreover, repair work involves some types of workers not found in construction at all—crews who operate and maintain dry docks, for example. It involves also a greater variety of jobs for workers in a given trade than does new construction, and men specializing in repair work are often referred to in the industry as “all-round men”.

Important to the would-be shipyard worker is the fact that the skills are to a considerable degree interchangeable as between construction and repair work. Where both kinds of activity occur in the same yard, workers may find themselves assigned to either class of work. A worker changing from one shipyard to another will likewise find that he can qualify in his vocation whether or not the new yard’s business differs from that of yards in which he gained experience. However, seniority policies may limit his chances to shift readily from yard to yard.
Other Jobs in Shipbuilding

In addition to workers directly involved in the physical process of building or repairing ships and in launching or dry-docking operations, the industry employs many other types of workers. There are the usual executives and auditors, clerks and stenographers, custodial workers and guards, time-keepers and tool checkers—to mention but a few of the many classes of workers not directly engaged in production. Their work is much the same as that of similar personnel found in industry generally. Discussion of some of these jobs is included elsewhere in the handbook. See index for page numbers.
AIRCRAFT MANUFACTURING OCCUPATIONS

The vital importance of aircraft to national defense and the wider use of civilian air transportation has made the manufacture of aircraft one of the important industries in our economy. It is still a young and dynamic industry, with the potentials of civilian use of aircraft far from realized. However, in 1950, the industry was primarily engaged in military aircraft production for military use. During the subsequent 5 to 10 years, the industry will probably continue to depend, for the most part, on Government needs for military aircraft. In July 1950, the industry employed more than a quarter of a million workers. In addition to the many specialized jobs found only in aircraft production, this industry is a major source of employment for engineers, draftsmen, tool and die makers, and other highly trained workers.

Nature of the Industry

The industry is composed of several separate and distinct branches. Airframe plants make up by far the largest division. These are the final assembly plants where the completed aircraft are produced and also most of the basic structures, such as the fuselage and the wings are made. The engines are made in separate plants and are installed in the plane at the airframe plant. Another division consists of plants that specialize in manufacturing propellers and their parts while the fourth division makes special equipment and parts such as instruments, gun turrets, and sub-assemblies of aircraft.

Airframe plants have approximately two-thirds of the industry’s employment. Aircraft engine plants account for about a fifth of the workers, and the remaining jobs are found in aircraft propeller and other parts plants.

The four segments of the industry have quite different operations and utilize different types of workers. Assembly and inspection is the basic process of the airframe plant, which can be considered as the heart of the aircraft industry. Airframe producers are responsible for the over-all construction of the planes, initiating the design, and planning the manufacture. In the manufacture of private and commercial planes, the engine and parts plants operate in effect as subcontractors; for most military planes, the Government contracts directly with the engine or parts producer and supplies the equipment to the airframe manufacturers for installation in the finished aircraft.

The manufacture of aircraft engines is a precision metal-working operation, requiring large numbers of machine-shop workers. To illustrate the almost complete separation between airframe assembly and the making of engines, not one important engine plant is located west of the Mississippi even though well over half of the airframe production is on the West Coast.

More than half of the jobs in airframe plants were in the West Coast States of California and Washington in October 1948. The Los Angeles area alone had two-fifths of the country’s airframe employment. About 1 out of 10 airframe workers was in a Texas plant. The Eastern States of New York, Maryland, and Connecticut accounted for a fifth of the jobs. However, the recent movement of a major aircraft plant from Connecticut to Texas has greatly reduced the number of aircraft workers in Connecticut. Almost all the remaining airframe employment is found in Kansas, Ohio, and Missouri.

The bulk of employment in aircraft engine plants is concentrated in States east of the Mississippi. Over a third of the jobs are in Connecticut, while most of the remainder are found in New Jersey, Indiana, Massachusetts, and Pennsylvania.

During World War II, the larger aircraft companies opened large branch plants throughout the country, and the automobile and household refrigerator industry converted to aircraft production. As a result, employment in aircraft manufacturing was much more widely distributed throughout the country than before the war. The industry returned largely, although not entirely, to the prewar locations. Texas, Kansas, and Missouri, however, are now relatively much more important than they were before the war.

Employment Outlook

Employment opportunities in the aircraft manufacturing industry, both during the early fifties
and over the longer run, will depend chiefly on the size of the Government's military aircraft procurement program. Whether measured by dollar value, airframe weight, or the amount of labor devoted to its manufacture, military aircraft represents by far the largest share of airplane production.

The expanded military aircraft procurement program initiated in the summer of 1950 is expected to continue into the foreseeable future. Military aircraft will compose an even greater proportion of future production. This higher level of activity should result in employment opportunities throughout the industry. However, should there be an improvement in the international situation, a drop in production comparable to the period following VJ-day, with similar effects upon employment would probably occur. A worsening in international relations would accelerate the expansion of employment in aircraft manufacturing.

Since 1940, the aircraft industry has undergone several stages of expansion and contraction. This has greatly affected the kind as well as the number of workers in its labor force. Chart 63 shows how, in the short span of 4 years, between the beginning of 1940 and the end of 1943, the industry increased its employment of production workers 14-fold in order to meet the demands of war production. During this period, the production worker total increased from 77,000 to 1,100,000. The average weekly hours also increased. In airframe plants, for example, average weekly hours were raised from 41.5 in January 1940 to 48.7 in January 1942. Actually, these figures underestimate the degree of employment increase. They do not include office and technical workers, nor do they include the substantial number employed in plants of other industries, such as the automobile industry, which converted to aircraft or aircraft parts production during the war. At the peak of aircraft employment in November 1943, the estimated total employment in all aircraft and parts establishments was 2,100,000.

To absorb the flood of new employees quickly it was necessary to utilize experienced workers as teachers, supervisors, and production lead men for the newly hired inexperienced workers. Job operations were broken down into more simplified and specialized steps. Women were used in large numbers for the first time. In January 1942, they accounted for 5 percent of total employment and by the end of 1943 over a third of the workers were women. While additional workers were hired in every occupation in the industry, most job openings were for specialized assemblers, riveters, machine-tool operators, inspectors, and testers. In general, the wartime expansion of the aircraft industry meant not only a great increase in employment but also a great increase in the proportion of semiskilled and unskilled workers.

The coming of peace reversed the wartime trends in employment and the composition of the labor force. Employment in the industry had already tapered off considerably from the peak in 1943, but, with victory in Europe, it contracted sharply. The major aircraft companies closed down many of their branch plants. Factories which had been converted to aircraft production, from the manufacture of such products as automobiles and refrigerators, returned to their normal peacetime products.

As a result, employment declined sharply and rapidly. The number of production workers in the aircraft industry proper fell from 683,000 in June 1945 to less than 140,000 in January 1946. The aircraft companies attempted to retain their more skilled workers and professional personnel. Seniority was frequently used as the basis for deciding who was to be laid off, so that workers with longer periods of service were kept on. Many
women and older people, most of whom had semi-skilled jobs, voluntarily left employment. The net effect of the reduction was to increase considerably the proportion of skilled workers in the industry’s labor force.

During the first 3 years after the war, a large share of the industry’s activity was devoted to civilian aircraft production. Military expenditures for aircraft were on a small scale, the Air Force and Naval Aviation drawing upon the stock of planes carried over from the war. Approximately thirty to thirty-five thousand production workers were added during 1946. However, after an early spurt of orders, production of planes for commercial aviation tapered off so that employment declined again during 1947. Airline operations did not expand as much as expected and many orders for planes were canceled. Another factor affecting aircraft production and employment was the failure of the sales of private planes to reach the levels previously anticipated.

In early 1948, following, in general, the recommendation of the President’s Air Policy Commission, Congress laid the ground work for the proposed eventual establishment and maintenance of a 70-group air force to be equipped with the latest model planes. As a result, most of the industry has shifted back to producing military aircraft and equipment. Employment began to rise during the latter part of 1948 owing to the first orders placed as part of the program. Between June 1948 and October 1949, total employment increase by almost 40,000. However, actual appropriations by Congress have provided for an air force well below the original 70-group program, and it was not until the summer of 1950 that a further substantial increase in funds materialized. A large increase in employment, and production over the February 1950 level can be expected during the next decade. In addition to any jobs created by rising employment, many replacements will be needed for workers who retire, die, shift to other industries, or enter the Armed Forces.

The Workers and Their Jobs

A great variety of jobs are to be found in this industry. Most of them are semiskilled, requiring less than 2 years of training and experience. On the other hand, there are a large number of highly trained aeronautical engineers, designers, and scientists as well as many skilled craftsmen.

More than a fourth of the total number of workers in the aircraft manufacturing industry have professional, technical, administrative, or clerical jobs. Among the factory occupations, assembly jobs are by far the most numerous. They constitute more than 15 percent of total employment in airframe plants while substantial numbers are also found in the other branches of the industry, especially in parts plants. During 1949, approximately 5,000 airframe workers were employed in such metal fabricating jobs as sheet metal work, riveting, and welding. Almost 3,500 inspectors were employed in airframe plants and about 2,000 additional workers were found in inspection jobs in the remainder of the industry. Tool-room and machine-tool operating jobs are another important group of occupations in the aircraft industry. In airframe plants alone, during 1949, these occupations included approximately 2,500 jig and fixture makers, over 1,400 milling-machine operators, 500 production machinists and almost 600 engine-lathe operators.

There are also several thousand tool-room workers and machine-tool operators in engine and parts plants where precision metalworking is a large part of the work. The major occupations in the aircraft manufacturing industry are discussed below in greater detail.

Average hourly and weekly earnings of aircraft workers compare favorably with most manufacturing industries. During July 1950, production workers in aircraft and parts plants averaged $1.62 an hour as compared to average hourly earnings of $1.62 for plant workers in all manufacturing industries. In the same month, hourly earnings in the automobile industry averaged $1.76 and shipbuilding $1.69. Average weekly earnings of aircraft and parts plant workers were $66.38 compared to $59.21 in all manufacturing industries. (These figures include extra pay for overtime, holiday work, and night shifts and therefore do not show the straight-time pay.)

Most of the production workers in the aircraft manufacturing industry are members of the United Automobile, Aircraft and Agricultural Implement Workers of America (CIO). The International
Association of Machinists (Independent) also has a substantial membership in this field.

Most employees in the aircraft manufacturing industry work in modern factory buildings which are clean and have good lighting and ventilation. In California and Texas, many work outside. The kind of physical effort required as well as the conditions surrounding the work vary somewhat with the different departments in a plant.

Industrial hazards in this industry have been minimized by the use of modern machinery equipped with safety devices. The industry has a relatively low injury-frequency rate when compared with most other manufacturing industries. During 1949, the aircraft and parts plants respectively had an average of 4.4 and 8.7 disabling work injuries for every million employee-hours worked compared with an average rate of 15.0 for all manufacturing industries.

Although the conditions of work in most jobs are relatively favorable, there are unpleasant aspects to some of the jobs. Some workers in the assembly and subassembly departments, such as electricians and control rigging installers, may work in cramped quarters inside and outside the planes, frequently having to work from a reclining position. Welders and riveters often must crouch, kneel, and crawl about the aircraft to perform their duties. Sheet metal workers are exposed to constant loud noises from the pounding and shaping of parts and to the heat from annealing furnaces. Cuts on hands from sharp edges of metal, bruises from use of hammers, and burns from furnace and hot metals are possible hazards in this department.

Professional, Technical, Administrative, and Clerical Jobs

Before an aircraft can be made and assembled by the various branches of the industry, it must be designed and its production planned. The workers engaged in professional, technical, administrative and clerical occupations accounted for more than a fourth of the 260,000 employees in the aircraft manufacturing industry in July 1950. Engineers (D. O. T. 0-19.05) and other scientific workers, such as physicists, metallurgists, chemists, and mathematicians prepare the plans and specifications for the complete design as well as the many component parts of the airplane. This industry employs more mechanical engineers than any other industry as well as a large number of engineers with electrical and electronics backgrounds. In most cases, the engineers and scientific workers must have a college degree in engineering or one of the physical sciences. Some entering jobs require little or no experience, while some of the highly trained scientists may have had postgraduate study as well as many years of experience in the aircraft industry. Draftsmen (D. O. T. 0-48.04) develop these plans in detail in the form of blueprints and specifications.

Production methods in the aircraft manufacturing industry are continually affected by modifications and changes in airplane design. In order to put these design changes into production it may be necessary to rearrange the lay-out of the plant and select and install new tooling equipment and machinery. Changes may also have to be made in the storage and movement of materials and parts within the plant. Even after changes in design have been incorporated there are daily problems in the methods and sequence of production which require the coordination of design plans and production practices.

There are a substantial number of professional and semiprofessional workers who are engaged in production planning and control in this industry. Production planners (D. O. T. 0-68.50, .52) generally serve as liaison men between the engineering and production departments in a plant. They plan from information contained in blueprints and various kinds of engineering specifications the sequence of operations and the processes necessary to fabricate, assemble, and install aircraft parts. They must keep in touch with the shop lay-out, facilities, and operating practices in order to make provisions for them when they make out their work orders.

The most skilled workers in this field are the experimental planners and tool planners. The division of responsibility among employees engaged in production planning differs in each plant. Production planners with wider experience and responsibility are usually employed where much of the work is experimental or where a plant is tooling up for a new job.

Since production planners serve as liaison men between the engineering and production departments, they must be able to apply some of the
AIRCRAFT MANUFACTURING OCCUPATIONS

engineering principles as well as have a working knowledge of shop practices. Tool, experimental, and class A production planners, who are the most skilled workers in their field, must usually have 5 years of diversified shop and tool planning experience. Not all plants now require formal engineering training, but it is becoming more common for these workers to have at least 2 years of college.

There are several ways in which workers can enter and advance in this field. Some workers acquire their initial experience in the drafting department, while others gain experience as skilled assemblers or machine-shop workers. However, the top production planning occupations require a combination of engineering as well as shop experience.

Technicians who specialize in designing special parts may, in some cases, substitute drafting or machine-shop experience for college training. Tool designers (D. O. T. 0-48.41) for example, have frequently been upgraded from the tool and die or drafting departments. In addition, there are many auxiliary office occupations, such as blueprinters, clerks, operators of various office and tabulating machines, and the technicians needed to do the paper work associated with designing, production planning, and general administration. (More complete statements on engineers, chemists, draftsmen, and tool designers are included in this handbook. See index for page numbers.)

Assembly and Installation Jobs

Over a fifth of the production workers in the aircraft manufacturing industry are directly engaged in assembling and installing the numerous parts which make up the finished product. These workers are employed, in large numbers, in all branches of the industry. The nature of their work varies considerably between the branches of the industry as well as from plant to plant.

The more skilled assemblers (D. O. T. 5-03.500 to .700; 5-17.240; 7-03.500 to .700) in airframe factories are usually known as chief, class A, or first-class assemblers; installers; or mechanics. They are all-round assemblers who perform diversified assembly or installation work. They must be able to use blueprint and other engineering specifications so as to decide the order of the assembly operations and how the various parts and smaller assemblies are related. They may then have to pick out the proper equipment or improvise production aids when adequate tooling or equipment is not supplied. The all-round assembler is usually employed in final assembly work where major subassemblies, such as the tail, fuselage, and wings, are fitted together and the major installations are made. They are also employed in plants which are engaged in producing prototypes and experimental aircraft. Rework, repair, or modification of aircraft in order to introduce technical improvements also requires the services of the top skilled assembler or mechanic.

It must be borne in mind, however, that the division of duties among assemblers in a particular plant depends largely on the organization of the production line. Factories which are engaged in the quantity production of aircraft, rather than a few experimental types, usually require even their skilled assemblers to specialize in one or more fields of work. They are assisted by several lower-rated assemblers who do routine work in a narrower field. For example, a class A armament assembler typically does such work as assembling, installing, and aligning power turrets, weapons, mechanisms, gun cameras, and related accessories. Lower-rated armament mechanics typically do such work as
OCCUPATIONAL OUTLOOK HANDBOOK

uncrating and cleaning weapons, loading ammunition, installing armor plate and placing parts in jigs. Electrical and radio assembly is another field of specialization. Assemblers of electrical equipment are sometimes called electricians rather than assemblers. They do such work as installing, hooking up, and checking major units in the electrical or radio systems. The class A electrical and radio assembler is assisted by less skilled assemblers, who do the more routine installations and wire routings by following standard wiring diagrams and charts. Power plant assemblers, sometimes known as engine mechanics, install, align, and check the various types of engines and accessories. Since jet and gas turbine engines are becoming widely used in military aircraft, new problems of installation and testing have arisen, requiring the use of specially trained assemblers.

Other parts of the aircraft in which assemblers specialize include the plumbing, hydraulic, and the various surface control and rigging systems. Precision assembly, another field of specialization, typically consists of assembling such large hydraulic and mechanical units as landing gear struts and bomb racks and operating hydraulic testing equipment so as to ensure a close fit with exacting tolerances.

The fields of specialization which have been described are usually found in the final assembly and large subassembly stages of production. Bench assembly, by which the small parts are fitted together, generally requires less skilled assemblers.

Assembly work in aircraft engine and aircraft parts factories differs to some extent from the assembly operations in airframe plants. Assembly operations are usually divided into bench and floor assembly in aircraft engine plants. The numerous small parts which go into making up an aircraft engine are fitted together by bench assemblers. They are then brought together on the floor of the factory. A crew of floor assemblers, usually consisting of a skilled assembler and several less skilled workers, then work around the engine until all the parts have been fitted together. As in airframe plants, the all-round class A assembler is usually employed in the final stages of floor assembly or on repair, modification, and experimental work. Most assemblers in aircraft parts plants are bench assemblers.

The skilled all-round assembler must have the equivalent of a high school or vocational school education, from 2 to 4 years of training in the trade and several years of shop experience. Specific requirements vary in each plant. Two years of high school and from 3 months to 2 years of assembly experience is usually required for the low-rated assembly jobs.

Assemblers must be able to read and interpret engineering blueprints, schematic diagrams, and production illustrations. The class A assemblers must, of course, be able to interpret engineering drawings which are more complex than the ones used by lower-rated assemblers. As part of their duties, skilled assemblers may be expected to do their own riveting and have a working knowledge of metal fabrication and machining methods.

In airframe plants during May–June 1949, straight-time average hourly earnings for class A assemblers were $1.52 and for class B assemblers, $1.31.

Sheet-Metal Fabricating Jobs

Closely allied to the assembly occupations in airframe plants are those occupations concerned with fabricating parts and assemblies of sheet metal.

Metal fabricators (D. O. T. 4–80.050, .060; 4–85.000 to .200; 6–88.622; 6–88.664; 6–94.207; 6–94.221; 6–94.060) shape metal aircraft parts from sheet metal by hand or machine meth-
tools. Machine methods involve the use of power hammers, presses, saws, tube benders, and drill presses. Metal fabricating includes several related occupations which have different skills. The all-round sheet metal workers, are the highest-rated metal fabricating workers in the aircraft plant. Their duties consist of laying out from blueprints, lofting data, and other engineering information the sequence of operations and fabricating by hand or power machine complicated and nonrepetitive metal shapes. Less complex parts, as well as those which are produced in large numbers, are fabricated by less skilled sheet metal workers or workers who specialize in operating a single machine and who are known as power-brake operators, power-hammer operators, power-shear operators, profile-cutting-torch operators, and punch-press operators.

Other important metal fabricating occupations in aircraft production are tube benders, riveters, and welders. The tube bender forms tubing which is used for oil, fuel, and hydraulic lines and electrical conduit lines. Riveters and welders join fabricated parts together by hand or machine riveting and by electric arc, gas, or electric resistance welding. (See statements on arc and gas welders, resistance welders, and pneumatic riveters, pp. 212, 215, and 224.)

Metal fabricating operations are sometimes carried on by workers in other occupations. Assemblers, for example, may be required to do riveting and welding as part of their duties. Jig and fixture builders may do sheet metal work in setting up work-holding devices. Since metal fabrication is so closely related to the assembly operations, the exact division of duties between workers in these fields differs to some extent from one plant to another.

Four years of apprenticeship or equivalent training and several years of experience are usually required to qualify as skilled sheet metal workers. They may be assisted by less skilled sheet metal workers who have had considerably shorter training. Operators of specialized power machines, riveters, and welders usually learn the work on the job in a year or two, although some all-round welders are required to have much broader training. Many of the machine operating, riveting, and welding jobs are entry occupations for workers with little or no experience. However, it must be remembered, that most of the semiskilled machine jobs do not lead to advancement to the skilled sheet-metal occupations.

Metal fabricating workers are exposed to constant loud noises from the pounding and shaping of parts and to the heat from annealing furnaces. These workers often must lift and place in position moderately heavy sheets of material in the various presses and operate the machines, as well as handle welding and riveting equipment. Cuts on hands from sharp edges of metal, bruises from use of hammers, and burns from furnaces and hot metals are possible hazards in this department. Arc and gas welders are exposed to certain hazards, such as electric shock or burns, but these can be avoided by proper precautions and the use of protective devices.

In May–June 1949, average straight-time hourly earnings of workers in some of the metal fabricating occupations in airframe plants were as follows:

- Riveters, class A ___________________________ $1.43
- Riveters, class B ___________________________ 1.24
- Sheet-metal workers, production _____________ 1.58
- Spot welders, class A _______________________ 1.51
- Spot welders, class B _______________________ 1.29
- Spot welders, class C _______________________ 1.28
- Welders, hand, production, class A ____________ 1.67
- Welders, hand, production, class B ____________ 1.53

**Inspection Jobs**

Thousands of inspections are made during the manufacture of an airplane from the time raw materials are received, through the metalworking and assembling operations, and until it has completed its first flight. A defective part or a mistake in the assembling can cause a fatal air crash later.

The inspector's (D. O. T. 4–80.025; 5–03.800 to .900; 7–03.800 to .900) job is to examine the parts and assembled units of the airplane in each stage of its manufacture to see that all engineering requirements have been met. Some inspectors specialize in examining materials and subassemblies which are purchased from the outside; others are engaged in inspecting the various stages of fabrication and final assembly within the plant; while still others inspect the completed aircraft after it
has been rolled out onto the field in preparation for its initial test flight. Within each field of specialization there are inspectors with different levels of skill, so that the less skilled class B and C inspectors are responsible for the more routine inspections or assist the skilled class A inspector in some of the more complicated tests in his field of work.

When an aircraft plant purchases supplies or subcontracts some of its production to other companies, it must inspect the incoming materials and parts to ensure that they meet specifications. Some of the most skilled inspectors, especially in airframe plants, are the outside production inspectors who examine machined parts, subassemblies, and tools and dies which have been ordered from other firms. They serve as liaison men between their own engineering departments and the contracting company. Other inspectors, with less responsibility than outside production inspectors, frequently known as receiving inspectors, check purchased materials and parts for conformity with blueprints, Air Force and Navy requirements, and other established standards. They operate testing equipment and must be familiar with the peculiarities of the parts and materials purchased from different sellers.

Machined parts inspectors in the production department determine, by the use of precision instruments, whether or not a part has been properly machined to conform to the sometimes exacting measurements of its blueprint specifications. Where large numbers of similar parts are being machined, the inspector usually checks the set-up (adjustments) of the machine tool, inspects the first parts turned out and then approves the machine run to produce the rest of the order. His duties also typically include testing for hardness and porosity, checking the finished parts against the rest of the assembly, and determining the machinability of castings and forgings.

Another field of specialization is that of fabrication inspector. The work of the more skilled inspectors in this field typically consists of examining fabricated sheet metal, the first run of assemblies and developmental parts, and the final inspection of complex parts which have required numerous fabricating operations. The more skilled of these inspectors are experts in sheet metal work.

As the purchased, machined, and fabricated parts are fitted together, they undergo numerous inspections by assembly inspectors. Class A assembly inspectors are employed, for the most part, in the later stages of the assembly process. They usually inspect complete major assemblies and installations, such as the fuselage, wings, and nose section to ensure their proper final mating. They also check the functioning of such systems as hydraulics, plumbing, and controls. Subassemblies and the assembly of prefabricated components parts into subassemblies are usually inspected by less skilled class B and C assembly inspectors. Some of the top-skilled inspectors are the field and service or ground and flight-test inspectors who make the final examination of the assemblies and systems of the airplane after it has been completed and sometimes go along on the initial flight.

The kind of training and length of experience required by inspectors depend largely on the field in which they specialize. Generally, the higher skilled inspectors gain their experience and training in one of the aircraft manufacturing trades while many of the lower-rated inspectors, especially when many new workers are being taken on, may be hired with limited or no experience in shop trades and trained directly as inspectors.

As part of their duties, inspectors must be able to read blueprints and other engineering specifications and use shop mathematics. They must also be able to install and use the various testing equipment and instruments used in their field of work.

Top skilled inspectors of outside production and machined parts must have had at least several years of machine-shop experience in addition to 4 years' training as a machinist. Lower-rated machined-parts inspectors must usually have from 1 to 2 years of machine-shop experience.

Among assembly inspectors, those engaged in final assembly or field and service inspection are usually the most skilled inspectors. They usually are drawn from experienced assemblers employed in final assembly, modification, or repair work. Fabrication inspectors must have a knowledge of sheet-metal work. Here too, the higher skilled fabrication inspectors are sheet metal workers, who have completed their training in the trade and acquired at least several years of experience.
In May–June 1949, average straight-time hourly earnings of inspectors in airframe plants were as follows:

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly, class A</td>
<td>$1.59</td>
</tr>
<tr>
<td>Assembly, class B</td>
<td>1.46</td>
</tr>
<tr>
<td>Assembly, class C</td>
<td>1.29</td>
</tr>
<tr>
<td>Fabrication, class A</td>
<td>1.60</td>
</tr>
<tr>
<td>Fabrication, class B</td>
<td>1.41</td>
</tr>
<tr>
<td>Fabrication, class C</td>
<td>1.25</td>
</tr>
<tr>
<td>Field and service, class A</td>
<td>1.79</td>
</tr>
<tr>
<td>Field and service, class B</td>
<td>1.67</td>
</tr>
<tr>
<td>Final assembly</td>
<td>1.65</td>
</tr>
<tr>
<td>Machined parts, class A</td>
<td>1.72</td>
</tr>
<tr>
<td>Machined parts, class B</td>
<td>1.52</td>
</tr>
<tr>
<td>Machined parts, class C</td>
<td>1.26</td>
</tr>
<tr>
<td>Processing</td>
<td>1.44</td>
</tr>
</tbody>
</table>

**Tool-Room and Machine-Tool Operating Jobs**

The tool room is one of the main places in aircraft manufacture requiring skilled workers. Tooling does not employ large numbers of workers, compared with some other operations in aircraft production, but the nature of the work demands highly skilled men with years of training and experience.

The two principal occupations in tool rooms are jig and fixture builders and tool and die makers. *Jig and fixture builders* (D. O. T. 5-17.060) are mainly employed in the airframe plants and they frequently work on the assembly floor making jigs and fixtures used in the production and assembly operations. Jig and fixture builders must be able, following information received from the engineering department, to plan the sequence of operations involved in making a jig, lay out the work, and carry it through to completion. Jigs and fixtures hold the parts and subassemblies while they are being riveted, welded, or assembled, and in airframe manufacture, these devices may be large and complicated metal frameworks. *Tool and die makers* (D. O. T. 4-76.040) make the cutting tools and fixtures used in machine-tool operations and the dies used in forging and punch press work. They must be all-round experts in the use of machine tools. (See statement on tool and die makers, p. 192.)

Another large group of workers in the aircraft manufacturing industry are engaged in shaping and finishing metal parts with machine tools. These machinists and machine-tool operators are relatively much more numerous in engine and parts plants than in airframe plants.

The most skilled among these workers are the all-round or general machinists, who can lay out the work and set up and operate several types of machine tools so as to perform machining operations on highly variable and nonrepetitive work. They are most frequently employed in departments or plants which are engaged in experimental and prototype production.

*Machine-tool operators* specialize on a single type of machine tool and they are often divided into three skill groups, A, B, and C. Class A machine-tool operators must be able to set up the work on their machine and they handle the more difficult, precise, and variable jobs. The less skilled B and C operators usually do more repetitive work. Milling-machine operators are the single largest group among the workers.

(For more information on machinists and machine tool operators, see the section on Machine Shop Occupations, p. 186.)

In May–June 1949, average straight-time hourly earnings of workers in some of the tool-room and machine-tool operating occupations in airframe plants were as follows:

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine-lathe operators:</td>
<td></td>
</tr>
<tr>
<td>Class A</td>
<td>$1.67</td>
</tr>
<tr>
<td>Class B</td>
<td>1.49</td>
</tr>
<tr>
<td>Jig and fixture makers:</td>
<td>1.70</td>
</tr>
<tr>
<td>Machinists, production:</td>
<td>1.72</td>
</tr>
<tr>
<td>Milling-machine operators:</td>
<td></td>
</tr>
<tr>
<td>Class A</td>
<td>1.63</td>
</tr>
<tr>
<td>Class B</td>
<td>1.41</td>
</tr>
<tr>
<td>Class C</td>
<td>1.26</td>
</tr>
</tbody>
</table>

**Field and Service Mechanics**

*Field and service mechanics* (D. O. T. 5-80.100; 5-80.352) prepare the airplane for its test flight after the final assembly operations have been completed. They look for flaws in the construction or functioning of the aircraft and make necessary repairs or return it for further re-work in the factory before final delivery. They may also be required to go up on test flights in the performance of their duties. Workers in this occupation are also often called operational checkout mechanics, or functional test mechanics.

The job of preparing an airplane for its first flight requires a team of mechanics who have different levels of skill and experience. The chief mechanic or crew chief, who is the most skilled among these workers, is responsible for the entire
checking-out operation and repair work. He usually supervises a crew of mechanics, each of whom specializes in one or more fields. For example, the armament mechanic is required to check out and repair, when necessary, the mechanism of power-driven turrets, fire controls, and bomb releases before and after test firing with live ammunition while the airplane is on the ground or in flight. Other mechanics, frequently called engine mechanics, specialize in checking out the power plant of the aircraft, including the engine, propellers, and oil and fuel system. The engine mechanic examines the power plant and subjects it to various tests during its operation so as to determine whether there are any flaws in its construction or operation. He then makes any necessary minor adjustments and repairs or returns it to the factory for any needed major assembly or fabricating changes.

Other fields of work in which field and service mechanics may specialize are the checkout and repair of the electrical systems, instruments, rigging and controls, and the plumbing and hydraulic systems of the airplane. In some cases, lower rated mechanics are employed to assist the specialized mechanics in conducting their tests and making minor repairs.

The extent to which mechanics specialize in checking out a particular section of the airplane varies from one plant to another depending on the type of aircraft being produced and the manner in which the checking-out operations are organized. For example, establishments which are engaged in developing prototypes and experimental aircraft, especially large military types, usually employ a larger proportion of all-round skilled mechanics than those factories which are engaged in the quantity production of established types, especially small civilian aircraft. In addition, the duties of field and service mechanics in some plants are more repetitive and specialized than in other plants where checking-out operations are organized in a way which requires more workers with all-round skills.

Chief field and service mechanics are usually required to have from 3 to 5 years of aircraft experience. Jobs for lower rated mechanics, who assist the specialized mechanics, are frequently beginning jobs for workers with little or no experience in the aircraft industry. They are required to have only 6 months or less of experience.

Workers in this occupation, especially chief mechanics, frequently acquire much of their experience in production departments before becoming field and service mechanics. As a result, workers can qualify for the higher rated operational mechanics in different ways. They can take a beginning job as a lower rated mechanic and may advance as they gain experience. Those who have completed high school or vocational school may be eligible for training jobs which are offered by some aircraft plants. The higher rated jobs are also sometimes filled by experienced “line maintenance” mechanics who have been employed by airlines.

Field and service mechanics must be able to understand and use shop mathematics, assembly blueprints, and service manuals. They use hand tools, testing equipment, and precision measuring instruments. The more skilled mechanics may be required to know how to install and maintain test equipment and check the operations of experimental test set-ups. The blueprints, shop mathematics, and testing instruments used are more complex for the highly skilled mechanics.

During May and June 1949, average straight-time earnings of class A field and service mechanics in airframe plants were $1.72 an hour.

Other Aircraft Manufacturing Occupations

Some of the major occupational groups in aircraft manufacturing have already been discussed. There are, in addition, a great variety of other occupations, each employing a relatively small number of workers, but which are important in some way to the production operations departments.

Some workers are employed as skilled pattern-makers, molders, and coremakers in making cast metal parts in foundries operated by aircraft plants. Drop-hammer operators and other forge shop workers are found in the forgings departments of some plants. Castings and forging workers are important mainly in plants making internal-combustion engines. Still other workers are engaged in anodizing, heat treating, and electro-
plating metal parts to give them various qualities of hardness or finish. Pattern and template makers have an important part in the preparation for airframe assembly operations. Most plants also employ aircraft painters. (More detailed information on foundry, forge shop, and electroplater occupations is included in this handbook. See index for page numbers.)

Tool crib attendants and stock clerks keep the production workers supplied with tools, parts, and materials.

A large staff of maintenance and custodial workers is also required in aircraft plants to keep the buildings and machines in good operating condition and to make changes in the lay-out of the plant. Among them are carpenters, electricians, plumbers, painters, millwrights, maintenance mechanics, and machinists. Guards and janitors are also part of the plant protective and custodial group. (Detailed discussion of some of these occupations is included in this handbook. See index for page numbers.)
FURNITURE MANUFACTURING OCCUPATIONS

The household furniture industry offers employment to a number of different kinds of workers. The majority of these workers are semiskilled. Furniture jobs are found throughout the country, although the bulk of employment is concentrated in a few States.

Many thousands of new workers will be hired by the household furniture industry during the fifties. Most openings will arise as a result of the need to replace those workers who die, retire, or transfer to other work.

The Industry and Its Products

The household furniture industry consists of two main branches—plants engaged primarily in making wooden (unupholstered) articles, and plants making upholstered articles. (Workers in factories making metal furniture, either for office or home, are not included in this report since most are in metalworking occupations rather than in woodworking jobs.)

In mid-1950, about 190,000 persons were employed in the household furniture industry; this is about the same as in 1948, the peak year. In 1947, there were more than 3,500 firms in the two main branches of the industry. A small additional number of persons engaged in making home furniture are found in small custom establishments and repair shops.

The furniture industry makes a wide variety of products—all those which are on display in furniture stores today. Some plants make only one product, such as chairs or tables; others produce only one kind of furniture, such as bedroom or living room furniture. However, there is a considerable number of plants which manufacture many types of furniture, ranging from complete suites to small decorative pieces.

The larger of the two main branches of the industry is that which makes primarily wooden or unupholstered furniture—bedroom and dining room furniture, kitchen furniture, occasional tables, chairs, and other nonupholstered products. Employment was nearly 145,000 in mid-1950. Many manufacturers in this branch also make upholstered pieces. Much of the furniture is made in factories using mass-production methods and is generally divided into three main operations—woodworking, assembling, and finishing. The cutting and shaping of the various furniture parts is done in the woodworking department by workers using a great variety of machines. Prior to woodworking, the lumber is seasoned by air- and kiln-drying. After the parts have been cut and shaped in the manner desired, they are assembled. The assembled piece of furniture is next sent through the finishing department where it is stained, filled, sealed, finish-coated, and polished.

There is a large number of plants in the branch of the industry which makes primarily upholstered furniture. They employed more than 45,000 persons in mid-1950. However, the plants are relatively small; they employed an average of 30 workers for each establishment in 1947. Small-scale manufacturing is the rule and is done mainly by hand. Some plants do not make the wooden frames for their furniture but purchase them ready to be upholstered. Only those parts of the frame which will be exposed after it is upholstered are finished off. The frames are then sent through the upholstering process which consists generally of attaching the springs, covering the springs with filling material, and stretching a fabric cover over the foundation.

Although the furniture industry as a whole is a large one, plants with 50 employees or less outnumber all the rest. On the other hand, about 12 percent of all plants employed more than 100 workers each in 1947; these larger plants have most of the industry’s employment.

Most of the furniture industry is concentrated in three regions—Southeastern, Middle Atlantic, and Great Lakes (see chart 64). Production in Pacific Coast States is increasing rapidly. There are several important furniture producing areas within these regions: High Point and other towns in North Carolina; New York City and James town, N. Y.; Martinsville, Va.; Gardner-Fitchburg area of Massachusetts; Chicago and Rock ford, Ill.; Sheboygan, Wis.; Grand Rapids, Mich.; Jasper-Tell City and Evansville, Ind.; and Los Angeles, Calif. Most of these areas specialize in a particular type of furniture making. New York City, with its many small establishments, is the country’s upholstery center. Virginia plants pro-
duce mainly bedroom furniture, and the Jasper, Ind., plants concentrate on bookcases and secretaries and radio and phonograph cabinets (as well as office furniture).

The larger plants are concentrated mainly within the above areas; however, repair shops and small plants making custom furniture are located in almost every fair-sized town or city.

Employment Outlook

The household furniture industry is expected to hire many thousands of new workers during the fifties. The level of employment in furniture manufacturing is not expected to remain at the high levels reached in the early fall of 1950. However, many openings for new workers are expected during the decade as a result of the need to replace those who die, retire, or transfer to other work.

Furniture production has been exceptionally high in the postwar years, although the level in 1949 was somewhat below that of 1948, the peak year. Several factors have contributed to the large volume of furniture sales. A big backlog of postponed replacement buying was carried over from the war years of limited furniture production. Consumer income, which is closely associated with furniture sales, has been at record levels in the postwar years. The big postwar jump in the number of marriages and the very high rate of residential construction have also contributed considerably to the demand for furniture, since new families and new houses generally mean new furniture.

A continuing high level of consumer income, a substantial volume of home construction, and
normal population growth all should help keep furniture production at a fairly high rate over the 1950-60 decade. On the other hand, in the early fifties, there is likely to be some decline in the annual number of marriages from the unusually high levels of the immediate postwar years. In addition, in this period, a decline in the number of persons reaching marriageable age will occur. Thus, there will be some reduction in the number of new families needing furniture. However, toward the end of the 1950 decade, the number of new families formed is expected to rise, owing to the increase in the number of young persons reaching marriageable age.

Another factor tending to decrease furniture sales in the early fifties, is the probable falling off of replacement purchases, which normally account for about two-thirds of all furniture sales. The backlog of replacement needs has been largely worked off in the past several years of high furniture production. Moreover, this large volume of output means that a substantial proportion of the furniture now in use is relatively new and may not be replaced for some time. Of course, possible changes in furniture style may induce consumers to replace their present furniture sooner than they would otherwise have done.

Furthermore, during the early fifties at least, furniture production will also be affected by the increased defense mobilization. It is not likely that residential construction will remain at the record level reached in the early fall of 1950, owing primarily to credit restrictions and to shortages of materials.

On balance, the prospects are that furniture production during the early fifties will not continue at the level reached in the early fall of 1950, but will remain considerably higher than prewar. Toward the end of the 1950 decade and on into the 1960's, furniture production will probably increase somewhat.

The outlook for furniture workers depends, however, not only on future production trends but also on technological changes in furniture manufacturing that may increase output per worker and affect the kinds of skills needed in the industry. Over the years, the furniture industry has been continually changing and improving its methods of manufacturing. Most furniture today is made in modern mass-production plants.

The greatest changes in furniture making have been job simplification and mechanization. The job formerly done many years ago by an all-round craftsman has been divided among a number of less skilled workers. The increasing use of power-driven machines and conveyor systems has helped to make furniture manufacturing more efficient. However, the furniture business cannot be entirely adapted to mass-production methods like the automobile industry because of the wide variety of styles required for today's market.

As a result of these technological changes, more furniture can be produced by each worker. These changes have made possible the employment of large numbers of semiskilled specialists.

The future should bring continued technological change in furniture making. New ways of performing the various operations are constantly being introduced; old methods and machines are being improved. Also, the more progressive methods and efficient machinery in use in the more modern plants will tend to spread throughout the industry. Further division and simplification of labor, already highly advanced, probably will not come about as rapidly or in as great amount. Thus, the main result of these future developments should be that a relatively smaller work force will be needed to produce a given amount of furniture.

During the early fifties, employment in household furniture manufacturing is not expected to remain at the level of 190,000 reached in the fall of 1950. In the latter half of the 1950 decade, the expected increase in production should bring with it a small rise in employment. In the skilled occupations, a continuation of the downward trend in numbers is expected.

Even though no great change in total employment is expected, replacement needs will create many openings for new workers in the furniture industry. Deaths and retirements may create an average of about 3,000 openings annually. However, an important source of jobs is the large turnover in the work force because of workers shifting to other fields of employment. There is a constant flow of workers into and out of the industry owing to quits, lay-offs, and other reasons. Most of the workers are semiskilled and unskilled and are not as hesitant about changing jobs as skilled workers are. Most openings that occur will prob-
ably be filled by new workers; if an experienced worker is separated, openings are usually filled by upgrading within the plant.

Furniture sales tend to be very sensitive to changes in economic activity; they usually fluctuate more widely over the business cycle than most consumer goods. Furniture is relatively durable and in some cases is a semiluxury; replacement buying and even original purchases are deferred when consumer buying power is low. In the event of a general business depression, furniture employment probably would suffer.

Jobs in Furniture Manufacturing

The many jobs in furniture manufacturing may be roughly classified in several major groups: woodworking, assembly, finishing, and upholstering. In addition, a number of persons are employed in maintenance, clerical work, sales, administration, and in professional and semiprofessional jobs. Also, a number of unskilled jobs are found in the average furniture factory. Of the 190,000 workers in household furniture plants in mid-1950, over 30,000 were engaged in woodworking-machine operations, more than 20,000 in assembly work, and 10,000 in finishing room work. Another 25,000 to 30,000 persons worked in the upholstery departments. The largest single occupation is that of helper.

The working force of the industry is predominantly male. A number of women work in production jobs (particularly in the finishing and upholstering departments), in addition to those employed in clerical and administrative jobs. Although many of the Negroes working in this industry are in unskilled jobs, a number are employed in semiskilled and skilled occupations. About one worker in five has a skilled job. Many are foremen and shop supervisors who must know all phases of furniture making in their respective departments. Others have detailed knowledge of all the woodworking machines and are responsible for setting them up for operation. In addition, skilled workers are employed in maintenance trades (electricians, millwrights, etc.) and in production jobs, such as spindle and machine carver, shaper operator, and upholsterer. About three out of every five workers in furniture factories are in semiskilled jobs. Nearly half of these jobs are in the woodworking department and about a fourth in assembly work.

Among the lesser-skilled workers are those who do much of the incidental work around the factory; they move wood parts and subassemblies from one worker to another, assist woodworking, machine operators, and are detailed to assist in the assembly, finishing, and upholstering departments. Most new workers in the furniture industry start in these jobs, e.g., offbearers, helpers, and stock movers.

Average earnings in furniture factories are lower than those in manufacturing industries as a whole. Earnings in plants making primarily wooden furniture generally average less than those in upholstered furniture factories.

In July 1950, the following average gross hourly earnings were reported to the Bureau of Labor Statistics:

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>All manufacturing</td>
<td>$1.46</td>
</tr>
<tr>
<td>All household furniture</td>
<td>$1.22</td>
</tr>
<tr>
<td>Upholstered</td>
<td>$1.33</td>
</tr>
<tr>
<td>Wooden</td>
<td>$1.13</td>
</tr>
</tbody>
</table>

Part of these differences may be attributed to the fact that a large part of the industry (particularly that making wooden furniture) is located in Southern States where prevailing wages are lower than in other sections of the country.

Most furniture factories give their employees vacations with pay, depending on length of employment. Some plants also have sick leave plans and employee insurance benefits.

The leading unions are the United Furniture Workers of America (CIO) and the Upholsterers’ International Union of North America (AFL). Less than half of the furniture workers are under union agreements.

Most of the hazards in furniture manufacturing are associated with the various types of machinery used. In 1949, the injury-frequency rate (average number of disabling injuries per million employee-hours worked) for the industry was 22.6, compared to 15.0 for all manufacturing industries.

Cabinetmakers

(D. O. T. 4-32.100)

The all-round cabinetmaker makes a completed piece of high-grade furniture, using both hand tools and machinery. He often cuts and shapes the parts and assembles them into articles of fur-
Cabinetmakers are employed mainly in repair shops or in small shops which make custom furniture.

Most of the furniture he makes is made to special order. His finished product is largely the result of fine hand work and expert knowledge of wood. A 3- to 4-year period of apprenticeship or equivalent training is necessary to learn the job.

The development of specialized machinery has been largely responsible for the decrease in numbers in this occupation, since, in a typical factory, his job is divided among many different occupations. (This trade as it is known today is not to be confused with the job of cabinet assembler or with the work done by skilled employees in the final fitting of assembled case goods such as chests, cabinets, or dressers.)

There are only a small number of all-round cabinetmakers now employed in larger furniture factories. Cabinetmakers are employed in plants making custom furniture and in retail shops where they repair and make new pieces. Some department stores in the larger cities employ one or two cabinetmakers as repairmen.

Wood Turners
(D. O. T. 4-33.363)

Hand wood turning is one of the few highly skilled occupations in furniture manufacturing.

A chair arm or leg (as seen on Colonial or other period furniture) are typical products of wood turning. The wood turner holds the cutting tool by hand against the wood stock which is set on a rotating lathe. He must use a high degree of skill and dexterity. The wood turner learns his trade during a 3- to 4-year period of training and perfects his ability through years of experience.

In most plants this trade has been mechanized for many years and automatic lathes are used instead of hand lathes. Only a very small number of skilled hand wood turners are now employed and prospects for additional jobs are quite limited.

Hand Carvers and Spindle Carvers
(D. O. T. 4-33.361, .362)

The hand carver uses various knives, chisels, and other hand tools to cut designs and figures into the surface of wooden furniture. The spindle carver cuts similar designs and figures, usually into smaller pieces of wood stock (such as chair legs and furniture panels by pressing the stock against the rotating cutter on the end of a spindle). Dexterity and judgment are essential in both jobs. Carvers usually learn their trade during a 3- or 4-year training period and emphasis is placed on understanding of free hand drawings and blueprints.

Ornamentation, elaborate scroll work, and other carving are not as popular as they used to be. Also, automatic carving machines with multiple spindles have been installed in most plants. Hand carving nowadays is generally employed only where higher priced furniture is made. There are very few employed in these occupations and future job opportunities will be extremely limited.

Woodworking Machine Operators
(D. O. T. 6-33.111, 211, 214, .364, and others)

These workers, who operate manual and automatic machines, comprise the largest occupational group in furniture making. There are many specialized machine operators, such as cut-off saw operators, hand shaper operators, belt sanders, and boring machine operators, employed in the woodworking room. The machines cut and shape the parts which will later be assembled into the final product. Larger plants frequently have a wider diversity of machines and jobs than smaller plants.
Some woodworking machine operators learn their work in a few weeks. More complex jobs may take as long as several months and a few highly skilled jobs require a year or so of training. As a rule, a new employee is assigned to a job as helper and then advances to other jobs as openings occur. Woodworking machine jobs are found in nearly all wood and upholstered household furniture plants and represent by far the best opportunities for employment in the average furniture plant.

Average straight-time hourly earnings in September 1949 of male workers in three typical woodworking machine jobs in wood furniture plants are shown below.

<table>
<thead>
<tr>
<th>Area</th>
<th>Belt sanders</th>
<th>Cut-off saw operators</th>
<th>Shaper operators, hand (set-up and operate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago, Ill.</td>
<td>$1.35</td>
<td>$1.30</td>
<td>$1.44</td>
</tr>
<tr>
<td>Gardner-Fitchburg, Mass</td>
<td>1.22</td>
<td>1.04</td>
<td>1.17</td>
</tr>
<tr>
<td>Jamestown, N. Y</td>
<td>1.31</td>
<td>1.26</td>
<td>1.34</td>
</tr>
<tr>
<td>Jasper-Tell City, Ind</td>
<td>1.10</td>
<td>1.10</td>
<td>1.12</td>
</tr>
<tr>
<td>Los Angeles, Calif.</td>
<td>1.48</td>
<td>1.58</td>
<td>1.68</td>
</tr>
<tr>
<td>Martinsville, Va.</td>
<td>1.03</td>
<td>1.04</td>
<td></td>
</tr>
<tr>
<td>Morganton-Lenoir, N. C.</td>
<td>1.02</td>
<td>1.09</td>
<td>1.06</td>
</tr>
<tr>
<td>Winston-Salem and High Point, N. C.</td>
<td>0.93</td>
<td>0.95</td>
<td>1.02</td>
</tr>
</tbody>
</table>

Earnings of cut-off saw operators making frames in upholstered furniture plants in Chicago, Los Angeles, and Winston-Salem averaged $1.34, $1.63, and $0.96, respectively.

Furniture-Assembling Occupations

Furniture finishers represent all of the finishing jobs in one occupation, plus the individual judgment and knowledge of a craftsman. The finisher applies successive coats of stain, sealer, filler, and lacquer or varnish to the surface of wooden furniture; smooths the surface between coats and rubs down the final coat to the desired finish. The finisher can prepare the formulas necessary to obtain the desired color and shading.

In most factories, the work of the all-round finisher has been broken down into several jobs. Even in these plants all-round finishers are em-
In the finishing department, paint is usually applied with a spray gun.

ployed as foremen or repairmen. Most openings are filled by upgrading specialized finishing-room workers. All-round finishers are also employed in small custom shops, repair shops, and large furniture stores.

Other Furniture Finishing Room Workers

Occupations in the finishing department range all the way from unskilled work, such as filling and stain wiping, to such highly skilled operations as blending and finish patching. As in other departments, the extent to which the jobs are specialized varies from plant to plant. In the smaller factories—and in the small repair shops—one employee may do all the various kinds of finishing work.

Finishing is usually divided into four phases: (1) preparation of the surface, (2) staining and filling, (3) coating the surface, and (4) rubbing and polishing the finish. The surface of a piece of furniture must be lightly sanded or rubbed down with abrasives between the coats of finishing material. In factories where the work is greatly specialized, hand sanders smooth the wood with sand and emery paper or steel wool, filler wipers smooth the surface after the filler is applied, and stain wipers clean the surface after it has been stained.

Other workers such as sprayers and recoaters apply varnish, lacquer, enamel, and other finishes to the surface of the furniture. These men usually work with spray guns, but occasionally use brushes, sometimes both. The latter work on a variety of products which call for different finishes and often select and mix the materials used. Some factories also employ blenders and high lighters for finishes requiring such treatment, i.e., shading stains and colors.

When the filling, sanding, varnishing, and other operations are completed, rubbers polish the furniture. Hand rubbers work with a cloth or felt pad dipped in a mixture of pumice stone and oil, or else they apply wax and rub it in. Machine rubbers use a portable rubbing machine to rub in the polishing compound and lubricants.

One of the most skilled jobs in the finishing room is that of the finish patcher, or burner-in. He repairs or "patches" defects in the finish of completed furniture and his work may involve all of the finishing operations—staining, sanding, painting, and rubbing.

Most finishing room workers learn their jobs in a relatively short time, from a few weeks to several months. Generally, a worker begins as helper, or else in one of the easier jobs in the finishing department, and is advanced to more difficult operations as openings occur.

Semiskilled jobs in the finishing room, as in other departments, have increased rapidly in the past 20 years. Prospects for new workers are good because replacements will be needed for many jobs currently held.

Average straight-time hourly earnings in September 1949 of male workers in three finishing room jobs in wood household furniture factories are shown in the following tabulation.

<table>
<thead>
<tr>
<th>Area</th>
<th>Sprayers</th>
<th>Rubbers, hand</th>
<th>Sanders, hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago, Ill...</td>
<td>$1.37</td>
<td>$1.19</td>
<td>$1.18</td>
</tr>
<tr>
<td>Gardner-Fitchburg, Mass</td>
<td>1.34</td>
<td>1.20</td>
<td>1.12</td>
</tr>
<tr>
<td>Jamestown, N. Y.</td>
<td>1.44</td>
<td>1.42</td>
<td>1.24</td>
</tr>
<tr>
<td>Jasper-Tell City, Ind.</td>
<td>1.13</td>
<td>1.17</td>
<td>1.12</td>
</tr>
<tr>
<td>Los Angeles, Calif.</td>
<td>1.59</td>
<td>1.41</td>
<td>1.26</td>
</tr>
<tr>
<td>Martinsville, Va.</td>
<td>.95</td>
<td>.84</td>
<td>.84</td>
</tr>
<tr>
<td>Morganton-Lenoir, N. C.</td>
<td>.99</td>
<td>.85</td>
<td>.85</td>
</tr>
<tr>
<td>Winston-Salem and High</td>
<td>Point, N. C...</td>
<td>.95</td>
<td>.83</td>
</tr>
</tbody>
</table>
**Upholsterers**

(D. O. T. 4-35.710 and .20)

Essentially, upholstering furniture consists of three operations—making a base for the piece (sofa, chair, etc.), putting in the springs and filler, and then covering the unit with some sort of fabric. The job is done mainly by hand and considerable skill is necessary. Upholstering furniture was once entirely a one-man operation. Now, part of the work is done by less skilled workers (see—upholstery room workers). However, in small retail shops which do repair work and some custom work, the all-round upholsterer does all the work by himself.

The first job of the upholsterer is "springing up" the base. This is done by first interweaving strips of burlap and tacking them to the frame. Several coil springs are then set upright on the burlap webbing, tied to each other, and anchored to the frame. In some furniture, an integrated spring unit is fastened directly to the base. Next, a burlap cover is placed over the spring and the various filling materials—such as cotton batting, animal hair, or sponge rubber—are placed over the burlap and covered with a piece of muslin. The arms and wings of chairs or sofas are padded with felted cotton and covered with canvas or muslin. The final upholstery fabric, which has usually been cut and sewed, is then fitted into place and tacked to the frame.

A 2- to 4-year training period is necessary to become an all-round upholsterer. Seldom is a formal apprenticeship arranged; usually the skill is acquired through informal on-the-job training.

The majority of all-round upholsterers are employed in department stores, furniture stores, and retail upholstery shops rather than in large manufacturing plants.

Replacement needs will provide a number of openings. However, many persons seek to enter this popular occupation and competition for jobs is usually keen.

Average straight-time hourly earnings of upholsterers in September 1949, in upholstered furniture plants were as follows:

<table>
<thead>
<tr>
<th>Upholsterers</th>
<th>Chicago, Ill.</th>
<th>Los Angeles, Calif.</th>
<th>New York, N. Y.</th>
<th>Winston-Salem and High Point, N. C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair</td>
<td>$1.27</td>
<td>$1.38</td>
<td>$1.47</td>
<td>$1.27</td>
</tr>
<tr>
<td>Section work</td>
<td>$1.89</td>
<td>$1.98</td>
<td>$2.38</td>
<td>$1.38</td>
</tr>
<tr>
<td>Complete work</td>
<td>$2.82</td>
<td>2.23</td>
<td>2.45</td>
<td>1.47</td>
</tr>
</tbody>
</table>

**Other Upholstery Room Workers**

(D. O. T. 6-35.110, .140, .720; 6-36.411, .414, .417; and others)

The extent to which specialized workers are used, especially in manufacturing plants, depends primarily on the method of operation. Even in small retail stores, where custom manufacturing and repair work are done, some specialization is found. Nearly all establishments employ cutters and many have sewers and cushion makers. The job of the cutter consists of measuring the frame of a couch or chair to determine the amount of material needed, laying out and marking the pattern, and finally cutting the material into the pieces desired. He often uses a cloth-cutting machine to cut several pieces at one time. The springer's job consists of attaching the spring coils to the burlap webbing (which has been installed by the webber) and tying the springs to the frame and to each other to prevent shifting.

Most of the jobs in the upholstery department are relatively simple and can be learned in a few weeks. Others, such as that of sewers, require more time; the cutter requires a training period of a year or two.

Average straight-time hourly earnings in two upholstery room occupations in upholstered fur-
Furniture Designers
(D. O. T. 0-16.11 and .12)

Furniture designers develop and sketch designs. Their work requires skill, originality, and good taste in addition to a knowledge of design, construction, and materials. The furniture designer, though essentially an artist, must have the technical ability to create models adaptable to consumer needs and to modern methods of factory production as well. After sketching the design, some designers may build and finish their own models. Usually, however, their work is confined to making drawings and diagrams which are translated into working plans by draftsmen and model makers.

Furniture design is one of the specialized fields in the broader field of industrial designing. As part of their necessary formal training, designers study fine arts and industrial design in an art, trade, or technical school. The specialist in furniture design acquires, in addition, a well-rounded knowledge of furniture history, architectural trends, and furniture style.

Furniture designers are members of, or are employed by independent designing firms; a small number work for individual furniture manufacturers. For the most part, furniture manufacturers obtain their designs from independent designers or designing firms.

The profession of furniture designer is small and may easily become overcrowded because many persons try to enter the occupation. Although not closed to the exceptionally talented specialist, opportunities for new entrants are very limited.

Earnings of furniture designers are generally comparable to those of industrial designers.

See also Industrial Designers, page 96.
PLASTICS PRODUCTS MANUFACTURING OCCUPATIONS

During the forties, plastics products manufacturing was one of the fastest growing American industries. In 1948, the number of jobs in the plastics products industry had risen to more than three times the employment in 1939. This is, however, still a relatively small industry, employing somewhat more than 60,000 wage and salary workers in 1948. There will be a considerable number of openings for new workers during the early fifties as the output of plastics products expands to meet defense requirements. The longer range outlook is for a gradual rise in employment. Most job openings will be for inexperienced persons to be trained for semiskilled and unskilled production jobs.

The Industry and Its Products

Plastics are synthetic organic materials which, through application of pressure or heat or both, may be formed into almost any desired shape. They are man-made from substances like coal, petroleum, wood, and cotton. Although not entirely of recent origin, they are mainly products of modern research.

Plastics are easy to shape and have many other useful properties. Generally they are light, resistant to corrosion, easy to color, odorless, and tasteless. Some are noted for toughness, electrical insulating qualities, transparency, flexibility, or resistance to water. Plastics have been put to thousands of uses. The following are some typical plastics products: radio cabinets, telephone headsets, electrical switch parts, gears, bottle tops, light reflectors, medical instruments, refrigerator parts, instrument panels, chemical tubing, novelties, and toys.

Most of the industry's output consists of parts made to order for firms in other industries, such as the electrical machinery, automobile, radio, aircraft, and fountain pen industries. Other plastics products are sold in finished form, such as novelties, toys, combs, and bottle tops. Not included in the industry are the plastic materials producers (part of the chemical industry) who supply molding compounds to molding plants, laminating resins to laminating plants; and plastic sheets, rods, and tubes to fabricating plants.¹

Plants in this industry are usually small. They range in size from those which are run by their owners, with perhaps one or two helpers, to a few large establishments with over 1,000 employees. In 1947, about four-fifths of the plants in this industry had less than 50 employees. Plastics products plants are located principally in the more important industrial regions of the country, near the main users of their products. There were plants in about 39 States, but, as chart 65 shows, about three-fourths of the workers in the industry were employed in 8 States: New York, Massachusetts, Illinois, Ohio, New Jersey, Pennsylvania, Connecticut, and Minnesota.

Plastics products are made primarily by machines. Hand work comes in mainly in some of the finishing, fabricating, and inspecting activities. In a particular plant, one or more processes may be used, each having its special type of machine. These machines are largely automatic in their operation.

Quantity production is the rule, even in the smaller plants. Typically, large numbers of each item are turned out; for example, a plant may have an order for many thousands of identical bottle caps or fountain pen barrels. It is usually not economical to mold plastics products in small quantities, because of the high cost of the individual molds used in their manufacture. Without mechanization and quantity production, the cost of such articles would be prohibitive and their widespread use impossible.

The principal methods of shaping plastics are by molding, laminating, and fabricating. There are four main ways of molding—compression,
transfer, injection, and extrusion. Choice of method is based on the shape of the piece to be molded and kind of plastic material used. In laminating, pressure is used to bond together plastic-impregnated sheets of paper or fabric. In fabricating, sheets, rods, and tubes, or molded or laminated forms are sawed, machined, or otherwise fabricated into desired products.

Employment Outlook

The plastics products industry will provide many job openings for new workers during the early fifties. Heavy defense requirements for plastics products will result in a considerable rise in employment. The industry experienced phenomenal growth during the forties. The number of jobs in 1948 was more than three times the employment in 1939 and much higher than the wartime peak. A great expansion of the industry occurred during World War II, when most of the industry's output went into military uses. Rapid growth occurred in the first postwar years as greatly increased peacetime uses of plastics products more than took the place of their military uses. During 1948 and early 1949 production in the industry slowed down somewhat. Decreased demand occurred as some of the principal users of plastics products finished working off their postwar backlogs of orders. However, in 1950, employment in the industry rose again to new high levels. The most important industrial users of plastics products include the manufacturers of electrical machinery (both industrial electrical equipment and consumer appliances), radios, automobiles, novelties and toys, household equipment and furniture, industrial machinery and equipment, and packaging and building supplies.
Long-run growth of the industry depends on increased use of plastics by these principal consuming industries and on the discovery of new applications for plastics. Many of the industry's present consumers expect to develop new uses for plastics parts in their products. This is especially true in the construction, automobile, railroad equipment, and household equipment industries. Extensive research is continually in progress in an effort to find additional uses for plastics products and to develop materials with properties which will create new fields for plastics. An example of a new use is the recent development of plastic bathroom tile. Wider use of new methods, such as low-pressure molding, may also open some new markets for plastics because these processes can produce larger and more intricate shapes. To sum up, it seems likely that with development of new markets for plastics products, and with continued growth of population and national income, a long-range upward trend in the volume of output is in prospect.

Technical advances are occurring in the industry which are raising output per worker, so that employment will not increase as much as production. These advances include the development of faster molding machines, the use of machines able to mold larger objects (such as television cabinets), and the application of more efficient finishing methods.

All in all, the long-range outlook is for a continued, but gradual, rise in employment. In addition to the new jobs that will result from the increase in employment, a number of openings will be created each year in the replacement of workers who leave the labor market because of death or retirement, or who shift into other lines of work. Also, plastics molding and laminating departments of plants in other industries will provide a number of similar job openings each year.

It must be remembered, however, that this industry will continue to be relatively small. Moreover, most job openings will be for inexperienced persons to be trained for semiskilled and unskilled production jobs.

Plastics Products Workers and Their Jobs

As this is a relatively new industry, and one which has added many workers in recent years, most of its employees are young. During World War II, women constituted 40 to 50 percent of the workers in plastics products plants. By 1948 the proportion had dropped to less than a third. Most of the women are in the finishing and inspection departments and in office work, although they frequently operate semiautomatic molding machines. Hourly earnings of plant workers in this industry in early 1948 ranged from an entrance rate of 60 cents an hour for some unskilled finishing jobs to more than $2 an hour for skilled tool and die makers. A high percentage of the workers are on incentive pay, with a guaranteed minimum hourly rate. The average hourly earnings of production workers employed in 127 plants reporting to the Bureau of Labor Statistics in May 1949 were about $1.32. On the average, they earned $51.22 for 38.8 hours per week. This compares with hourly earnings of $1.10 and weekly earnings of $54.08 for production workers in manufacturing industries as a whole in the same month. (These figures include extra pay for overtime and night shifts, and therefore do not show the straight-time pay.)

Working conditions in plastics products plants are usually good, compared with factory work in general. The buildings are often modern, well-lighted, and adequately ventilated. Molding departments tend to be noisy, and it may be quite hot next to the molding machines. The operators have to wear gloves, since they handle hot plastics pieces. In laminating plants, the odor from the laminating solution may be disagreeable, and heat near the presses may be bothersome.

The work is not particularly dangerous. Accident data for 1949 indicate that in this industry there were about 13.3 disabling injuries for each million employee-hours worked, compared with a rate of 15.0 for all manufacturing industries. The machines used in molding are largely automatic, with numerous safety devices to reduce the hazards. In finishing operations, cutting and stamping machines cause occasional injuries, and the workers may be affected by dust from grinding and polishing.

Most plants operate more than one shift; three-shift operation is the most common. About half of the plants are unionized. Locals of various CIO and AFL unions and some independent unions have organized these plants.
Because the production methods of the plastics products industry are largely mechanized, the bulk of the jobs are semiskilled and unskilled. The various occupations in plastics products plants are discussed below.

**Molding-Machine Operators**

(D. O. T. 7-10.014 and .016)

The largest group of the industry's workers are employed in the molding departments of molding plants. Most of the employees in these departments are semiskilled workers who operate compression, injection, or extrusion-molding machines which form plastics articles or parts. Their basic duties are to feed plastics materials into the molding machine, start the machine, and take out the molded pieces. A set-up man makes ready the machines used by the operators, setting the controls and positioning the molds. The operator watches the process and calls his foreman if anything goes wrong. A few molding machine operators have jobs requiring greater skill. These are the so-called "hand molders," who set up their own machines and assemble the molds by hand.

Usually, no previous experience or special training is required to obtain the job of the molding-machine operator. The general practice is to hire inexperienced persons and train them on the job. The training period varies from the 2 or 3 weeks necessary to learn the operation of the more automatic machines to the 12 to 18 months needed to become a skilled hand molder. There are a number of trade schools in the plastics field which give training in the operation of molding machines as part of their courses. However, the large majority of the operators have not had such courses nor are they generally necessary to obtain jobs of this kind.

With little additional training, workers can transfer from one type of molding machine to another, e.g., from compression to injection machines. Average strength is enough to do this work. About a sixth of the operators are women.

**Tool-Room Jobs**

Many molding plants, especially the larger ones, make their own molds instead of buying them from outside machine shops. These plants have toolrooms in which skilled tool and die makers and machinists are employed. Although this is only a small part of employment in the industry (with about 3,000 workers in 1948), it is the main place in the industry where skilled jobs are found.

*Tool and die makers* use machine and hand tools to shape molds from steel. They must be able to read blueprints, to use precision measuring instruments, and to set up and operate various machine tools, such as lathes and boring mills. *Machinists* assist the tool and die makers, recondition and repair worn or damaged molds, and make replacement parts for the various machines in the plant. Machinists must be able to set up and operate machine tools. The work of the tool and die maker is usually learned through a 4- or 5-year formal apprenticeship or the equivalent in other types of on-the-job training. One may become a machinist through a 4-year apprenticeship similar to that of the tool and die maker. Men also become machinists by learning the trade while working in toolrooms as machinist's helpers or machine tool operators. (See section on machine shop occupations, p. 186 for more information on machinists and tool and die makers.)
PLASTICS-PRODUCTS MANUFACTURING OCCUPATIONS

Jobs in Finishing Operations
(D. O. T. 7-10.200 through .290)

One of the largest groups of jobs in the plastics products industry is in the finishing departments. Most molded plastics undergo a series of finishing operations before they are ready for use. In general, not much skill is needed by finishing department workers, most of whom are women.

There are a number of different jobs in finishing rooms. **Tumbler operators** place molded pieces in wire tumbling barrels containing polishing materials and start the tumbling machine. The rotating motion of the barrel rubs the pieces against one another and against the polishing material, which gradually removes the excess material. **Bench grinders** hold the molded articles against rotating abrasive wheels to remove excess material. **Hand files or burners** use hand files or carving spindles to smooth edges and remove material. **Buffers and polishers** polish articles to a high luster by holding them against rapidly rotating wheels. **Drill press operators** drill holes in plastic pieces and clean the excess material from holes. In some plants, a number of **assemblers** are employed to put together molded pieces in the making of the finished product.

Because these jobs are easy to learn, unskilled and inexperienced workers are hired. Training to operate the various machines and tools is given on the job.

Jobs in the Inspection Department
(D. O. T. 7-10.415)

Plastics products usually must be inspected before they leave the plant. The amount of inspection needed differs widely. For some molded products, the workers need only look over the articles for blisters or improper finish. Other products must be examined more closely to see whether they are the exact shape and size required and meet other specifications. As in finishing, a large proportion of the workers are women.

Previous experience is usually not required. Good eyesight is essential, but little physical strength required. Very brief training is needed to perform most of the inspection operations. On the other hand, instruction in blueprint reading and use of measuring instruments, such as micrometers, dividers, and the various types of gages, is essential for some **inspectors** and supervisory inspectors.

Jobs in Laminating
(D. O. T. 6-51.500 through .519)

Most workers in the laminating shops are semiskilled machine operators, helpers, and laborers. Three typical jobs are those of coater, press operator, and mandrel man. The **coater** operates the machine that impregnates paper or fabrics with synthetic resins. He places large rolls of paper or fabric into the machine and directs the course of the material through a resin bath and through drying ovens. After that, the dried material is wound in rolls by the same machine. A **laminating press operator** runs a hydraulic press which produces sheets of plastic material by pressing layers of resin-impregnated paper, textiles, or other material between steel plates. The laminating press operator has to regulate the head and pressure controls. The **mandrel man** tends a semi-automatic machine which winds resin-impregnated paper or fabric onto heated cores (mandrels) used in making laminated plastic tubing. He regulates the thickness of the tube by using simple gaging tools. After the desired thickness is reached, he stops the machine and cuts the material. The tube is then taken to an oven where the cure is completed.

Production workers in laminating departments usually learn their work through informal on-the-job training. The amount of training required ranges from 2 to 12 months, depending on the complexity of the job and the kind of machinery used. Inexperienced workers are usually hired as laborers or learners, and upgraded to fill vacancies as they occur.

Fabricating Jobs
(D. O. T. 7-10.233, .234 and .235)

Fabricating occupations include drill-press operators, lathe operators, sawing-machine operators, and assemblers. While almost all plants in the industry do some fabricating, there are some firms which do only fabricating. These fabricating plants buy plastics forms from plastics-materials manufacturers, molders, and laminators and turn them into finished articles. They range in size from one-man shops making novelties in basements and garages to a few plants with more than 100 employees.
Technical, Office, and Sales Occupations

Although most jobs in the industry require little skill or knowledge, some technically trained people, such as chemists, engineers, designers, and draftsmen, are needed to carry on this complex, rapidly changing industry. (Statements on many of these occupations are included in the handbook. See index for page numbers.) Plastics products companies must also have salesmen who know plastics products and can sell them to skeptical purchasing agents and production men, in competition with other materials. Most technicians work at developing new products and improving old ones. Qualified production superintendents are also needed to plan and oversee plant operations, and keep the plant running efficiently. Clerks, bookkeepers, accountants, typists, and purchasing agents are among the workers found in the administrative offices of plastics products firms. Nearly a seventh of the employees in the industry have technical, office, or sales jobs.

College training in chemical or mechanical engineering is a prerequisite for most technical jobs; to qualify for the more responsible positions, such as production superintendent, considerable experience is required. These technical workers are not a large proportion of the industry’s employment and are more commonly found in large plants, since many of the smaller molding firms do not employ designers, engineers, or draftsmen. Instead, these small companies temporarily engage the services of independent technical men and consultants for this work. Some of the development work is carried on by the plastics materials producers, who employ a number of technical men in this activity.

Salesmen, often called sales engineers, should have some technical training. They need a knowledge of the properties of plastics materials, of costs, of plant equipment, and of marketing possibilities. It is often necessary to have either experience in a plastics plant or training in an engineering school in order to become a salesman for a plastics products firm.
PRINTING OCCUPATIONS

Printing is an art, a great industry, and one of our chief means of communication. Its contribution to the growth of democracy was so fundamental that freedom of the press was one of the basic rights incorporated in the first amendment to the United States Constitution.

Printing workers make up one of the largest occupational groups in American industry. In 1949, jobs in the printing, publishing, and allied industries numbered about 725,000, of which roughly half a million were production and related workers. Outside the industry itself, many thousands of printing workers were employed by government agencies, factories making items involving printing but which are not essentially graphic arts products, businesses doing their own commercial type printing, libraries, and other categories of employers.

Methods of Printing

Printing is essentially a means of putting ink on paper, metal, or other types of materials. Present-day printing is done with the use of plates which are “run” on special printing presses.

There are three basic methods of reproduction—letterpress, gravure printing, and lithography. In letterpress (also known as relief) printing, the letters and designs to be reproduced are raised above the nonprinting areas of the type or the press plate. When the actual printing is done, ink is applied only to the letters and designs, usually by means of an inking roller.

In gravure (or intaglio) work, the relation between the printing and nonprinting areas of the plate is opposite to that in letterpress. The letters and designs to be printed are cut or etched into the plate and are below the nonprinting surface. Ink has to be applied to the entire plate, but the surface is then wiped or scraped, leaving ink only in the depressions. In printing, suction is created, which lifts the ink out onto the paper.

The plate used in lithography (offset printing) is smooth or nearly so, with both the image and nonimage areas on the same level, instead of on different levels, as in letterpress and gravure work. Lithography makes use of the principle that grease and water repel each other. The image areas of the plate are coated with a greasy substance to which the greasy printing ink will stick. On the press, the plate is moistened with water before each inking, with the result that only the image areas take up the greasy ink from the inking roller.

In modern lithography the plates are processed photographically, and the method is often referred to as photolithography. There are a few types of work—preparing posters, for example—in which some of the plates are still made by hand.

Letterpress is the oldest and by far the most common printing process. Practically all newspapers, the bulk of books and magazines, and most other printed items are produced by this method. Work done by photoengraving shops (chiefly making plates for use in relief printing of illustrations and other copy that cannot be set up in type) and by stereotyping and electrotyping shops (mainly producing metal and plastic duplicates of type forms and photoengravings for use as press plates) is also part of letterpress printing operations.

Gravure printing, the process least employed (but most rapidly growing) is of two main types: Rotogravure (in which press plates are made from pictures by a method based on photography) and hand or machine engraving. The picture supplements of some Sunday newspapers are the best known rotogravure items. Rotogravure pictures appear in many magazines and are used in other forms as well. Some printing on metal foil is done by this means. Hand or machine engraving is used in making engraved stationery, greeting cards, paper money, bonds, and similar products.

Lithography is in use to a much greater extent than the gravure method of reproduction, but considerably less than letterpress techniques. Practically all items printed by the relief process are also produced by lithography—including, for example, books, calendars, maps, posters, labels, office forms, sheet music, and even newspapers. Almost all printing on metal and much of the printing on rough paper is done by this method.

Printing Occupations

The all-round printer skilled in typesetting and also in operating a press was the typical printing worker up to the closing years of the nineteenth
CHART 66

OCCUPATIONAL OUTLOOK HANDBOOK

MAJOR PRINTING OCCUPATIONS

EMPLOYMENT, 1940

THOUSANDS OF WORKERS

COMPOSING-ROOM JOBS
- Compositors and Typesetters, hand
- Linotype Operators
- Monotype Keyboard Operators
- Proofreaders
- Monotype Caster Operators

ELECTROTYPERS AND STEREOTYPERS

PHOTOENGRAVERS, including rotogravure

LITHOGRAPHIC JOBS
- Platemakers
- Artists and Letterers
- Cameramen
- Cutters

PRESSROOM JOBS
- Pressmen and Plate Printers
- Press Assistants

BINDERY JOBS
- Bindery Workers, semi-skilled
- Bookbinders

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

BASED ON 1940 CENSUS OF POPULATION AND OTHER SOURCES
century. Some craftsmen who are adept in both kinds of work are still employed in small newspaper and job shops. In the printing industry as a whole, however, they are greatly outnumbered by specialized craftsmen and semiskilled employees.

The largest group of skilled and semiskilled workers are in the composing room, the department responsible for typesetting and composition. Other major groups are the printing pressmen and their assistants, photoengravers and rotogravure photoengravers, electrotypers and stereotypers, lithographic workers, and bookbinders and bindery workers. Chart 66 indicates the relative importance of the largest printing occupations.

Besides the occupations shown in chart 66, there are many other small groups of skilled or semiskilled printing workers. In some plants, especially in the newspaper industry, the composing-room work force includes Ludlow operators, who run a typecasting machine known as the Ludlow Typograph. Big composing rooms nearly always employ one or more “stonemen,” who place the pages of type in the large type form in which they leave the department.

Another small group of workers, found in large plants, are mechanics who specialize in repairing and adjusting typesetting machines, printing presses, or bindery machines. Steel and copperplate engravers, on the other hand, work mainly in small engraving shops. They cut or etch lettering and designs into plates by hand or machine.

Most of the occupations indicated in chart 66 and the preceding paragraphs are skilled jobs. The main exceptions are the press assistants and nonjourneymen bindery workers, whose jobs are semiskilled. Proofreaders in nonunion shops are sometimes classed as clerical employees.

In skilled occupations practically all the workers are men. However, many of the semiskilled workers, especially in binderies, are women. Small numbers of Negroes are employed in skilled jobs; a greater number in semiskilled occupations. In the several hundred shops which print newspapers or other items for the Negro community (magazines have experienced unusual growth in recent years) the great majority of workers in all types of jobs are Negroes.

To complete the picture of the printing and publishing work force, the professional, administrative, clerical, and unskilled employees of printing plants should be mentioned. The chief professional workers are the reporting and editorial staffs of newspapers and other publishers. In addition, all sizable plants employ increasing numbers of executives, estimators, salesmen, stenographers, clerks, and laborers of various types; these employees usually have duties much like those of comparable personnel in other industries.

Fields of Employment

The establishments engaged primarily in job or commercial printing make up the largest printing industry, in terms of employment of production workers (see chart 67). In 1947, as for many years in the past, about a third of such workers were employed in job shops.

The Nation's commercial plants produce a greater variety of printed matter than the other types of shops. Letterheads, business forms, posters, displays, calendars, and folders are but a few of the many thousands of items made by job plants.

CHART 67

**NEWSPAPER AND JOB SHOPS EMPLOY MOST PRINTING WORKERS, 1947**

*Production Workers in Printing and Allied Industries*

<table>
<thead>
<tr>
<th>Category</th>
<th>Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspapers</td>
<td>150</td>
</tr>
<tr>
<td>Lithography</td>
<td>100</td>
</tr>
<tr>
<td>Service Shops</td>
<td>50</td>
</tr>
<tr>
<td>Bookbinding</td>
<td>25</td>
</tr>
<tr>
<td>Periodicals</td>
<td>20</td>
</tr>
<tr>
<td>Greeting Cards</td>
<td>10</td>
</tr>
</tbody>
</table>

*Thousands of Workers*

United States Department of Labor
Bureau of Labor Statistics
In addition, a large number of these commercial shops do a considerable amount of printing of newspapers, periodicals, books, pamphlets, or other items which are mainly produced in other branches of the printing industry.

Newspapers make up the second largest employer of production workers in the printing and publishing fields. Newspaper plants concentrate mainly on turning out newspapers and do relatively little printing of other materials. On the average, newspaper shops are larger than commercial printing establishments.

As chart 67 shows, lithography was the printing industry's third largest employer of production and related workers in 1947, followed by bookbinding establishments and periodical printers and publishers. In addition, a considerable amount of lithographic reproduction was done in letterpress and other types of printing plants.

Among the smaller branches of the printing industries, according to the 1947 Census of Manufactures, are those made up of its book publishers and printers, greeting card manufacturers, and service shops. The last named do primarily typesetting, engraving (including photoengraving), or electrotyping and stereotyping; this is done as a service to regular printers and others doing their own reproduction work.

In addition to the workers in firms that are mainly engaged in printing, or in publishing and printing, many printing and bindery workers are employed by Government agencies and libraries, and also by manufacturers and other firms doing some printing in connection with their opera-
tions—for example, canned goods producers printing their own labels. The largest printing plant in the world is the United States Government Printing Office in Washington, D.C.

Where Printing Jobs Are Found

As chart 68 shows, well over half of the printing jobs in the country are located in a few States, mainly in the Middle Atlantic and Great Lakes regions. The principal States and cities are New York (New York City), Illinois (Chicago), Pennsylvania (Philadelphia), and Ohio (Cleveland and Cincinnati). Well over half of the Nation’s printing is done in these States. Other leading centers are Los Angeles, San Francisco, Detroit, St. Louis, and Minneapolis-St. Paul. Washington, D.C., takes on special importance as a printing center owing to the concentration there of the Government’s printing and engraving activities.

Employment in job and periodical printing is concentrated to a considerable extent in these areas. In the newspaper industry, a much larger proportion of jobs is found outside the main centers because of the great number of small, local newspapers scattered elsewhere throughout the country. Almost every small town has a printing shop of some kind—frequently a small newspaper plant which also handles the community’s job printing.

Earnings and Working Conditions

Earnings have long tended to be higher in printing than in most other industries, owing to the large number of skilled workers employed, the strong influence of the printing unions, and other factors. In March 1950, production workers and nonsupervisory employees in newspaper plants averaged $2.12 an hour, considerably higher than in all but a very few industries. In manufacturing, the next highest earnings for the same class of workers were in petroleum refining, with an average hourly figure of $1.90, in March 1950.

The other printing industries also showed hourly earnings in March 1950 higher than those for most groups: $1.84 for production workers in periodical printing and publishing; $1.82 for those in lithographic plants; commercial and job shops, $1.79; and book printing and publishing, $1.64. The average for all printing industries combined was $1.86; for all manufacturing, $1.43.

The comparisons and averages cited above refer to production workers and nonsupervisory employees only, but cover all classes of such personnel. They include premium pay for overtime hours worked, extra pay for night shifts, and other forms of compensation which add to base pay.

Earnings may vary considerably among individual printing workers. The differences may be a result of occupational variations in wage scales. The practices of different employers and unions in the same or in different cities may play a part. Many workers receive premium rates for long service, quality work, or for other reasons. Additional factors make for differences in pay between individual workers.

The best source of information on basic pay rates in printing occupations is the union wage scales for selected groups in the important printing centers reported annually to the Bureau of Labor Statistics. Averages obtained from these scales differ from those shown above not only in that the union rates cover only certain individual trades, principally in the skilled crafts, but also in that they are the minimum basic scales for the given occupational classifications and sub classifications.

Union wage scales are usually uniform for each occupation in a given locality, and are representative generally of wage rates in the highly organized skilled trades and, to a lesser extent, those in semiskilled printing jobs. A range indicated for a given occupation and city (as shown in the reports on individual printing occupations which follow) means that there are two or more effective rates falling under the same general occupational classification, based on variations in job content or requirements. For example, the standard photoengraver rate in an area may be $2.58 an hour, while tint layers in the occupation may earn $2.84; or there might be a rate of $1.50 an hour for one-color pressmen in a given city, and $1.75 an hour for two-color men in the same city, under the same contract. There are frequently differences in the union wage scale between English and foreign-language operations.

The Bureau of Labor Statistics’ union wage scales do not include Government scales, although these may be arrived at through negotiation with
employee organizations, including the regular printing trades unions found in private industry. Scales of the Government Printing Office are indicated separately at appropriate points of this report.

Starting pay of an apprentice (see p. 304) is usually 30 or 40 percent of the wage rate for journeymen in the shop. This is increased once or twice a year, until, in the final year or half-year of training, he receives 80 or 90 percent of the journeymen rate. Men who have had some experience in the trade, civilian or military, can often obtain credit for this. They will then start at a wage above the beginning apprentice rate, and the length of time before they become journeymen will be reduced. Veterans who qualify under the GI Bill of Rights may also receive subsistence allowances from the Federal Government during part or all of the training period.

The Bureau of Labor Statistics obtains the separate union wage scales for day and night work. The rates referred to below and elsewhere throughout this report are for day work. More detailed information on union wage scales than appears in this report is available upon request.

In July 1949, union wage scales in the 77 printing centers covered taken together averaged about $2.50 an hour in the newspaper industry; $2.08 in book and job work. Three-fifths of the workers covered were employed at scales ranging from $2 to $2.60 an hour. In the half-year following July 1949, many wage scales increased. Most increases appeared to fall within a range of 5 to 15 cents an hour, or $2 to $6 a week.

In most printing plants, as in many other manufacturing establishments, workers are paid time-and-a-half not only for work in excess of a specified number of hours a week, but also for hours in excess of 8 a day. For such overtime purposes, the standard workweek in mid-1949 was usually 37½ hours in the mechanical departments of newspaper plants where collective bargaining agreements were in effect. Shorter schedules apparently prevailed under contracts in shops outside the newspaper industry. There is considerable variation, however. In newspaper work, for example, according to the American Newspaper Publishers Association, a young man going into a small plant would most likely work a 40-hour week. In a metropolitan plant, he might be on a schedule even shorter than 35 hours.

Work on Sundays and holidays is customarily paid for at time-and-a-half or double-time rates in most branches of printing. In newspaper plants, an individual employee's regular workweek often must include Sundays and holidays; time-and-a-half or double-time is paid for these days only when they are not part of the employee's regular shift. In early 1950, night-shift workers in union shops generally received about $5 or more extra for the regular workweek.

Yearly earnings of workers depend not only on rates of pay and related provisions, but also on how regularly they are employed. Printing workers are fortunate in having steadier employment and earnings than workers in many other industries. This is true especially in the newspaper field.

Paid vacations are called for by most union contracts. The most common provision is 2 weeks' vacation with pay after 1 year of employment. In addition, the printing unions are noted for welfare provisions for their members. For example, pensions, sanitarium facilities, and educational programs are frequently provided. The principal labor organizations are listed on page 307, and are referred to elsewhere in this report.

How To Enter the Field

Apprenticeship is the accepted way of entering skilled printing occupations. With very rare exceptions, it is the only means by which one may qualify as a journeyman in a union shop, where the ratio of apprentices to journeyman is established by agreement between the employer and unions.

Printing apprenticeships usually require from 4 to 6 years, depending on the occupation and whether the shop is union or nonunion. The training program covers all phases of the particular trade and almost always includes classes in related technical subjects, as well as training on the job.

To be eligible for apprenticeship, applicants are generally required to be 18 (sometimes only 17) years of age and not over 30. A physical examination is usually given to find out whether the applicant is free from communicable diseases, has eyesight adequate for the particular occupation, and is in good enough physical condition to do the work which will be involved in his job.
Exceptional physical strength is rarely required. Printing is, on the whole, a relatively good field of employment for handicapped people. A considerable number of workers, particularly linotypists and compositors, have speech or hearing defects; some are even totally deaf. Men who have lost one or both legs or do not have the use of all 10 fingers have proved satisfactory in some composing-room occupations. Success in a job generally depends on the individual's ability to do the work and to adjust himself to specific working conditions. Handicapped people should not consider themselves automatically disqualified for employment in the industry, but should seek competent professional advice.

Education is another factor which employers consider in selecting apprentices. A high school education is usually required and always preferred. A thorough knowledge of spelling, punctuation, and grammar is essential for most trades. Technical training in printing in a vocational school is desirable. Printing courses in a high school, often given as part of a general industrial arts program, are also good preparation. In addition, courses in art, such as drawing, design, color, and lettering, are helpful for many kinds of printing work. Such courses are offered by the Carnegie Institute of Technology (in Pittsburgh, Pa.), Rochester (N. Y.) Institute of Technology, and New York (City) Printing School and are considered to be unusually good.

In late 1949, an estimated 20,000 veterans were receiving some training or education in connection with printing and publishing vocations under the GI Bill of Rights. Nonveterans in similar training programs also numbered in the thousands.

Employment Prospects

During the early fifties, employment in printing occupations as a whole will remain about the same as in 1949. There will be some job openings each year, largely to replace men leaving the printing trades because of death and retirement. The defense production program begun during 1950 is not likely to increase the volume of printing substantially over the high postwar levels. The bulk of printing production is connected with advertising, or is used for education, information or recreation, and is not directly affected by defense requirements. There may be some slight increase in the total output of printed materials to meet the expanded needs of the Armed Forces, and the accompanying higher levels of business activity. Many of the printing plants will be able to handle any increases in their business by lengthening the workweek of their employees. If, as seems likely under the mobilization plans set up in 1950, a large proportion of the Nation's youth is taken into the Armed Forces, at least temporarily, there will be less competition for apprenticeship openings. On the other hand, it is probable that the printing industries will offer fewer apprenticeships. The widely discussed recent technological developments in printing are not likely to affect employment appreciably during this period.

Over the longer run, printing employment is likely to show a gradual increase. The history of employment in the printing industry has been one of steady growth, except for periods of severe business depression (chart 69). In 1899, there were about 200,000 jobs in production and related work in the printing, publishing, and allied industries. By 1929, the number had risen almost 80 percent to more than 350,000. During this same
period the actual output of printed matter increased much more rapidly.

Printing activity was hit fairly hard by the depression of the early 1930's, although printing employment did not decline as much as that in other industries. Newspaper and magazine publishing held up particularly well. Total employment of production workers in printing and publishing dropped to about 260,000 in 1933, but recovered to about 350,000 by 1937, according to census reports.

Probably the sharpest year-to-year gain in printing employment ever recorded was that which occurred between 1945 and 1946. During World War II, the number of wage earners was not much above the 1939 level of 325,000. Instead, hours of work were increased to meet the heavier demands for printing. The great postwar boom in general business and reductions in the length of the workweek expanded printing employment to 438,000 in 1947. Following this upsurge in employment, the number of production jobs leveled off in 1948 and 1949.

In the future as in the past, population growth and the general tendency toward greater use of printing material for information, advertising, entertainment, and various industrial and commercial purposes should cause further gains in printing output over the long run. But past experience in this field also indicates that possible gains in employment arising from increased consumption of printed matter will be limited by technical improvements in the printing process. In the past few years there have been a number of developments which may have considerable effect on printing methods and the number and kinds of printing workers employed.

Now in commercial use or in the laboratory stage are a wide variety of new devices and techniques, ranging from such comparatively simple items as electronic counters to highly complex systems of radio transmission of copy and proof. Some of the new methods affect primarily a single printing operation, while the influence of others may be spread across the entire printing field.

One of the developments, relating to composing-room work, involves the use of special typewriters which “justify” copy (even it up at the right-hand margin) by varying the space between words. The copy is “pasted-up,” photographed, and plates made by means of photoengraving. These are then used to produce stereotypes or offset plates from which the printing is done. When used, this process eliminates the usual typesetting process.

Implying a still greater technical revolution is the Fotosetter, a photocomposition machine already in commercial use. This equipment is said to be as effective in composition as is the present-day method of setting type. It is claimed also that it is easier to operate than typesetting machines now in use and that it does the job faster. One of its outstanding features is a special automatic camera which photographs letter characters one at a time and records them on a new type of photographic film in lines assembled in galley form. This film can then be used to make offset plates or photoengravings.

A new type of machine can be used in engraving in place of the conventional chemical process. In this new method a heated steel stylus is guided by means of photo-electric cells.

Electronic printing, another new development, may replace some of the conventional printing presses. In this process, ink is drawn off the printing surface onto the paper by an electric force; no physical contact occurs between the printing surface and the paper. It is claimed that printed matter can be turned out by this method at many times the speed of regular presses. At the same time, improvements are being made on old style presses which increase their speed of operation, and these should have a definite influence on pressroom labor requirements.

The introduction of these and other methods is likely to be gradual. They will have a tendency to reduce printing employment or to limit gains which would result from increased demands for printed materials. To the extent that they do increase efficiency of printing operations and hold down printing costs, they may actually encourage greater use of printing. This has been the case with the important innovations in the past, such as the linotype machine. Despite the labor-saving effects of these inventions, printing employment continued to grow rapidly.

Another important factor which will tend to limit any possible decrease in employment resulting from technological changes is the likelihood of a continued reduction in the length of the workweek in printing plants. Over a period of years, weekly work schedules have been steadily cut from the 9-hour day and 6-day week which prevailed in commercial printing at the beginning of the cen-
tury, to workweeks of 35 and 37½ hours which are now prevalent in newspaper plants and job shops. The limiting of the number of weekly hours (at straight-time pay) is a policy of the printing unions which is expected to continue in future years.

The over-all result of the increased demands for printing, technological changes, and the trend toward a shorter workweek should be a slight and gradual long run increase in employment. However, there will be more job openings each year to replace older workers who die or retire than will be caused by the small increases in employment.

Where To Get More Information

Additional information on the printing industries, on methods of printing, and on typesetting and many other printing occupations is given in:


Information on opportunities for apprenticeship or other types of printing employment in a particular locality may be obtained from several different sources. Applicants may go to the nearest office of their State employment service affiliated with the United States Employment Service, or to any printing plants in the neighborhood (addresses can be obtained from the classified section of the local telephone directory). Local unions and employer associations can also be of great assistance. If none is listed in the telephone directory, an applicant may write to the following national headquarters of such organizations and ask them to refer the letters to their nearest branches.

Labor Organizations

Amalgamated Lithographers of America (CIO), 143 W. 51st St., New York 19, N. Y.
International Allied Printing Trades Association (AFL), 302 AFL Bldg., Washington 1, D. C.
International Brotherhood of Bookbinders (AFL), 901 Massachusetts Ave., NW., Washington 1, D. C.

International Photo-Engravers' Union of North America (AFL), 212 Madison Ave., New York 17, N. Y.
International Printing Pressmen's and Assistants' Union of North America (AFL), Pressmen's Home, Tenn.
International Stereotypers' and Electrotypers' Union (AFL), 752 Old South Building, Boston 8, Mass.
International Typographical Union (AFL), 2820 N. Meridian St., Indianapolis 6, Ind.

Trade Associations and Others

American Photoengravers Association, 166 W. Van Buren St., Chicago 4, Ill.
Book Manufacturers Institute, Inc., 25 W. 43rd St., New York 18, N. Y.
Employing Printers Association of America, 53 W. Jackson Blvd., Chicago 4, Ill.
International Association of Electrotypers and Stereotypers, Inc., % Executive Secretary: Mr. A. P. Schloegel, 701 Leader Bldg., Cleveland 14, Ohio
International Association of Printing House Craftsmen, 18 E. Fourth St., Cincinnati, Ohio.
Library Binding Institute, 501 Fifth Ave., New York, N. Y.
Lithographers National Association, Inc., 420 Lexington Ave., New York 17, N. Y.
Lithographical Technical Foundation, Inc., 131 E. 39th St., New York 16, N. Y.
National Association of Photo-Lithographers, 317 W. 45th St., New York 19, N. Y.
Printing Industry of America, Inc., 710 Fifteenth St., NW., Washington 5, D. C.
A GENERAL PICTURE OF THE FLOW OF WORK IN PRINTING

LETPRESS

COMPOSING ROOM

HAND COMPOSITORS
LINOTYPE OPERATORS
MONOTYPE KEYBOARD OPERATORS
MONOTYPE CASTER OPERATORS
PROOFREADERS	OThERS

ELECTRO-TYPERS
STEREO-TYPERS

PHOTO-ENGRAVERS

LITHOGRAPHIC

COPY

CAMERAMEN
ARTISTS

PLATEMAKERS

PRESSROOM

LETTERPRESS PRESSMEN
AND ASSISTANTS

LITHOGRAPHIC PRESSMEN
AND ASSISTANTS

ROTogrAVURE PRESSMEN
AND ASSISTANTS

BINDERY

BOOKBINDERS
BINDERY WORKERS

MAILING OR SHIPPIng

TO CUSTOMER

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
Hand Compositors and Typesetters  
(D. O. T. 4-44.010)

*Outlook Summary*

Job prospects fair for qualified journeymen in most parts of country in early fifties, but diminishing number of apprenticeship openings. Employment will probably soon resume its long-range downtrend.

*Nature of Work*

Copy to be printed by the letterpress process starts its trip through a printing plant in the composing room as shown in chart 70. There the type is set and assembled in type forms, ready for the pressroom—or for electrotyping or stereotyping, if printing is to be done from press plates instead of directly from type forms.

The oldest and largest composing-room occupation (with probably no less than 100,000 now employed) is that of hand compositor and typesetter. Their job involves setting each line of type in a “composing stick”—letter by letter and line by line and, when the stick is full, sliding the completed lines onto a shallow metal tray or “galley.” Even in shops where all “straight matter” (such as you are now reading) is set by machine—and there are many—hand compositors may still be needed to set some of the type required for headlines, titles, and other special work, and to assemble the machine- and hand-set type. Taking proofs of type that has been set (i.e., printing a few copies on a proof press), checking the proofs against the original copy, correcting errors in typesetting, page make-up (arranging type and any needed engravings into pages), and locking the completed pages into forms are among the other tasks sometimes performed by compositors, particularly in small shops. In large plants, page make-up is usually done by special “make-up men,” chosen from among the compositors; type forms are generally locked up by “stonemen.”

All the major branches of letterpress printing—newspaper, job, book, and periodical—employ large numbers of hand compositors. Smaller numbers work in other kinds of printing shops or in service shops doing typesetting on contract for printing and other establishments. A good many men in the occupation have their own small job or service shop.

*Training and Qualifications*

A 6-year apprenticeship is usually required for employment as a journeyman compositor or typesetter. In union shops, apprenticeship of this length is always needed except for some veterans with military experience related to printing, and apprentices for whom shop foremen recommend shorter training periods in recognition of outstanding ability.

The apprenticeship commonly found in this trade includes a considerable amount of classroom and correspondence study. Printed manuals of instruction have been prepared by the International Typographical Union (AFL) and the Printing Industry of America, Inc. (employer association). These manuals are used not only in apprenticeship programs but also in vocational schools.

Besides having the educational qualifications needed for all skilled printing occupations, a compositor should be good in arithmetic, so that he can calculate spacing of type on pages. A knowledge of English is especially important, since the worker should be able to catch errors in copy before setting type. Imagination and artistic ability in planning page lay-outs are assets which may help him to advance to lay-out work or make a success in business for himself.

It is necessary for the worker to be in good enough physical condition to be on his feet 8 hours a day. He should also be able to use his hands, arms, and eyes constantly.

*Outlook*

Employment prospects for journeymen compositors are expected to be fair in most parts of the country during the next few years. For a year or two following VJ-day, there were many more openings for inexperienced men than usual. In these immediate postwar years, employers, in order
to make up for the wartime deficit in trainees, generally took on as many apprentices as were permitted by the ratios of apprentices to journeymen established by union agreements, or that it was feasible to take on, but training opportunities have since become much fewer. Apprentice members of the International Typographical Union in all printing trades in which the union provides for such affiliation numbered about 6,500 in mid-1949, considerably more than in 1945. Similarly, gains were registered in other categories of hand compositor trainees. During the early fifties, apprenticeship openings will be fewer, but probably there will also be a smaller number of applicants.

Employment in this occupation, as before World War II, will no doubt tend to decrease, in the long run—owing to continued advances in machine typesetting and to other factors. The decline will be slow and will probably not involve many layoffs. Men in the occupation should have a good chance of holding their jobs indefinitely, especially if they have machine (linotype or monotype) as well as hand skills.

For years there have been so many small general printing shops that competition for business has been keen in most parts of the country, and earnings of shop owners have often been very inadequate. Nevertheless, some men may be able to go into business for themselves during the next few years. Those with varied experience in the industry will have the best chance of success, especially if they locate in growing suburban and other areas where they will not be in direct competition with well-established “downtown” firms.

Men with composing-room skills plus supervisory and managerial abilities will also find some immediate openings in salaried positions with large organizations, and, in general, good opportunity for advancement to such positions.

**Earnings and Unionization**

Hand compositors are among the better paid printing trades workers. Union wage scales in effect in a large number of cities on July 1, 1950, averaged nearly $2.42 an hour in book and job printing and about 8 cents more in newspaper plants (day work).

The lowest scale among the cities covered was in book and job work in Manchester, N. H. and Savannah, Ga. (see table below). At the extreme upper end of the scale was a rate of $2.74 an hour, in Detroit, for some newspaper craftsmen. On July 1, 1950, more than half the workers were on pay scales ranging from 240 to $2.60 an hour.

The minimum union wage rates for hand compositors and typesetters as of July 1, 1950, for most of the important printing centers are shown in the following tabulation:

<table>
<thead>
<tr>
<th>City</th>
<th>Newspapers</th>
<th>Book and job shops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga</td>
<td>$2.45</td>
<td>$2.33</td>
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<tr>
<td>Baltimore, Md</td>
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<td>Birmingham, Ala</td>
<td>2.38</td>
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<td>2.13</td>
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<tr>
<td>Buffalo, N. Y</td>
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<td>2.31</td>
</tr>
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<td>Butte, Mont</td>
<td>2.40</td>
<td>2.37</td>
</tr>
<tr>
<td>Charlotte, N. C</td>
<td>2.10</td>
<td>2.05</td>
</tr>
<tr>
<td>Chattanooga, Tenn</td>
<td>2.32</td>
<td>2.13</td>
</tr>
<tr>
<td>Chicago, Ill</td>
<td>2.63</td>
<td>2.59</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>2.53</td>
<td>2.34</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>2.53</td>
<td>2.35</td>
</tr>
<tr>
<td>Columbus, Ohio</td>
<td>2.48</td>
<td>2.35</td>
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<tr>
<td>Dallas, Tex</td>
<td>2.53</td>
<td>2.35</td>
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<tr>
<td>Davenport, Iowa</td>
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<td>1.85</td>
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<tr>
<td>Dayton, Ohio</td>
<td>2.37</td>
<td>2.37-2.40</td>
</tr>
<tr>
<td>Denver, Colo</td>
<td>2.52</td>
<td>2.19</td>
</tr>
<tr>
<td>Des Moines, Iowa</td>
<td>2.40</td>
<td>2.19</td>
</tr>
<tr>
<td>Detroit, Mich</td>
<td>1.50-2.74</td>
<td>2.58-2.69</td>
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<tr>
<td>Duluth, Minn</td>
<td>2.19</td>
<td>1.75</td>
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<tr>
<td>El Paso, Tex</td>
<td>2.35</td>
<td>2.35</td>
</tr>
<tr>
<td>Erie, Pa</td>
<td>2.19</td>
<td>2.00</td>
</tr>
<tr>
<td>Grand Rapids, Mich</td>
<td>2.34</td>
<td>2.15-2.34</td>
</tr>
<tr>
<td>Houston, Tex</td>
<td>2.57</td>
<td>2.51</td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>2.51</td>
<td>2.27</td>
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<tr>
<td>Jacksonville, Fla.</td>
<td>2.39</td>
<td>1.88</td>
</tr>
<tr>
<td>Kansas City, Mo</td>
<td>2.44</td>
<td>2.37</td>
</tr>
<tr>
<td>Knoxville, Tenn</td>
<td>2.32</td>
<td>2.25</td>
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<tr>
<td>Little Rock, Ark</td>
<td>2.18</td>
<td>1.59</td>
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<tr>
<td>Los Angeles, Calif.</td>
<td>2.48</td>
<td>2.47</td>
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<tr>
<td>Louisville, Ky</td>
<td>2.44</td>
<td>2.06</td>
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<tr>
<td>Manchester, N. H</td>
<td>2.08</td>
<td>1.70</td>
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<tr>
<td>Memphis, Tenn</td>
<td>2.40</td>
<td>2.05</td>
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<tr>
<td>Milwaukee, Wis</td>
<td>2.48</td>
<td>2.35</td>
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<tr>
<td>Minneapolis, Minn</td>
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<tr>
<td>Mobile, Ala</td>
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<tr>
<td>Moline, Ill</td>
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<td>1.85</td>
</tr>
<tr>
<td>Newark, N. J</td>
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</tr>
<tr>
<td>New Haven, Conn</td>
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<td>1.93</td>
</tr>
<tr>
<td>New Orleans, La</td>
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<td>2.10</td>
</tr>
<tr>
<td>New York, N. Y</td>
<td>1.88-2.73</td>
<td>2.48</td>
</tr>
<tr>
<td>Norfolk, Va</td>
<td>2.35</td>
<td>2.00</td>
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<tr>
<td>Oakland, Calif</td>
<td>2.64</td>
<td>2.63</td>
</tr>
<tr>
<td>Oklahoma City, Okla.</td>
<td>2.33</td>
<td>2.00</td>
</tr>
<tr>
<td>Omaha, Neb</td>
<td>2.25</td>
<td>2.18</td>
</tr>
<tr>
<td>Peoria, Ill</td>
<td>2.28</td>
<td>2.08</td>
</tr>
<tr>
<td>Philadelphia, Pa</td>
<td>2.40</td>
<td>2.20</td>
</tr>
</tbody>
</table>
PRINTING OCCUPATIONS

<table>
<thead>
<tr>
<th>City</th>
<th>Newspapers</th>
<th>Book and job shops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoenix, Ariz</td>
<td>$2.35</td>
<td>$2.35</td>
</tr>
<tr>
<td>Pittsburgh, Pa</td>
<td>2.53</td>
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<td>Portland, Maine</td>
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<td>Portland, Oreg</td>
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<tr>
<td>Providence, R. I.</td>
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<td>2.10</td>
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<tr>
<td>Reading, Pa</td>
<td>2.16</td>
<td>2.04</td>
</tr>
<tr>
<td>Richmond, Va</td>
<td>2.21</td>
<td>1.75</td>
</tr>
<tr>
<td>Rochester, N. Y</td>
<td>2.32</td>
<td>2.25–2.29</td>
</tr>
<tr>
<td>Rock Island, Ill</td>
<td>2.22</td>
<td>1.95</td>
</tr>
<tr>
<td>St. Louis, Mo</td>
<td>2.59</td>
<td>2.32</td>
</tr>
<tr>
<td>St. Paul, Minn</td>
<td>2.65</td>
<td>2.43–2.50</td>
</tr>
<tr>
<td>Salt Lake City, Utah</td>
<td>2.40</td>
<td>1.88</td>
</tr>
<tr>
<td>San Antonio, Tex</td>
<td>2.29</td>
<td>2.18</td>
</tr>
<tr>
<td>San Francisco, Calif</td>
<td>2.64</td>
<td>2.63</td>
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<tr>
<td>Savannah, Ga</td>
<td>2.13</td>
<td>1.70</td>
</tr>
<tr>
<td>Scranton, Pa</td>
<td>2.37</td>
<td>2.28</td>
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<tr>
<td>Seattle Wash</td>
<td>2.71</td>
<td>2.71</td>
</tr>
</tbody>
</table>

A large proportion, if not the great majority, of compositors are represented by the International Typographical Union (AFL), one of the six major unions of printing workers.

Linotype Operators

(Do. O. T. 4-44.119)

Outlook Summary

Fairly good employment prospects for skilled men during early fifties, in country as a whole, but diminishing number of training opportunities. Long-run uptrend in employment expected to continue for some time. Eventually, however, decline in number of jobs is possible, even under favorable economic conditions.

Nature of Work

In the late 1880’s, a new machine, which was to revolutionize the composing room and the printing industries generally, came into use. This machine, the now famous linotype, sets type very much more rapidly than is possible by hand (as does the Intertype, a similar machine invented some years later). Reading from copy clipped to the machine’s copyboard, the linotype or Intertype operator selects the letters and other characters to be printed by operating a keyboard which has about 90 keys. After he completes each line, he works a lever, and the machine then casts the lines of type automatically in solid strips known as slugs.

Other duties performed by the operator include removing type from the machine, putting new “pigs” (blocks) of type metal into the melting pot, and making adjustments. In shops having a considerable number of linotype machines, however, a machinist is usually employed who makes all but the minor adjustments directly connected with machine operation.

As linotype and Intertype machines came into wider use, the number of operators needed increased. They have made up the second largest group of composing-room workers for many years, exceeded in number only by hand compositors.

In 1940, an estimated 60,000 persons were employed as linotypists and the number is now considerably greater. The largest groups of such workers are in newspaper and job shops, but they are also employed in book and periodical houses and in service shops doing machine typesetting for printing firms. Some linotype operators have their own service shops.

Training and Qualifications

Like hand compositors and typesetters, linotype operators are skilled journeymen. The apprenticeship requirements are usually the same as for hand compositors, except that in the last 6 months of training the linotypist apprentice receives specialized training in machine work.
Qualifications needed by apprentices are much the same for machine as for hand typesetting. For machine work, however, artistic ability is less important than it is for hand work. Machine work, on the other hand, calls for much more mechanical skill than does hand work, as the duties of the different classes of workers involved suggest.

Outlook

The employment outlook for experienced linotype (and intertype) operators during the early fifties is fairly good in the country as a whole. There will also be some training opportunities, although not as many as during the first year or two after World War II when several thousand newcomers were taken on for training (total of hand and machine programs). Because of the large number of young men who will be going into the Armed Forces, the number of job seekers will be somewhat smaller. Top-skilled men, with experience in hand as well as machine composition, and with supervisory and managerial abilities, will find some immediate openings in salaried positions or will have good chances for advancement to such jobs. Some ex-servicemen and others wishing to go into business for themselves may find favorable opportunities to do so; those with good all-round civilian experience will have the best chances of success.

The long-range outlook, too, is reasonably favorable—more so than for hand compositors, for example. Employment has tended to rise over the years and should continue to do so for some time. Eventually, however, technological and other factors may lead to a stable or even a declining trend in employment. On the other hand, printing is less affected by declines in general business activity than many other manufacturing industries.

Earnings and Unionization

Linotype operators tend to have much the same rates of pay as hand compositors. (See p. 311.) A large proportion, if not the great majority, of linotypists are represented by the International Typographical Union (AFL).

Monotype Keyboard Operators

(D. O. T. 4-44.120)

Outlook Summary

Enough jobs likely for all qualified journeymen in this small occupation during the early fifties; also a limited number of openings for apprentices. Long-range trend of employment upward.

Nature of Work

An important step forward in typesetting was the invention of the monotype keyboard and monotype casting machines. In contrast to the solid lines cast in linotyping, these later machines make possible the automatic casting of individual letters and other type characters, and also the automatic assembling of type into the long shallow trays, known as galleys (see p. 309). Monotyping thus retains some of the flexibility of hand composition, while offering advantages of machine operation.
The monotype keyboard is similar to a type-writer keyboard, but has some 200 keys. Unlike the linotype, which does the whole typesetting job, the monotype keyboard machine only perforates a narrow roll of paper for use later in a separate casting machine.

The workers who operate the keyboard and make the many different adjustments needed are called monotype keyboard operators (sometimes simply monotype operators.) They are a small occupational group with only about 6,000 employed in 1940. The number in mid-1950 was probably no more than half again as great. Most monotypists work for book or periodical houses; some few, for job and service shops.

In general, qualifications for employment are the same as for linotype operators.

**Outlook**

In few, if any, parts of the country where monotype operators are employed will qualified journeymen have any difficulty finding jobs within the 1950 decade—especially if general business conditions remain favorable. In addition, employers will have an increasing number of openings for apprentices as the number of craftsmen grows. The actual number of training opportunities will not be large, however, because total employment in the occupation will remain small.

The long-range trend in employment in the field is upward. Men already in the trade and those who enter it in the near future should have a good chance of holding their jobs indefinitely. Those who are adept in hand composition and in linotyping as well as in monotype keyboard operation are likely to have the greatest job security.

Big printing centers will generally offer the most job openings, but also the keenest competition for employment. In the long run, more and more jobs are likely to be found in smaller cities, to which book and job plants have been moving gradually over the years.

**Earnings and Unionization**

Wage rates for monotype keyboard operators are generally the same as for linotype operators and hand compositors in book and job shops. (See table p. 310).

A large proportion, if not the great majority, of monotype keyboard operators are represented by the International Typographical Union (AFL).

### Monotype Caster Operators

(D. O. T. 6-49.310)

**Outlook Summary**

Limited number of openings for new workers in this small occupation during early fifties. Long-range employment trend upward.

**Nature of Work**

Workers in this occupation operate the monotype casting machines, referred to in the statement on Monotype Keyboard Operators, p. 312. These machines cast and assemble type automatically, guided by the perforations in the rolls of paper prepared by the monotype keyboard operators. Caster operators not only adjust and tend the machines but usually are required to know the mechanism in order to make repairs. In shops having several casting machines, the operator may supervise unskilled workers who tend the machines.

Taking the printing industry as a whole, only one caster operator has been employed to every two or three keyboard operators, as of early 1950. The occupation is, therefore, very small, employing only about 2,000 workers in 1940 and probably not more than three or four thousand in 1949. The types of plants using caster operators are the same as for keyboard operators—chiefly book and periodical houses and, to some extent, job and service shops.

**Qualifications for Employment**

Most newcomers to this occupation learn to operate the machine at a monotype school. Training is then completed on the job. This experience is especially needed for the more skilled and better paying jobs in the occupation, which require an understanding of the mechanism of the caster and the ability to make adjustments and repairs. Persons entering the occupation should be physically strong and in good health.
Outlook

There will be more openings for newcomers during the early fifties than there were in the late thirties—but only a limited number at best, since the occupation will remain small. As the number of monotype keyboard machines in use increases, job prospects for trainee monotype caster operators will become more favorable.

Total employment is likely to increase steadily, although only slightly, over the long run. The rise will be, however, at a faster rate than in monotype keyboard operation. Under fairly normal general business conditions, experienced workers should have little difficulty in obtaining jobs, with good chances for continued employment for many years.

Earnings and Unionization

Most monotype-caster operators have about the same wage rates as linotypists, monotype-keyboard operators, and composing room craftsmen outside the newspaper industry. (See table, p. 310.) However, caster operators without responsibility for adjustments or repairs earn less.

Proofreaders

(D. O. T. 1-10.67)

Outlook Summary

Number of jobs in the early fifties will remain about the same as in 1949. Slight increase in employment over the longer run. Most proofreading jobs go to persons already employed in printing industries.

Nature of Work

These workers guard against error in the final printed product. For this purpose, it is customary to make proofs of type set-ups and read these carefully against the original copy. In small shops, journeymen typesetters and advanced apprentices may do the proofreading. In most large plants, however, particularly in the newspaper, book, and periodical industries, there are special proofreaders.

The work is done in one of two ways. Either the proofreader puts the proof and the copy side by side and reads one against the other, a line at a time, or he has the material read to him by a copy holder while he follows the proof. Where there are errors, he notes the corrections needed, using standard proofreaders' marks.

Qualifications for Employment

Workers usually enter the occupation from another composing-room job or a front-office job with the same company. Skilled compositors and composing-machine operators who are no longer able to do typesetting at the speeds required may take positions as proofreaders. Those who do so, keep their journeyman status, at least in union shops.

A knowledge of grammar, spelling, and punctuation is very important to help the proofreader find and correct errors. The work requires good eyesight and good hearing.
Employment of proofreaders in the early fifties will remain at about the 1949 level. Altogether, about 5,000 proofreaders were employed in 1940, including a good many women. The number employed in mid-1950 is estimated to have been about 20 or 25 percent greater. Most of the job openings arising from turnover will be filled by workers already employed in the printing industries. There will also be a few openings for men and women with some outside experience related to proofreading. Persons completely new to the field will usually have little, if any, chance for jobs.

The long-range trend in employment will probably continue to be upward. Those already in the occupation in early 1950 and those who enter it soon thereafter should have a good chance of holding their positions indefinitely.

Wage rates for proofreaders in union shops are generally the same as for hand compositors (see p. 310). Nonunion shops are likely to pay less, particularly to women. Some union contracts provide lower scales for proofreaders who have never qualified as hand compositors.

Electrotypers and Stereotypers

(D. O. T. 4–45.010 and .210)

A limited number of openings for apprentices in the early fifties. Long-range trend slowly upward.

Nature of Work

From the composing room, type forms often go to the electrotyping or stereotyping department (or to an independent service shop doing such work for printing firms). Electrotyping and stereotyping are two different processes, having the same purpose—making duplicate press plates from the type forms. One reason why it may be necessary to use such plates, instead of printing directly from the forms, is that a number of plates made exactly the same may be needed (any number can be turned out by either electrotyping or stereotyping).

When a large edition of a book or magazine is printed, several plates must be used one after the other to prevent the printing surfaces from becoming too worn to make clear impressions. By means of duplicate plates, printers can also use several presses on the same job, at the same time, and thus finish a big run quickly. This is especially important in publishing daily newspapers, since a plant may have to rush many thousands of papers onto the streets with news that is no more than an hour or two old. Furthermore, the rotary presses used in many big plants require curved plates (which can be made by either process), and type forms are always flat.

The usual first step in both processes is the making of a mold of the type form. In electrotyping, wax and plastic molds are the most common, although lead or some other metal is also used. To make a wax or plastic mold, the electrotyper lays the type form on the bed of a power molding press,
and covers it with a wax-coated sheet of metal or with a sheet of plastic. He then applies the pressure and obtains an impression of the type form in the wax or plastic.

To produce a final metal plate ready for use in the pressroom, a metallic shell must be deposited on the mold, stripped from it, backed with metal, and carefully finished and mounted. First the electrotyper makes the wax or plastic mold electro-conductive, by coating it with copper sulphate or nickel solution (in the case of a wax mold) or a thin film of metallic silver (in the case of a plastic mold). The mold is then suspended in an appropriate electrolytic solution, which is used to obtain a metallic shell deposit on the coated mold. Stripping, backing, finishing, and mounting follow in order.

The stereotyping process is much simpler, quicker, and less expensive than electrotyping, but it does not yield as fine a plate. Stereotypers make molds of papier mâché (a strong material composed of paper pulp) instead of wax or lead. This work involves placing a damp papier mâché pad (in newspaper printing, usually a dry mat) on top of the type form and running both through a rolling machine. After the paper mold has been dried, it is used in casting a composition-lead plate, which needs only trimming to be ready for the pressroom.

Journeymen electrotypers and stereotypers must know how to handle all the tasks involved in their respective processes, although in practice they are often assigned to only one phase of the work.

Electrotypers work mainly in large book and periodical plants, while stereotypers are principally employed in newspaper plants or in shops servicing newspaper publishers.

Qualifications

To qualify for either type of work, a 5- or 6-year apprenticeship is usually required. Training is quite different for each trade; rarely do journeymen change from one occupation to the other.

Young men who wish to become electrotyper or stereotyper apprentices need about the same educational qualifications as are required for all printing trades. In addition, mechanical training and courses in chemistry and metallurgy are useful.

In workrooms where electrotyping or stereotyping is done, there are frequently fumes and dust, and the temperature and humidity are often extremely high. Moreover, the work involves lifting of very heavy plates and type forms. Persons entering the occupations should be sufficiently strong and healthy to work under these conditions, although they are being increasingly mitigated in large part through scientific air-conditioning, mechanical conveyors, and other means.

Outlook

Although not much, if any, increase in employment is expected during the early fifties, journeymen electrotypers and stereotypers will generally find it fairly easy to get jobs. Under collective bargaining agreements, of the type which have been in effect for many years, a limited number of training opportunities for newcomers may be expected in this period—fewer than during the first year or two after World War II. Some men with all-round experience and managerial abilities will be able to go into business for themselves, with fair chances of success. But these are small occupations, employing in mid-1950 roughly 10,000 journeymen and probably 1,000 or so apprentices. The total number of job openings resulting from the need to replace workers who die or who retire or leave the occupation for other reasons, will therefore average no more than a few hundred each year.

The long-range trend in employment has been and is likely to continue to be slowly upward in these occupations. Men already in the trades in mid-1950 or about to complete their training have a good chance of holding their jobs indefinitely.

Earnings and Unionization

Wage rates for electrotypers tend to be higher than those for any other printing trade, except photoengravers. Those for stereotypers are frequently lower than for electrotypers.

The average union wage scale for electrotypers in effect on July 1, 1950, was about $2.70 an hour in the principal cities in which they are employed in book and job printing. Rates ranged from $1.88 an hour in Syracuse, N. Y., to almost $3.00 an hour in New York City, and Newark, N. J.
Almost half the city scales were $2.35 an hour and up. The highest scales were found principally in cities with heavy concentrations of electrotypers. The bulk of the men covered were earning upward of $2.70 an hour.

Newspaper stereotyper rates ranged from $1.99 an hour, in Duluth, Minn., to $2.81 an hour in Chicago, Ill. Their average rate of about $2.52 was 17 cents an hour less than that for electrotypers in book and job work, but probably also much less than that for the smaller number of stereotypers in book and job work. Over half the newspaper stereotypers were on pay scales ranging from $2.30 to $2.55 an hour.

The minimum union wage scales for electrotypers and stereotypers as of July 1, 1950, for most of the important printing centers are shown in the following tabulation.

<table>
<thead>
<tr>
<th>City, State</th>
<th>Sterotypers (Newspapers)</th>
<th>Electrotypers (Book and job)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga</td>
<td>$2.45</td>
<td>$2.45</td>
</tr>
<tr>
<td>Baltimore, Md</td>
<td>2.32</td>
<td>2.09</td>
</tr>
<tr>
<td>Birmingham, Ala</td>
<td>2.25</td>
<td>2.44</td>
</tr>
<tr>
<td>Boston, Mass</td>
<td>2.58</td>
<td>2.30</td>
</tr>
<tr>
<td>Buffalo, N. Y</td>
<td>2.37</td>
<td>2.20</td>
</tr>
<tr>
<td>Butte, Mont</td>
<td>2.38</td>
<td>2.69</td>
</tr>
<tr>
<td>Charleston, W. Va</td>
<td>2.13</td>
<td>2.76</td>
</tr>
<tr>
<td>Charlotte, N. C</td>
<td>2.10</td>
<td>2.76</td>
</tr>
<tr>
<td>Chattanooga, Tenn</td>
<td>2.29</td>
<td>2.76</td>
</tr>
<tr>
<td>Chicago, Ill</td>
<td>2.53–2.81</td>
<td>2.94</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>2.48</td>
<td>2.38</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>2.44</td>
<td>2.60</td>
</tr>
<tr>
<td>Columbus, Ohio</td>
<td>2.41</td>
<td>2.35</td>
</tr>
<tr>
<td>Dallas, Tex</td>
<td>2.45</td>
<td>2.44</td>
</tr>
<tr>
<td>Davenport, Iowa</td>
<td>2.14</td>
<td>1.96</td>
</tr>
<tr>
<td>Dayton, Ohio</td>
<td>2.34</td>
<td>2.39</td>
</tr>
<tr>
<td>Denver, Colo</td>
<td>2.36</td>
<td>2.32</td>
</tr>
<tr>
<td>Des Moines, Iowa</td>
<td>2.39</td>
<td>2.40</td>
</tr>
<tr>
<td>Detroit, Mich</td>
<td>2.65</td>
<td>2.83</td>
</tr>
<tr>
<td>Duluth, Minn</td>
<td>1.99</td>
<td>2.76</td>
</tr>
<tr>
<td>El Paso, Tex</td>
<td>2.18</td>
<td>2.76</td>
</tr>
<tr>
<td>Erie, Pa</td>
<td>2.11</td>
<td>2.76</td>
</tr>
<tr>
<td>Grand Rapids, Mich</td>
<td>2.34</td>
<td>2.40</td>
</tr>
<tr>
<td>Houston, Tex</td>
<td>2.31</td>
<td>2.44</td>
</tr>
<tr>
<td>Indianapolis, Ind</td>
<td>2.49</td>
<td>2.38</td>
</tr>
<tr>
<td>Jacksonville, Fla</td>
<td>2.39</td>
<td>2.37</td>
</tr>
<tr>
<td>Kansas City, Mo</td>
<td>2.37</td>
<td>2.37</td>
</tr>
<tr>
<td>Knoxville, Tenn</td>
<td>2.29</td>
<td>2.29</td>
</tr>
<tr>
<td>Little Rock, Ark</td>
<td>2.18</td>
<td>2.29</td>
</tr>
</tbody>
</table>

1 Excludes Government Printing Office.

In both occupations, the proportion of workers organized—by the International Stereotypers' and Electrotypers' Union (AFL)—is extremely high. This is one of the six major unions of printing workers.
Photoengravers
(D. O. T. 4-47.100)

Outlook Summary

The very few employment opportunities for newcomers expected each year will result largely from replacement needs. Long-run trend in employment has been very slowly upward, but may level off in the early fifties, or possibly decline slightly.

Nature of Work

Photoengravers enter into the printing process when copy to be reproduced by letterpress includes pictures or designs. The photoengraving department supplies the composing room with any needed plates of illustrations and other material that cannot be set up in type. On these plates, the printing surfaces stand out in relief above the nonprinting spaces, as do the letters on the accompanying type.

Photoengravers are skilled journeymen, able to handle all the operations involved in the process. The entire job of producing a plate (photoengraving) may be done by one man, or the work may be divided among a number of photoengravers and the men then referred to as photographers, printers, etchers, finishers, routers, blockers, or provers, depending on the particular phase of work handled. The latter arrangement is frequently found in large shops; it is the method more commonly used.

A cameraman starts the process by photographing the material to be reproduced (using the necessary screens or color filters) and developing the negative. Making a print from the negative on a metal plate coated with sensitized solution is the job of a printer. A coating placed over the image areas of the plate hardens by exposure to light during the printing process or as a result of further chemical treatment and protects these areas against the acid into which the plate is put by an etcher, whose job is to "cut" away the background areas by means of this acid, leaving the image standing out in relief. After that, a few more operations remain—including finishing (careful inspection and touching up with hand tools), routing (cutting away metal from the nonprinting parts of the plate to prevent them from touching the inking roller during printing), blocking (mounting the engraving on a wooden block to make it the right height), and proving (printing a sample copy on a proof press).

Upwards of eleven or twelve thousand men were engaged as journeymen photoengravers in early 1950. They are most numerous in service shops where the main business is making photoengravings for use by others; many craftsmen have their own shops. Newspaper plants, book and periodical houses, the United States Government Printing Office, and the United States Bureau of Engraving and Printing also employ, together, a considerable number of such photoengravers.

Qualifications for Employment

A 6-year apprenticeship is generally required to become a journeyman. The training covers all phases of the process and includes 864 hours of classroom instruction. At least some of the skills acquired are readily adaptable to one or two phases of the lithographic process (see p. 325). In early 1950, the bulk of apprentices were registered with the union only, this figure then being close to 3,000. Since photoengravers' duties involve constant

Photoengraver (router) cutting away metal from nonprinting areas of a plate.

Photograph by U. S. Department of Labor
close work, good eyesight is essential in this occupation. Because of the work with acids and other chemicals which give off fumes, the occupation is not a good one for people with respiratory disabilities. Many employers require physical examinations for prospective photoengravers, testing both eyes and lungs. Courses which photoengravers will find helpful in addition to those indicated as desirable for all printing workers (see p. 305) include chemistry and metallurgy.

**Earnings and Unionization**

Photoengravers are among the highest paid printing craftsmen. In both book and job and newspaper work the average minimum union wage scale in the 77 cities covered was $2.84 an hour on July 1, 1950. The top rates in each case were ($3.14 and $2.92 respectively). The lowest scale was $2.13 for book and job photoengravers. Over half the photoengravers earned more than $2.70 an hour.

Union minimum wage scales for photoengravers as of July 1, 1950 in most of the important printing centers, are shown in the following tabulation:

<table>
<thead>
<tr>
<th>City, State</th>
<th>Newspapers</th>
<th>Book and job shops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga</td>
<td>$2.61</td>
<td>$2.56</td>
</tr>
<tr>
<td>Baltimore, Md.</td>
<td>2.68</td>
<td>2.45–2.67</td>
</tr>
<tr>
<td>Birmingham, Ala.</td>
<td>2.45</td>
<td>2.45</td>
</tr>
<tr>
<td>Boston, Mass</td>
<td>2.70</td>
<td>2.45</td>
</tr>
<tr>
<td>Buffalo, N. Y.</td>
<td>2.73</td>
<td>2.47</td>
</tr>
<tr>
<td>Charlotte, N. C</td>
<td>2.37</td>
<td></td>
</tr>
<tr>
<td>Chattanooga, Tenn</td>
<td>2.13</td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>2.92</td>
<td>3.00–3.06</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>2.75</td>
<td>2.53</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>2.76–2.81</td>
<td>2.67–2.86</td>
</tr>
<tr>
<td>Columbus, Ohio</td>
<td>2.84</td>
<td>2.31–2.53</td>
</tr>
<tr>
<td>Dallas, Tex.</td>
<td></td>
<td>2.25</td>
</tr>
<tr>
<td>Davenport, Iowa</td>
<td></td>
<td>2.18</td>
</tr>
<tr>
<td>Dayton, Ohio</td>
<td>2.48</td>
<td>2.53</td>
</tr>
<tr>
<td>Denver, Colo.</td>
<td>2.57</td>
<td>2.35</td>
</tr>
<tr>
<td>Des Moines, Iowa</td>
<td>2.48</td>
<td>2.48</td>
</tr>
<tr>
<td>Detroit, Mich.</td>
<td>2.75–2.89</td>
<td>2.67–2.80</td>
</tr>
<tr>
<td>Duluth, Minn.</td>
<td>2.32</td>
<td>2.13</td>
</tr>
<tr>
<td>Grand Rapids, Mich</td>
<td>2.67</td>
<td></td>
</tr>
<tr>
<td>Houston, Tex.</td>
<td>2.59</td>
<td>2.58</td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>2.65</td>
<td>2.53</td>
</tr>
<tr>
<td>Jacksonville, Fla.</td>
<td>2.39</td>
<td>2.20</td>
</tr>
<tr>
<td>Kansas City, Mo.</td>
<td>2.68</td>
<td>2.40</td>
</tr>
<tr>
<td>Knoxville, Tenn.</td>
<td>2.13</td>
<td>2.20</td>
</tr>
<tr>
<td>Los Angeles, Calif</td>
<td>2.64</td>
<td>2.67</td>
</tr>
<tr>
<td>Louisville, Ky.</td>
<td>2.65</td>
<td>2.15–2.53</td>
</tr>
<tr>
<td>Manchester, N. H</td>
<td></td>
<td>2.40</td>
</tr>
<tr>
<td>Memphis, Tenn.</td>
<td>2.60</td>
<td>2.44</td>
</tr>
</tbody>
</table>


Photoengravers are almost completely organized by the International Photo-Engravers' Union of North America (AFL), one of the six major unions of printing workers.

**Outlook**

Employment of photoengravers rose substantially during 1945, 1946, and 1947, but leveled off in 1948 and 1949. In the next several years and also over the longer run, replacement needs rather than expansion will provide the bulk of job openings.

In 1939, journeymen photoengravers numbered about 10,000, but many were unemployed. There was, on the average, 1 apprentice to every 10 or
12 employed craftsmen, the ratio varying from area to area and from shop to shop; some shops offered no training opportunities of any kind.

During World War II, a shortage of skilled workers, trainees, and trainee replacements developed, primarily because of workers going into the Armed Forces and transferring to war industries. In the immediate postwar years, employers, in order to make up for the labor shortage, meet normal replacement needs, and handle the increasing demand for photoengraving, hired virtually all qualified journeymen who were available and took on many more trainees than usual. Generally, it was still not difficult for craftsmen to obtain jobs during 1948 and 1949, although apprenticeship opportunities in particular had become considerably fewer than in the immediate postwar period.

In the early fifties and thereafter, the number of openings for trainees is not likely to exceed two or three hundred in any one year. Some very few persons may find favorable opportunities to go into business for themselves; generally, those with good all-round experience in the field will have the best chances of success. The over-all outlook appears to be for fairly stable employment during the fifties although the number of jobs may possibly decline slightly.

Rotogravure Photoengravers

(D. O. T. 4-47.100)

Outlook Summary

Expanding field, but likely to remain small for many years. As a result, there will be at most only a few job opportunities for trainees each year.

Nature of Work

Rotogravure photoengravers, like photoengravers (p. 318) and lithographic process workers (p. 325), make plates for use in reproducing pictures, but these are gravure plates with the image etched below the surface. The printing has to be done on special rotogravure presses, and often the entire process, from preparation of the plates through printing, is carried out in separate plants specializing in this kind of work.

Rotogravure photoengravers are a very highly skilled group. Like regular photoengravers, they are required to know all phases of the photoengraving process, more particularly, the rotogravure process, although they usually specialize in one of them. The operations which they handle are much like those involved in photoengraving, except that a positive (instead of a negative) is used in making the plate, and it is the image (rather than the background) areas which are etched away.

A few large newspaper and commercial plants have departments which reproduce pictures by this method. However, rotogravure men are employed mainly in independent rotogravure plants. Most of them work for a small number (perhaps a dozen or so) big firms which handle a large proportion of all rotogravure work.

Qualifications for Employment

It is possible to enter the occupation either by a 6-year apprenticeship in a rotogravure shop or by transferring from photoengraving. Photoengravers are usually required to complete a probationary training period before being classified as skilled rotogravure men. The qualifications needed by apprentices are the same for rotogravure work as for photoengraving. A number of the nearly 3,000 young people reported to be in training under registered “photoengraving” apprenticeship programs in early 1950 are actually preparing for rotogravure jobs. (See p. 318).

Rotogravure is a relatively new process, which was being used increasingly before World War II and has made rapid gains since the war's end. In the entire country, however, there were fewer than 2,000 journeymen employed in rotogravure work in mid-1950. Young men seeking apprenticeship opportunities have always had difficulty breaking into rotogravure photoengraving.

During World War II, the amount of rotogravure printing was somewhat reduced, and a large proportion of the journeymen and apprentices either went into the armed services or transferred to photoengraving. However, the postwar return to prewar output of rotogravure was rapid. The prewar level of activity was soon surpassed, and
expansion has continued steadily through early 1950, especially in the magazine publishing field. But the need for additional personnel and replacements since the war’s end has been met in large part by the return of craftsmen to the trade and the transfer of letterpress photoengravers to rotogravure. Since the occupation is expected to go on expanding for an indefinite period, there should be increasing opportunities for newcomers in the years ahead, although only a small number of openings in any one year.

**Earnings and Unionization**

Rotogravure men are among the best paid printing craftsmen. Generally, their wage scales are above even the comparatively high rates for photoengravers doing letterpress work. Rates shown for photoengravers in the table on page 319 include those for rotogravure photoengravers.

Rotogravure photoengravers, like regular photoengravers, are practically all represented by the International Photo-Engravers’ Union (AFL).

### Printing Pressmen and Assistants (Letterpress and Gravure)

(D. O. T. 4-48.010; .020, .030, and .060; 6-49.410, .420, and .430)

**Outlook Summary**

Fairly strong demand for journeymen pressmen in early fifties. Opportunities more limited for apprentices and press assistants during this period. Long-range outlook also generally favorable for pressmen, but probably not for assistants.

**Nature of Work**

Type forms from composing rooms, press plates from electrotyping and stereotyping departments, and rotogravure and lithographic plates all go to a pressroom for use in printing. In small shops, this department may consist of only one or two small presses in a back room or a corner of the shop. In big plants, however, pressrooms are large. Many workers and, frequently, huge presses are employed. These machines may be so heavy and create so much vibration that the department has to be located on the ground floor or in the basement.

Pressmen. (D. O. T. 48.010, .020, .303 and .060). Skilled pressmen are the key workers in the department. Their basic duties are to “make-ready” and then tend the presses while in operation. The object of the make-ready, which is one of the most delicate and difficult parts of the work, is to insure printing impressions that are distinct and even, and neither too dark nor too light. This is accomplished by such means as placing pieces of paper of exactly the right thickness underneath low areas of the press plate or type form to level it, and attaching pieces of tissue paper to the surface of the cylinder or flat platen which makes the impression. Pressmen also have to make many other adjustments—for example, those controlling margins and the flow of ink to the inking roller. In some shops, they are responsible not only for tending the presses but also for oiling and cleaning them and making at least minor repairs. In many cases they have assistants whose work they supervise.

Pressmen’s work may vary greatly from one type of shop to another, because of differences in the kinds and sizes of presses used and for other reasons. Small commercial shops, many of which are owned and run by pressmen themselves in partnership with compositors, generally have small and relatively simple platen (or job) presses that are often fed paper by hand.

At the other extreme are the big newspaper plants with their tremendous web-rotary presses. These giant presses are fed paper in big rolls (or webs). They print the paper on both sides by means of a series of cylinders; cut the pages and assemble and fold them; and, finally, count the finished newspaper sections which emerge from the press ready for the mailing room. These steps are accomplished automatically by means of many different mechanisms, each of which calls for repeated attention while a run is being made. Presses of the kind described above are therefore operated by crews of journeymen and less-skilled workers directed by a pressman-in-charge.

Other types of presses on which men specialize are those used in offset printing (see p. 325), and the rotogravure press, a rotary press with a “doctor” blade which scrapes the surplus ink off the surface of the plate.
Press Assistants. (D. O. T. 6-49.410, 420, and 430). The duties of press assistants range from merely feeding sheets of paper into hand-fed presses to helping pressmen make ready and operate large and complicated rotary presses. Workers whose main responsibility is feeding are often referred to simply as feeders.

Helping in web-rotary work in newspaper plants are men commonly known as flyboys. They pick up the newspapers as they come off the press and load them onto hand trucks; they also wheel the trucks out of the pressroom and do other work.

The ratio of assistants to pressmen varies greatly from one establishment to another, depending on size of the plant, type of press used, and other factors. Many shops are too small to have any pressroom helpers.

Qualifications

To become a skilled pressman requires 3 to 5 years of apprenticeship in most instances; in newspaper work, almost always 5 years. Usually, men receive training in only one type of press, and opinion differs as to how readily journeymen can become skilled on other types of presses. The length of the apprenticeship and the content of the training depend largely on the kind of press involved.

Individual companies choose apprentices generally from among press assistants and others already employed in the company. Thus, an apprentice often has worked for 2 or 3 years in the pressroom before starting the 3- to 5-year training period leading to journeymen status. To be se-
lected for training, one must have completed at least the eighth grade in school; some employers require high-school graduation. Since pressmen often have to blend their own inks, a knowledge of color is necessary. Art courses are therefore very helpful.

Physical strength and endurance are necessary for work on some kinds of presses, where the pressman has to lift heavy type forms and press plates and be on his feet all day. Mechanical aptitude is also important in making press adjustments and repairs.

**Outlook**

**Pressmen.** During the early fifties, employment is not likely to change much from the 1948-49 levels. Vacancies arising as a result of deaths, retirements, promotions, and other causes will average around a thousand each year, providing apprenticeship openings for many nonjourneymen already employed in pressrooms or other departments of printing firms and even some outsiders. In mid-1950, there were more than 5,000 pressmen apprentices and about 40,000 journeymen. Pressmen made up the third largest group of printing craftsmen in 1940, and probably still held this position 10 years later.

Over the long run, a gradual growth of employment can be expected, although technological developments may limit this expansion. The effect of technical and other changes which tend to reduce labor requirements is likely to be at least partially offset by increasing demands for printing and the continued shortening of the workweek.

**Press Assistants.** With an average of one helper to about every three journeymen, no more than a few hundred newcomers may expect to find employment during any one year of the early fifties or the years immediately following. Before World War II, the printing industries tended not to fill all of the vacancies created through normal losses of assistants. A resumption of this practice is likely and perhaps has already started. Declining employment may once more mark the occupation, at least as a long-run tendency. But lay-offs of journeymen will occur only in exceptional circumstances.

**Earnings and Unionization**

Wage rates of pressmen vary with the make and style of press operated, as well as with the type of printing plant and other factors. They tend to be the highest in the newspaper industry (see following tabulation).

A range of $1.10 to about $3 an hour for day work is indicated for the four skilled groups covered by the Bureau of Labor Statistics taken together: Newspaper pressmen-in-charge and journeymen pressmen and book and job cylinder pressmen and platen pressmen. (In the Bureau of Labor Statistics data, the so-called “cylinder pressmen” group includes also other non-platen pressmen.) Hourly rates for book and job press assistants and feeders ranged from about 90 cents in Portland, Maine, to approximately $2.55 for some workers in Chicago.

The Bureau of Labor Statistics survey of union wage scales in 77 cities as of July 1, 1950 showed that the average hourly rate for newspaper pressmen-in-charge was $2.74; for newspaper journeymen, $2.55; for book and job cylinder pressmen, $2.40; for book and job platen pressmen, $2.12; for book and job press assistants and feeders, $1.94.

The July 1950 minimum union hourly wage scales (day work) for most of the important printing centers in the selected pressroom occupations listed are shown in the following table.

Pressroom workers are usually covered by union agreements. Practically all the letterpress and rotogravure pressmen and assistants who are organized belong to the International Printing Pressmen’s and Assistants’ Union of North America (AFL).
OCCUPATIONAL OUTLOOK HANDBOOK

Table

1 .— Union

wage scales in important printing centers in selected pressroom occupations, July 1, 1950

Book and job shops

Newspapers

Journeymen press­ Pressmen-in-charge Cylinder pressmen Platen pressmen
men
Atlanta, Ga____________________________________
Baltimore, Md_______ __________________________
Birmingham, Ala_____ _ _______________ _
Boston, Mass___ ^______________________________
Buffalo, N. Y ___________________________________________
Butte, Mont __________________________________
Charleston, W. Va _ _ _ _ _ _ _ _ _ _
___
Chattanooga, Tenn___ ________________ _
__
Chicago, III____ _________ _________________ __
Cincinnati, Ohio ____________ ______________
Cleveland, Ohio_________________ __ __________
Dallas, Tex_________________________________ ___
Davenport, Iowa________________________________
Dayton, Ohio __________________ ____ ________
Denver, Colo__. ________________________________
Des Moines, Iowa. __ _ _ _ _ ____________ _ ___
Detroit, Mich.. __ _ ___________ ____ _ __
Duluth, Minn.. ___ _______________ ______ _ __ _
El Paso, Tex _ _
_
Erie, Pa
____
Grand Rapids, Mich___ ______ ____ _________ __
Houston, Tex
___ _ _ ___ ____________________
Indianapolis, Ind. _________ _ _ _ _ _________ __
Jacksonville, Fla _____________ ________________
Kansas City, Mo__________ __ _________________
Knoxville, Term _____ __ __ _________ _________ _
Little Rock, Ark________ ______________________
Los Angeles, Calif____ _ _ ______ _ __________
Louisville, Ky__________________________ ______
Manchester, N. H _ _ _________
__ ____ .
Memphis, Tenn ___ _ _____ ___ _ __ _ ___ ______
Miami, Fla ._ ____________________ _________ _ _
Milwaukee, Wis__ ____________ _ _______ _ _
Minneapolis, Minn________ __________________ __
Mobile, Ala________ ______ ___ _ _____________
Moline, 111_________ ________ _ __ _____________
Newark, N. J___________________________________
New Haven, Conn________ _ _________________
New Orleans, La______________ ________________
New York, N. Y ___________________ ____________
Norfolk, Va _________________________________
Oakland, Calif __________ ___ ___ _ ______
Oklahoma City, Okla ____ _ _ _ ________ _ _ _ _
Omaha, Nebr_ __ ________ ______________ ______
Peoria, 111__ _ __ ______ __ __________ _____
Philadelphia, Pa _ _ ______ __________________
Phoenix, Ariz__ ____ ________ __________ ____
Pittsburgh, Pa__________________________________
Portland, Maine. _________ . __ _ _ _ _ _ ___
Portland, Oreg ________ __________ __ _ ___
Providence, R. I___ ______ _ _ ________ _ _ _ _ .
Reading, P a____ _ ___ _ __ _ _ _ _____________ _
Richmond, Va_____ ___ _ _ _ _ _ _ . ___ _ ______
Rochester, N. Y___________________ ____________
_____ _________
Rock Island, 111.___
St. Louis, Mo___ __________________ _ _ ___ _
St. Paul, Minn_________________________________
Salt Lake City, Utah... _________ _ _ ... _ ___ _ _
San Antonio, Tex__ __________________________
San Francisco, Calif___ _________________________
Savannah, Ga______ _ _ _ _ _ _ _ ____ . _ ___
Scranton, Pa_________ ________ ________ ___
Seattle, Wash __________________________________
South Bend, Ind__ _ _________ _ _______ ____
Spokane, Wash_____ __________________________
Springfield, Mass ____ _ ____ _______________
Syracuse, N. Y_________________________________
Toledo, Ohio___________________________________
Washington, D. C_______________________________
Wichita, Kans.. ____ - - - - - - ____ __ ___ ___ _
Worcester, Mass__ _____________________________
York, Pa
___
_ _ _ __
__
Youngstown, Ohio. ____________________________
1 Pressmen, first, $1.88 ; pressmen, second, $1.81.
2 Excludes Government P r in tin g Office.

324
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Federal Reserve Bank of St. Louis

$2. 45
2. 52-2. 59
2. 25
2.33-2. 45
2.37-2. 57
2.36
2.05
2.10
2.29
2.41-2. 67
2.46
2.42-2. 78
2.40
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2.14
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2.36-2. 43
2. 37
2. 52-2. 59
2. 07
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2. 62
2.40-2. 50
2. 52
2.19
2.14
2. 48
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2.15
2.61-2. 76
2. 28
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2. 41
2.18
2.28
2.27-2. 47
2. 35
2. 34
2.00
2. 42
2. 36
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2.16
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2. 41
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2.21
2.38-2. 47
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$2. 67
2. 52
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2. 51-2. 64
2. 57
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2. 59-2. 72
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2. 66-2. 78
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2.30
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2.49
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2. 72-2. 79
2. 21
2. 24
2. 32
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2. 68
2. 27
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2.60
2. 72
2.46
2. 30
2. 68
2. 23
2. 30
2. 78-3. 01
2. 55
2. 78
2. 33
2. 41
2.47-2.70
2. 54
2. 62
2. 49
2. 29
2.41
2. 55
2. 36
2. 59
2. 64
2. 36
2. 47
2. 78
2. 48
2. 51
2. 67
2.67
2.38
2. 45-2. 75
2. 62
2.04
2. 26

$2.38-2. 44
1.86-2.09
2.08-2.30
2.07-2. 24
2. 23-2. 47
2.31
2.15
2.00
2.13
2. 57-3. 01
1. 76-2. 46
2. 35-2. 49
1. 86-2.00
1.25-1.87
2.25-2. 40
2.19
2.01-2. 30
2. 55-2. 63
1.72
2.00
2.00
2.00
2.16-2. 30
2.23-2. 44
1.50
2. 37-2. 44
1.90-2.10
1.92
2. 47-2. 51
1.61-2. 45
1.70
1.95-2.05
2.23-2. 42
2.20-2.40
1. 70-2. 59
2.00
1. 25-1. 87
2.03-2.66
1.88-2.37
2.10-2.18
2.45-2. 81
2.11
2.74
2.00
1.90
2.03
2.27-2. 70
2.35
2. 40-2. 57
1.21-1.33
2. 51
2.04
2.02
1.62-2.00
1.86-2. 50
1.35-1.97
1. 91-2. 76
1. 70-2. 61
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1. 9Q-2. 33
1. 97-2. 63
1.55
2.19-2.30
2. 71
2.03-2.18
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2. 00
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2. 06
2 2.28-2. 74
2.13
2. 07-2.12
2.00-2.06

$2.28
1.70
2.08
1.86-1.95
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2.13
2.37-2. 57
1. 77-1.87
2.10-2. 31
1.68
1.50-1.59
2.02-2. 25
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1.35-1. 57
1.87
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1.88-2.05
2.09-2. 24
1.50
2.21-2. 31
1.43
1. 70
2. 37
1.61-1.74
1.43-1.51
1.68
2.23
2.18-2. 22
1. 52-2. 43
2. 00
1. 50-1. 59
2. 25-2. 53
1. 75-2.05
1.47-1. 86
2.19-2. 34
2. 63
1.84
1.90
1.91
2.11
2. 20
2. 31
1.10
2. 44
2.04
1.90-1.95
1.22-1. 50
1.86-2.16
1.60-1. 69
1.91-2.16
1. 75-2. 41
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2 2. 06-2.19
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Press assistants
and feeders
$1.54
1.30-1.67
1.04-1.44
1.17-1.93
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.97-1.38
1.82-2. 54
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1.60-1.98
1.92
1.65
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1.30
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. 90-1. 35
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1.09-1. 62
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1. 50-1. 84
1.03-1. 60
1.05-2. 21
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1.60-2. 20
1. 70
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.88
1.66
1. 63-1. 95
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1.38-2. 02
1.15-1. 40
1.65-2. 08
1. 48-1.87
1.79-2.15
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1.73-1.78
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Lithographic (Offset) Occupations

(D. O. T. 4-46, 4-48.050, .070)

Outlook Summary

Better chances for newcomers in early fifties than in other printing fields. Long run upward trend in employment, but number of jobs will remain relatively small.

Nature of Work

The main groups of lithographic workers are cameramen, artists and letterers, platemakers, and pressmen and assistants.

Cameramen. (D. O. T. 4-46.200).—Cameramen who photograph the copy to be printed are highly skilled workers. As a group, they do several different kinds of photography, developing, and related work in black and white or color; the photographing of drawings or photographs, as well as taking original shots; developing glass plates on negative paper or film. The individual cameraman nearly always specializes in one type of photography.

Artists and Letterers (D. O. T. 4-46.700).—After negatives have been made and developed, they frequently have to be retouched, to lighten or intensify certain parts. This is done by hand, with chemicals and dyes, and is one of the many highly skilled operations handled by craftsmen in the art department. Artists may have to correct colors in the final press plates. They also draw posters or other pictures on stone or metal plates or on special paper, on the comparatively rare occasions when hand methods are used in place of photolithography. Lettering is usually done by hand.

To be journeymen, artists have to be adept either in one or more of the various retouching methods or in hand drawing with lithographic crayon. Like cameramen, they are customarily assigned to one phase of the work and may then be known, for example, as dot etchers (who do a highly specialized type of retouching), retouchers, crayon artists, or letterers, depending on the particular job.

Platemakers. (D. O. T. 4-46.300 through .600).—In photolithography, negatives and positives (made by cameramen and corrected by artists) are transferred onto press plates by workers in the platemaking (chemical or processing) department. First, a platemaker places a metal plate with a light sensitive coating in a vacuum frame or photocomposing machine; puts a photographic negative (or, sometimes, a positive) on top of it; and makes an exposure under an arc lamp. The plate is then developed and chemically treated so as to make the nonimage areas repellent to grease when damp, while leaving the image areas receptive to it.

The foregoing indicates only a few of the main steps in this highly complicated and technical process. Platemakers in small shops often perform all the different operations. Those in large shops, however, are likely to be more specialized; they may, for example, operate only a vacuum frame or a photocomposing machine. Besides platemakers using these photo-mechanical methods, there are some who do hand transferring—although this latter process has been largely displaced by photomechanical platemaking.

Pressmen and Assistants (D. O. T. 4-48.070 and 6-49.410).—Although the basic duties of lithographic (offset) pressmen and assistants are similar to those of letterpress and gravure men (see p. 321), there are many differences. These variations arise at least in part from the specialized character of lithographic presses.

An offset press has three, rather than two, cylinders. The first carries the curved plate; the second, a rubber blanket; and the third, the paper (or other material) on which an impression is to be made. The plate does not print directly onto the paper; instead, it transfers the impression to the rubber blanket around the second cylinder which then offsets the image onto the paper. Another special feature is the dampening rollers which pass over the plate before each inking, to prevent the greasy ink from adhering to the nonprinting areas of the plate. Both these features create extra complications for the pressman. In printing by this method much less pressure is needed than in relief and gravure printing, and unusually delicate and skilled adjustments by the pressman are required to attain exactly the right pressure.
A few pressmen specialize in operating direct lithographic presses. When these presses are used, impressions are made on paper or other printing surfaces directly from the plate (stone) instead of by a blanketted middle cylinder.

Training and Qualifications

A large proportion of offset workers are skilled. To become an all-round craftsman generally requires a 4- or 5-year apprenticeship covering the basic techniques of the process. The main emphasis of the training is on the operations related to the specific occupation in which journeyman status is being sought.

Beginners are usually hired as helpers (or assistants) and promoted to apprentices after a year or two, if they show promise and there are openings. Besides on-the-job training, many plants have supplementary courses for their workers. Courses are offered also in vocational schools. Although the skill requirements for lithographic work are often similar to those in other printing methods, opinions differ as to how readily journeymen can transfer from jobs in this field to the more or less comparable activities in letterpress and gravure printing.

A high school education is needed for most jobs. Work in the art, engraving, and camera departments calls for natural drawing ability and an eye for color and design, as well as technical ability. Since pressmen often must blend their own inks, they too should have a knowledge of color. In platemaking, manual dexterity and an interest in chemistry are more important. Many types of physical handicaps are not bars to employment in offset jobs.

Outlook

There will be openings for a limited number of trainees in lithographic work during the early fifties. Employment is expected to rise moderately, but the offset field will remain relatively small in comparison with letterpress printing. Platemakers make up the largest occupational group in offset work (over 5,000 were employed in mid-1950), and there will be more openings in platemaking than in any other offset job.

The longer run employment prospects in lithography are also generally favorable. Any kind of printing job that can be done by letterpress or gravure can be done also by lithography. Practical considerations determine which method is used. Lithography has special advantages when the copy to be reproduced includes photographs, drawings, or paintings, and particularly when these are in color. Recent improvements affecting the life of plates and the speed of presses have been enabling the process to gain headway in the important mass magazine field. But even before these latest developments, offset was a rapidly expanding graphic art, perhaps the fastest-growing reproduction method. Employment gains will occur not only in plants specializing in lithographic work, but also in the growing number of letterpress establishments setting up offset departments. Such combination plants are playing an increasingly important role in the printing industries.

There will be opportunities for a few men to open their own shops. The initial investment is greater than in letterpress printing, and the chances for success are likely to be best in localities which do not already have well-established lithographic businesses.

For many years, New York, Chicago, and San Francisco have been the principal lithographic centers, accounting for perhaps half or more of all offset jobs in the country. Excessive humidity or dryness and other factors have retarded offset progress in some parts of the country. Jobs will become more and more widespread, however, in future years. Offset work has had an especially rapid growth in recent years in some of the large western cities.

Earnings and Unionization

A large proportion, if not a majority, of lithographic craftsmen and operatives belong to the Amalgamated Lithographers of America (CIO), the only printing union organized on an industrial basis. All or almost all of the occupations involved are well represented. A small number of offset pressmen and assistants are in the AFL’s International Printing Pressmen’s and Assistants’ Union, and their wage scales (see p. 324) have been included with those of other nonplaten pressmen and helpers in the separate statements on letterpress and gravure pressmen and assistants.

Union wage scales under the agreements of the Amalgamated Lithographers of America are not included in the regular annual surveys of the
Bureau of Labor Statistics. The information on union wage scales in lithography (shown above) is based on data for 38 cities compiled by the National Association of Photo-Lithographers, but the data are of a similar nature to those of the Bureau.

At the end of 1949, more than half the city scales for artists were between $2.40 and $2.70 an hour (not including opaquers and spotters, whose rates were much lower). Rates for cameramen frequently ranged below those of skilled artists shown, but the top-grade cameramen usually made as much or more than the top-skilled artists.

Nearly all the platemaker and related scales reported were between $1.60 and $2.50. This range includes men with varying degrees of skill and responsibility; the scales of the more highly skilled men, such as the journeymen discussed in this report, were toward the upper end of the range.

A wide range of scales is indicated also for pressmen. The great majority of the scales reported for these workers were between $1.90 and $2.60 an hour. Press assistant rates ranged largely from $1.30 to $1.80. The number and size and complexity of the presses operated and tended by journeymen and helpers influence their rates.

### Bookbinders

**Outlook Summary**

Job opportunities will continue to become fewer because of expected employment declines during the early fifties and also over the longer run.

**Nature of Work**

Many products are finished when they leave the pressroom. This is true of a wide variety of items produced by job shops—business forms, printed stationery, labels, advertising flyers, etc. Newspapers, except the few that are bound for libraries, never see a bindery department. Nevertheless, binderies play a part in the manufacture of many items besides books. The sewing or stapling of magazines, pamphlets, or small calendars is considered a bindery operation.
There are several different kinds of binderies, serving a variety of purposes. Edition and pamphlet binderies (or bindery departments) bind the regularly published editions of books and pamphlets printed in large quantities. Trade binderies serve a function similar to the service shops of other branches of the printing industry discussed on page 302. Job binderies do odd jobs on order for customers direct or for the trade. Blankbook binderies bind ledgers and bookkeeping and accounting volumes. There are also library binderies (or properly staffed and equipped specialized departments of job binderies) which bind and rebind books and other printed materials for libraries, and do various kinds of related work.

Edition binding—making books in quantity out of the big, flat sheets of paper that come into a bindery from the pressroom or from an outside printer—is by far the most complicated kind of bindery work. The first step is to fold the printed sheets, each of which contains many pages, so that these pages will be in the right order. When so folded into sections of 16 or 32 pages, the sheets are known as signatures. The next steps are to insert any illustrations that have been printed separately, to assemble the signatures in proper order, and to sew them together. The resulting book bodies are shaped in various ways, usually with power presses and trimming machines, and fabric strips are glued to the backs to reinforce them. Sometimes the edges of the pages are gilded or colored. Covers are glued or pasted onto the book bodies, after which the books undergo a variety of finishing operations and, frequently, are wrapped in paper jackets. Machines are used extensively throughout the process.

Skilled bookbinders seldom handle all these different tasks, although many journeymen have had training in all of them. In large shops especially, bookbinders are likely to be assigned to one or a few operations, most often to the operation of complicated machines.

The majority of journeymen are employed in shops whose chief business is bookbinding. However, a good many work in the bindery rooms of large book, periodical and commercial printing plants. Some are employed in libraries, where the work is done mainly by hand and also differs in other respects from that performed elsewhere.

Qualifications for Employment

Completion of a 4-year apprenticeship is usually required of men seeking to qualify as skilled bookbinders. Apprenticeship programs may vary considerably among the different types of shops or services. Where large quantities of books are bound on a mass-production (edition) basis, emphasis is on the most modern machine methods. Where fine hand binding is done, the training is mainly in hand methods, including artistic designing and decorating of leather covers.

Outlook

During the early fifties, employment of skilled bookbinders is likely to slip further from the high immediate postwar levels. Many new bookbinders were trained between 1946 and 1949—to make up for the wartime labor shortage, take care of normal replacement needs, and handle the expanded volume of bookbinding work. Despite an apparent decline in employment in the closing year or two of the forties, the number of jobs in early 1950 was probably still several thousand above the 1940 total of less than 25,000. The recent downtrend in employment is a resumption of the long-run decline of the occupation which was interrupted by the
war and the immediate postwar boom. Job openings are likely to be relatively few, on the whole, in the years to come.

**Earnings and Unionization**

Wage scales in this occupation tend to be below the general average of the skilled printing trades. On July 1, 1950, the union rates for journeymen bookbinders in book and job printing in about three-fourths of 77 cities surveyed were from $1.80 to $2.40 an hour. The average union rate was $2.07 an hour.

The union wage scales for bookbinders as of July 1, 1950, in most of the important printing centers, are shown in the following tabulation.

Although employees in binderies are not so strongly organized as other groups of printing workers, many skilled bookbinders are represented by the International Brotherhood of Bookbinders (AFL), one of the six major unions of printing workers. A higher proportion of journeymen bindery workers belong to this union.

### Bindery Workers

**(D. O. T. 6-49.000 through .199)**

#### Outlook Summary

A gradually growing field made up mainly of women workers. Fairly large number of openings for newcomers in early fifties to replace workers leaving their jobs.

#### Nature of Work

In many binderies, especially large ones, a great part of the work is done by employees trained in only one operation or in a small number of related tasks. These semiskilled workers, often classified as *bindery workers* or *bindery hands*, are mostly women (hence the common designation *bindery women*). Women handle a variety of hand or light-machine operations, such as hand-folding, pasting-in of inserts, assembling signatures by hand, machine-sewing, gluing fabric reinforcement on signatures, and feeding machines. The small number of men involved are usually assigned to more intricate machine jobs; they may operate assembling, trimming, stamping, and many other types of machines. Bindery workers are employed both in independent binderies and in the bindery departments of big printing plants and of other operations.

#### Training

For inexperienced men and women entering the occupation a training period which may be as long as 1 or 2 years is frequently required. In union shops, there are always formal training programs.

#### Outlook

Employment of bindery workers has risen considerably since the end of the war. During the early fifties the number of jobs is expected to remain about the same as in 1949, with a slight increase possible.

Bindery workers are by far the largest group of semiskilled workers in the printing and allied industries. In 1939, roughly 70 to 80 thousand women and men were in bindery work and substantially more are now employed. Because this is a relatively big field, and because there is usually considerable turn-over among women employees, there should be a fairly large number of openings for new workers during the early fifties. The long-range trend in employment is upward, and those who obtain jobs in the early fifties have good chances of reasonably steady work for many years if favorable general business conditions continue.
Earnings and Unionization

Women bindery workers have the lowest wage rates of any group of production workers in the printing and allied industries (see following tabulation). For example, even the union scales for bindery women in effect in book and job printing on July 1, 1950, in the cities covered in the annual union wage scale survey of the Bureau of Labor Statistics, were rarely over $1.45 an hour and more than half of them were under $1.20. No scale, however, was below the rate of 75 cents found in Baltimore. The highest rate, $1.50, was in effect in Seattle. The general average of the union rates for bindery women in the cities surveyed was $1.18.

Men doing semiskilled machine work are generally paid somewhat more than the usual top rate for women. The few men performing semiskilled hand operations are paid rates similar to those for women workers.

The union hourly wage scales for bindery women in book and job printing plants as of July 1, 1950, in most of the important printing centers, are shown in the following tabulation.

Although employees in binderies are not so strongly organized as other groups of printing workers, many bindery workers are represented by the International Brotherhood of Bookbinders (AFL), one of the six major printing unions. The proportion of semiskilled bindery personnel organized is smaller than that for bookbinders and bookbinders machine operators.

<table>
<thead>
<tr>
<th>City</th>
<th>Rate</th>
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<tbody>
<tr>
<td>Atlanta, Ga</td>
<td>$1.17</td>
</tr>
<tr>
<td>Baltimore, Md</td>
<td>0.75- 0.93</td>
</tr>
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<td>Birmingham, Ala</td>
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</tr>
<tr>
<td>Boston, Mass</td>
<td>1.11</td>
</tr>
<tr>
<td>Buffalo, N. Y</td>
<td>1.04</td>
</tr>
<tr>
<td>Butte, Mont</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>Chicago, Ill</td>
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</tr>
<tr>
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<td>1.27</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>1.08-1.15</td>
</tr>
<tr>
<td>Columbus, Ohio</td>
<td>1.29</td>
</tr>
<tr>
<td>Dayton, Ohio</td>
<td>1.05-1.11</td>
</tr>
<tr>
<td>Denver, Colo</td>
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</tr>
<tr>
<td>Des Moines, Iowa</td>
<td>1.11</td>
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<tr>
<td>Detroit, Mich</td>
<td>1.15-1.25</td>
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1 Excludes Government Printing Office.
PETROLEUM PRODUCTION AND REFINING OCCUPATIONS

The petroleum industry’s products provide a third of the energy used in running our industrial civilization. Petroleum products power automobiles, trucks, busses, airplanes, ships, and most of the newer locomotives; modern machinery could not run without lubricants derived from crude petroleum.

The industry is also important as a field of employment. Petroleum production and refining, the basic branches of the industry and the ones covered in this report, employed in early 1950 over 400,000 wage and salary workers in a wide range of jobs in many different parts of the country. Earnings are relatively high and many of the jobs require considerable skill. It is expected that there will be many openings for new workers during the next 5 to 10 years.

The Petroleum Industry and Its Products

There are thousands of companies in the oil business, most of them engaged in a single specialized aspect, such as exploring, drilling wells, producing or transporting oil, or operating filling stations. The bulk of the oil business, however, is done by a limited number of large firms engaged in all branches, from production through marketing. These “integrated” firms provide a large share of the jobs in the industry.

Production, refining, transportation, and marketing constitute the main branches of the petroleum industry. This chapter deals exclusively with production and refining. Production of natural gas, often carried on in conjunction with petroleum production, is not covered in this report. However, some workers, such as drilling crews, are employed in both petroleum and natural gas operations. Petroleum production is usually classified among the mining industries, while petroleum refining is classified as a manufacturing industry. In this handbook they are discussed in one chapter for convenience in presentation, and the chapter is included in the section on manufacturing industries.

Petroleum Production

In early 1950, well over 200,000 wage and salary workers were employed in petroleum production. There were about 13,000 different companies engaged in various oil field activities. Employment is concentrated in certain States, although occurring to some extent in a number of other States. As chart 71 indicates, Texas is far and away the leading State in the number of oil field jobs, followed by Oklahoma, California, Louisiana, Kansas, Illinois, and Pennsylvania, in that order. An additional 11 States each provided 1,000 or more of these jobs in 1948.

Petroleum production includes three broad kinds of work: Exploration, drilling and other oil field servicing, and crude production (well operation and maintenance).

Exploration. Since oil is difficult to find—only rarely are there any signs on the earth’s surface of its presence underground—a sizable business has grown up having to do with the application of scientific methods to the search for oil. This work is done by two different kinds of firms; most of it is done by the exploration departments of major oil companies; a number of independent firms are also engaged in exploration, working under contract to companies or individuals seeking oil.

The various exploration methods can neither show the precise location of oil nor indicate with certainty whether petroleum is present at a particular place. What they can do is to locate geologic formations “favorable” to oil accumulation. The old adage, “oil is where you find it,” still holds, and the way to find it is to drill a hole in the ground down to the oil level.

Drilling, Rig Building, and Other Oil Field Servicing. More than 39,000 wells were drilled in the United States in 1949. Oil producing companies do some drilling, but most is done by independent firms working under contract. Of the wells drilled in 1949, 19 percent were “wildcats.”
that is, they were drilled in places where oil had not previously been found. The remainder were “development” wells, drilled in connection with the development and extension of existing fields. Texas was by far the leading State in 1949, both in number of wells and total footage drilled. Wells were drilled in 25 other States, of which Oklahoma, Kansas, Illinois, California, Louisiana, and Pennsylvania were the most important with respect to such operations.

Before a well can be drilled, a derrick must be built on the spot where the drilling is to be done (unless a portable rig is used) and the drilling rig put in place. A number of independent contracting companies specialize in rig and derrick building, repairing, and dismantling.

In addition to drilling and rig building, a number of other necessary services are performed in connection with oil production. These services include hauling supplies, cementing wells, chemical treatment in cleaning of wells, and other special operations. Much of this work is handled by independent contractors.

Crude Petroleum Production. Once oil is found, the next job is to bring it out of the ground. More than half of the oil field workers are engaged in operating and maintaining the Nation’s 445,000 producing wells. There are over 4,000 oil fields in the United States, but 130 major fields accounted for half of the Nation’s crude oil output in 1948.

Refining

Crude oil—petroleum as it comes from the ground—has very few uses. It is turned into hundreds of useful products by the process of refining. The approximately 375 refineries in the
United States employed nearly 200,000 wage and salary workers in early 1950.\(^1\) Refineries range in size from small plants, with fewer than 50 employees, to a relatively few large ones, each having several thousand workers on its payroll. The 16 largest refineries had nearly two-fifths of total refining capacity at the beginning of 1949.

Refineries are located with reference to two factors: proximity to markets and nearness to the supply of crude petroleum (near oil fields, at the terminals of oil pipelines, at deep water ports where tankers can dock). Refineries, therefore, tend to be concentrated in the great oil producing or oil consuming areas. Texas led in refinery jobs (with about one-fifth of the United States total in 1949), followed by California and Pennsylvania. Five other States had at least 10,000 refinery workers each.

**General Employment Outlook**

Many factors affect the long-range outlook for employment in the petroleum industry. Some of these factors are reasonably predictable, such as the generally rising trend in demand for petroleum products. Other factors are fundamentally uncertain. No one can say for example, exactly how much oil remains underground, where it is, or how long it will be before it is discovered. Moreover, the petroleum industry is a world industry and its products often have critical military importance. Unpredictable military and diplomatic factors, therefore, may greatly affect the outlook. Nevertheless, observable trends in the industry can be used in evaluating future job opportunities, subject to the qualifications which have been noted.

_Petroleum Demand and Supply_

The long-range trend in demand for petroleum products has been sharply upward. Chart 72 shows the steeply rising demand for these products in the United States. Total domestic consumption in 1949 was nearly six times the 1919 level. It is also apparent from the chart that per capita consumption has nearly kept pace with the growth in total consumption, indicating that population increase, although a factor in the rising demand, has been less important than the intensified use of petroleum in our economy.

There also has been a great rise in the relative importance of petroleum as a source of energy. At the turn of the century, crude oil accounted for only about 5 percent of energy produced; by 1948, the percentage had risen to nearly 35.

\(^1\) This figure includes employment in central administrative offices of integrated oil companies, even when these offices are located away from refineries.

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**CHART 72**

TREND OF U.S. PETROLEUM CONSUMPTION IS SHARPLY UPWARD

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Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis
development placed great strain on petroleum refining and transportation facilities, so that in 1946 and 1947 there were local, temporary shortages of fuel oil and gasoline (particularly the former). In 1948 and 1949, however, petroleum supplies were ample.

All indications point to a continued and fairly rapid rise in demand during the 1950 decade. Most of the factors responsible for past growth will continue to operate. These include the rising number of motor vehicles, growth of aviation, increased use of oil in heating, wider application of the Diesel engine, greater use of petroleum byproducts, and, finally, continued growth of United States population and industry. It seems probable, in view of the international situation in mid-1950, that increasing amounts of petroleum products will be needed to meet military and defense industry requirements.

Will there be enough oil to meet the expected demand? At the end of 1948, estimated proved petroleum reserves in the United States amounted to over 23 billion barrels of crude oil and 3½ billion barrels of natural gas liquids (see chart 73). In addition, many billions of barrels are known to be present underground, but are, as yet undiscovered. The trend in proved reserves is clearly upward, and there have been relatively few years in which reserves were not greater than those of the preceding year. However, in recent years oil has been harder to find and reserves have been rising at a diminishing rate, while production has been increasingly rapidly. Nevertheless, the indications are that the supply of oil in the United States is adequate for the next decade at the very least.

Job Opportunities

It is expected that there will be a substantial number of jobs for new workers in petroleum production and refining during the 1950 decade.

Petroleum Production

Chart 74 shows the recent trend of employment in the Nation's oil fields. In 1949, the employment level was considerably above prewar. Between 1950 and 1960, the number of jobs is expected to increase moderately.

Exploration and drilling activity in 1948 and 1949 was at the highest level in history. More than 2 billion barrels of crude—an all-time high—were produced in United States oil fields in 1948. Because of rising demand, production during the next decade will reach an even higher level. The upward trend in the number of producing wells and fields is expected to continue. This will mean more jobs for oil field workers.

Opportunities for new workers will be created by the gradual rise in employment. A much larger number of jobs, however, will result from replacement needs. In a field of employment as large as this one, annual replacement needs are very substantial. The number of workers who die or retire each year may be about 4,000. Many additional thousands will transfer into other lines of work, while some will enter the Armed Forces.

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1 “Proved reserves” refers to the estimated amount of oil which has been discovered, which remains underground, and which is recoverable by present methods of production.
Various kinds of workers will be needed in oil production. Most new workers will start as laborers, roustabouts, or helpers. In addition, a large number of openings are anticipated for petroleum engineers, geologists, geophysicists, surveyors, draftsmen, and other technical workers.

Although many uncertainties cloud the employment outlook beyond the next decade, it is probably safe to say that those who obtain jobs in petroleum production during the next 5 or 10 years will continue to hold them over a much longer period.

**Petroleum Refining**

Refinery employment in 1948-49 was the highest ever attained in the industry. Much of the increase has occurred in the last several years, as chart 74 indicates. However, the long-range trend has also been upward. Between 1909 and 1939, refinery employment rose 500 percent; this was among the fastest rates of growth shown by any industry.

The outlook is for continued advance in refinery output but at a slower rate than in many past periods. Reasons for this expected growth have been indicated in the preceding discussion of the future demand for petroleum products. To achieve any substantial increases in output, considerable expansion of refining capacity will be needed. In 1948-49, work was begun on construction of new refineries and additions to existing ones; further growth in capacity is planned for the near future. Rising military and defense industry requirements may necessitate further increases. The rise in output and capacity will markedly increase the number of refinery jobs.

Even in the event of a general business depression, with output of petroleum products falling far below the expected levels, refinery employment should not decline greatly, because such employment is more closely related to changes in capacity than to variations in output. A refinery may be operated at widely varying rates without greatly affecting the total number of workers needed. A large share of refinery employment is in maintenance departments, which have nearly as much work to do when the refinery is operating at 70 percent of capacity as at 90 percent. The number of administrative, technical, and clerical employees is also fairly stable, regardless of the rate of production. Finally, processing jobs involve mainly the tending of types of equipment which require a relatively fixed number of workers.

In addition to the many job opportunities resulting from the expected expansion in refining, replacement needs (resulting from death, retirement, transfers into other industries, and entry into the Armed Forces) will be numerous. Most new plant workers will start as laborers, since the usual practice in refineries is to fill the more skilled jobs by promoting from within.

There will also be many opportunities in technical jobs, especially for chemists, chemical engineers, mechanical engineers, and laboratory technicians. Accountants, bookkeepers, stenographers, typists, and various kinds of clerical workers will also be needed.
Petroleum Production Occupations

Petroleum production includes three broad kinds of work—exploration, drilling, and well operation and maintenance.

Exploration

Exploration has to do with the finding of underground geologic structures likely to contain oil. Two main methods are used—geological and geophysical. These methods are often combined, however, in the search for oil.

Petroleum geologists in the United States number an estimated 6,000. They are on the staffs of oil companies, work for independent exploration firms, or operate as independent consultants. Their main function is to recommend where to drill for oil. However, they also advise management on methods of drilling and oil field development, make appraisals of properties for leasing, and estimate oil reserves. Four or five years of college training in geology are needed to get a job as a beginning petroleum geologist.

Some geologists are in central or district offices of oil companies or exploration firms. Most of them, however, spend a great deal of their time making field surveys. Geological parties, headed by petroleum geologists, study and map surface and subsurface geologic structures.

In addition, the parties may include college-trained paleontologists and chemists. Paleontologists study fossils—the remains of organic life in rocks—in order to determine the geologic age of the rocks. Chemists conduct analysis of rock samples. Plane-table operators, draftsmen, and rodmen assist in surveying and mapping operations. (Detailed discussions of chemists and draftsmen are included in this handbook. See index for page numbers.)

Another science used in exploration is geophysics—the application of the principles of physics to the study of the subsurface structure of the earth.

Seismic prospecting is by far the most extensively used of geophysical exploration methods. The seismograph (originally devised to record earthquakes) measures and records the rate of transmission of sound waves through the earth. In oil prospecting, a dynamite blast is set off, sending energy waves down into the earth. As these waves strike rock formations, they are reflected back to sensitive detecting instruments. The instrument readings are recorded on film and interpreted by geophysicists, who can thus determine the nature of underground formations. A seismograph crew is composed of from 10 to 18 persons, working under the supervision of a party chief, who is usually a college-trained geophysicist. Computers, who usually have had college training in geophysics, mathematics, or engineering, prepare maps from the seismic data. An observer operates and maintains the seismic equipment; he generally has a degree in electrical engineering. Drillers and their helpers operate portable drilling rigs used to make holes into
which explosive charges are placed. Shooters are in charge of the placing and detonation of explosive charges.

Gravity prospecting, another method of finding oil traps, involves use of the gravity meter. This instrument is an extremely sensitive scale that measures the vertical pull of gravity with minute accuracy. Heavy rocks near the surface pull harder than light ones or than heavy rock at greater depth. The gravity meter, by detecting these variations, helps disclose the possible presence of oil-bearing structures. Workers employed in gravity prospecting include operators of gravity measuring instruments, draftsmen, computers, party chiefs, and surveying crews.

Another method of exploring underground rock is by electricity. A special electric probe is lowered into a well. A current is passed through the rock layers and the rock’s resistance to the current is measured. Different kinds of rock have varying resistance to electricity. Resistance is affected also by the oil, gas, or water content of the rock. An electrical prospecting party, including the party chief, surveyor, operators of electrical measuring instruments, and cablemen usually has four to eight members.

The land man, or lease man (D. O. T. 0–98.22), has essential functions in exploration and oil field development. His job is to make the necessary legal and financial arrangements with the owners of prospective oil land in which his company is interested.

Another important job in oil exploration is that of the scout (D. O. T. 1–48.22). He keeps his company informed on all explorations, leasing, drilling, and production activity in his area.

**Drilling**

In spite of all the exploration methods that have been developed, there is no device that will actually find petroleum. Only by drilling can the presence of oil be proved. There are two methods of drilling a well: cable tool drilling and rotary drilling.

Cable tool drilling was the original method, but it has been replaced to a great extent by rotary drilling. At present the cable tool method is mainly employed in drilling shallow wells in hard rock formations. Most of the cable tool drilling is done in Pennsylvania, New York, Ohio, and West Virginia. In cable tool drilling, a hole is pounded through the rocks by raising and dropping (over and over again) a heavy, sharpened bit attached to the end of a cable.

The usual cable-tool drilling crew consists of two men: the driller and the tool dresser. The cable tool driller (D. O. T. 5–75.270) is in charge of all operations during his tour of duty and maintains a detailed record of drilling activity. One of his main functions is to control the force with which the bit strikes the bottom of the well. He also supervises and helps in the setting up of the machinery and the derrick. The cable tool dresser (D. O. T. 5–75.280) assists the driller and maintains the equipment.

Almost all the deeper wells are drilled by the rotary method. Rotary drilling bores a hole in the ground as a carpenter bores a hole with a brace and bit into a board. The drilling bit is a steel tool having a cutting surface at its lower end. The bit is attached to a string of jointed hollow pipe held in place by a round table which is rotated by a steam, Diesel, or gasoline engine. As the bit goes down, the drill stem is lengthened by the addition of more pipe. A stream of mud is continuously pumped through the pipe in order to cool the drilling bit and to plaster the walls of the hole to prevent cave-ins.
A typical rotary-drilling crew consists of a rotary driller (D. O. T. 5–75.050) and four or five helpers. To operate one rig the customary 24 hours a day, 7 days a week, about 20 workers are required. The rotary driller is in charge of the work of the crew during his tour of duty and operates the drilling machinery. His duties include controlling drilling speed and pressure, and keeping a record of operations. He must be ready to meet a variety of emergencies, such as breakdown of equipment or encountering unusual geological formations. His helpers include a derrickman (D. O. T. 5–20.825), a fireman or engineer (D. O. T. 5–72.915), and two or three rotary floormen (D. O. T. 7–75.050). The derrickman is second in charge on the drilling rig. When pipe is being removed and replaced, the derrickman handles the upper end of the pipe, working on a small platform high on the rig; the rotary floormen handle the lower end, racking and unracking pipe sections and connecting and disconnecting pipe joints. The derrickman also controls the consistency and circulation of the drilling mud.

Another important oil field worker is the tool pusher (D. O. T. 5–93.310), who supervises the operations of a group of drilling rigs. He also has the responsibility of supplying the drilling crews with needed materials and equipment. Roustabouts (D. O. T. 9–20.10) are sometimes employed in drilling operations to do odd jobs around the drilling rigs. Among other workers connected with drilling operations are the rig builders (D. O. T. 5–20.840) who erect and dismantle the giant steel derricks.

Well Operation and Maintenance

Production begins once the well is drilled and oil is found. Many different kinds of workers are employed in a producing field. Switchers (D. O. T. 5–20.600 through 20.699 and 7–20.610) work in fields where oil flows under natural gas pressures and does not require pumping. They open and close valves to regulate the flow of oil from well to tanks, between tanks, or into pump lines. Pumbers (D. O. T. 5–72.570 and 7–72.570) operate and maintain power units, pumps, compressors, and other equipment used in producing an artificial flow of oil from the wells. This is the largest occupation in the oil fields. Generally, a pumber operates a group of wells. Gagers (D. O. T. 6–55.060) measure and record the contents of the field tanks and take samples of the oil. In many fields, the jobs of switchers, gagers, and pumbers are combined in various ways. Treaters (D. O. T. 5–20.400 through 20.599 and 7–20.410) test oil from wells for sediment and water content and use chemical or electrical equipment to treat oil in the storage tanks. (This occupation may also be combined with pumber or gager). Roustabouts perform the various duties of field and well maintenance, which require relatively little skill but often involve heavy, hazardous work.

A number of workers are engaged in various specialized maintenance operations in the oil fields. Welders, carpenters, electricians, machinists, and blacksmiths are employed to repair and install equipment. (Discussions of these and other maintenance occupations are included elsewhere in this handbook; see index for page numbers.) Well-pulling crews use mechanical winches to remove the pumping rods and steel casing from wells; this is done either to clean and repair pumping equipment or to salvage the casing when wells are abandoned.

Petroleum Engineers. Over-all planning and supervision of drilling and production operations are usually the responsibility of the petroleum engineer. He helps to select drilling sites and directs rig builders and other workers in erection of the derrick and installation of the drilling machinery. He advises drilling personnel on technical matters and may supervise the completion of
of wells. One of his principal functions is to prevent waste; he may determine oil flow rates and pumping methods. The usual requirement for this job is graduation from a 4-year college course. Some petroleum engineers are trained in specialized petroleum engineering courses in colleges and universities. Others have degrees in chemical, mining, or mechanical engineering or nonengineering degrees in the physical sciences, such as geology. (For more detailed description of the engineering field, see section on engineering occupations, p. 79.)

Working Conditions in Petroleum Production

Most oil field work is done outdoors and the workers are thus exposed to extremes in weather. Fields may be near cities; however, they are often far from sizable communities and are sometimes in swamps or deserts. A few drilling crews actually work and live on specially-constructed platforms miles off-shore in the Gulf of Mexico. Drilling employees may expect to remain in one place a few years at most; their work in a particular field may be completed in less than a year. Exploration personnel move around even more frequently. Well operation and maintenance workers, however, may stay in the same locality for years. Drilling employees who wish to settle in one place sometimes transfer to lower-paying production jobs.

Accident data indicate that exploration and crude production are not particularly dangerous; they have a lower accident frequency rate, for example, than the average for manufacturing industry generally. Drilling, on the other hand, is much more hazardous.

Most oil field workers are not union members. Some of the fields have been organized, however, by the Oil Workers International Union (CIO) and by various independent unions.

Except for scientists, engineers, and other technical employees, oil field workers generally are hired as laborers, roustabouts, or helpers, and advance to more skilled jobs as openings occur. In rotary drilling, for example, a new crew member is hired as a fireman or floorman. A floorman can advance to derrickman, and then to driller. It takes several years at least to attain the status of driller.

Much drilling and exploratory work requires men capable of performing heavy physical labor. Well operation and maintenance, with the exception of some of the heavy labor done by the roustabouts, does not require great physical effort. Women are employed only in the offices and laboratories of oil producing companies.

Most oil field workers are hired at the field or through the local offices of the various State employment services, affiliated with the United States Employment Service.

Earnings

Earnings of oil field workers compare favorably with those in industry generally. In July 1950, average weekly earnings of production workers in petroleum and natural gas production (excluding drilling and rig building) were over $76 for about 42 hours of work. Recent earnings information for individual occupations is not available. Examination of a number of union agreements which cover only a small part of oil field employment indicates the following range of hourly earnings in important occupations in 1948-49.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Typical straight-time hourly earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotary driller</td>
<td>$2.25–$2.85</td>
</tr>
<tr>
<td>Derrickman</td>
<td>1.75–2.00</td>
</tr>
<tr>
<td>Rotary floorman</td>
<td>1.60–1.85</td>
</tr>
<tr>
<td>Fireman</td>
<td>1.60–1.85</td>
</tr>
<tr>
<td>Pumper, switcher, and gager</td>
<td>1.60–1.90</td>
</tr>
<tr>
<td>Roustabout</td>
<td>1.40–1.80</td>
</tr>
</tbody>
</table>
Refining Occupations

Petroleum refining is the processing of crude petroleum into usable end products, such as gasoline, kerosene, fuel oil, and lubricants. This processing is carried on in plants called refineries, which look very much like the apparatus for gigantic chemical laboratory demonstrations.

Duties, Training, and Qualifications

About a third of the plant workers in a modern refinery are engaged in processing. The processing operations are highly mechanized and are controlled by a large number of instruments, so that relatively little manual work is required. Stillmen operators (D. O. T. 4-55.030) have the responsibilities of running the various distillation and cracking units safely and economically. In order to control the operation of the equipment, they observe and record instrument readings showing the temperature, pressure, and oil flow. A stillman has two or more assistants—stillmen's helpers (D. O. T. 6-55.020). Stillmen also supervise firemen (D. O. T. 6-55.070), who operate the burners which maintain required temperatures in the refining units. Pumpmen (D. O. T. 5-72.550) and their helpers (D. O. T. 6-55.930) maintain and operate power-driven pumps which circulate petroleum products, chemicals, and water through units during processing. Impurities present in gasoline, oil, and other products are removed in purification units run by treaters (D. O. T. 4-55.310).

More than half of the plant workers in a typical refinery are employed in repairing, rebuilding, and cleaning operating equipment. Included among these are skilled boilermakers, bricklayers, carpenters, electricians, instrument repairmen, lead-burners, machinists, painters, pipefitters, pipe coverers, riggers, sheet-metal workers, and welders. There are also many helpers and trainees in these trades. (This handbook includes detailed descriptions of the duties, training, working conditions, and job prospects in other industries for most of the above-mentioned maintenance occupations. See index for page numbers.)

In addition to process and maintenance jobs, a number of workers are employed in the packaging and shipping departments.

Petroleum-refining employees include a relatively large proportion of professional and technical workers. Among these are chemists, chemical engineers, mechanical engineers, laboratory technicians, and draftsmen.

Chemists control the quality of petroleum products by conducting tests and analyses to determine chemical and physical properties. Many chemists are engaged in the development of new products.

Engineers are employed in a variety of refinery activities, including design of chemical equipment, supervision and development of processes, plant lay-out, and quality control. Some laboratory technicians assist the chemists in research projects; others do routine testing. Draftsmen prepare working plans and detailed drawings required in refinery construction and maintenance. (See index for separate statements on these professional and technical occupations.)

Working Conditions in Petroleum Refining

Working conditions in refineries compare favorably with those in manufacturing industry generally. Most refinery jobs do not require great
PETROLEUM PRODUCTION AND REFINING OCCUPATIONS

physical effort. Some workers, however, climb stairs and ladders to considerable heights in the course of their duties. Others work in hot places or are exposed to unpleasant odors. Refineries are relatively safe places in which to work; accident frequency is barely half the average for manufacturing industries as a whole. Because refineries operate 24 hours a day, 7 days a week, many of the process workers are on night shifts and many work on weekends. Plant jobs in refineries are filled by men; there are jobs for women in the laboratories and offices. Refinery employment varies little seasonally; nearly all the workers have year-round jobs.

The majority of refinery workers are union members. A large number of petroleum refineries have been organized by the Oil Workers International Union (CIO); many refinery workers are in various independent unions. Some are members of AFL craft unions.

Except for the office help and technical workers, the usual way to start in a refinery is as a laborer. When a vacancy occurs, the worker is assigned to one of the processing or maintenance departments. Here, the more skilled work is learned on the job, with advancement by strict seniority. For example, in a processing department, a worker may advance along these lines: laborer, fireman, assistant stillman, stillman. In maintenance departments, a worker advances from laborer to helper or learner. He trains, over a period of 3 or 4 years, to become skilled in such work as boilermaking, pipefitting, or welding. Some refineries have formal apprenticeship programs to train workers for skilled maintenance occupations.

Earnings

Earnings in petroleum refining are among the highest in industry. In July 1950, production workers in petroleum refining earned an average of nearly $79 for a workweek of 41 hours. (In the same month, the average for all manufacturing industries was about $59 for slightly over 40 hours of work.) The following tabulation gives straight-time average hourly earnings for selected occupations in refineries in September 1948.1

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Average straight-time hourly earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant stillman, cracking</td>
<td>$1.95</td>
</tr>
<tr>
<td>Assistant stillman, straight-run</td>
<td>1.91</td>
</tr>
<tr>
<td>Assistant stillman, combination units</td>
<td>1.97</td>
</tr>
<tr>
<td>Carpenter, maintenance</td>
<td>1.98</td>
</tr>
<tr>
<td>Electrician, maintenance</td>
<td>2.01</td>
</tr>
<tr>
<td>Fireman, stills, cracking</td>
<td>1.84</td>
</tr>
<tr>
<td>Fireman, stills, straight-run</td>
<td>1.76</td>
</tr>
<tr>
<td>Fireman, stills, combination units</td>
<td>1.87</td>
</tr>
<tr>
<td>Gager</td>
<td>1.87</td>
</tr>
<tr>
<td>Helper, maintenance</td>
<td>1.67</td>
</tr>
<tr>
<td>Instrument repairman</td>
<td>2.01</td>
</tr>
<tr>
<td>Laborer</td>
<td>1.42</td>
</tr>
<tr>
<td>Loader, tank cars or trucks</td>
<td>1.70</td>
</tr>
<tr>
<td>Machinists, maintenance</td>
<td>2.01</td>
</tr>
<tr>
<td>Packer, hand</td>
<td>1.66</td>
</tr>
<tr>
<td>Pipefitter</td>
<td>1.98</td>
</tr>
<tr>
<td>Pumpman</td>
<td>1.92</td>
</tr>
<tr>
<td>Pumpman's helper</td>
<td>1.83</td>
</tr>
<tr>
<td>Routine tester, laboratory</td>
<td>1.77</td>
</tr>
<tr>
<td>Stillman, cracking</td>
<td>2.15</td>
</tr>
<tr>
<td>Stillman, straight-run</td>
<td>2.07</td>
</tr>
<tr>
<td>Stillman, combination units</td>
<td>2.18</td>
</tr>
<tr>
<td>Treater, light oils</td>
<td>1.96</td>
</tr>
<tr>
<td>Treater, heavy oils</td>
<td>1.97</td>
</tr>
<tr>
<td>Treater's helper, light oils</td>
<td>1.89</td>
</tr>
<tr>
<td>Treater's helper, heavy oils</td>
<td>1.86</td>
</tr>
<tr>
<td>Welder, hand, maintenance</td>
<td>2.02</td>
</tr>
<tr>
<td>Mechanic, maintenance</td>
<td>1.92</td>
</tr>
</tbody>
</table>

There have been some wage increases in petroleum refineries since September 1948; average earnings of production workers in petroleum refining rose from about $1.87 an hour in September 1948 to about $1.93 in July 1950.

Employees generally receive additional pay for working the second or third shifts. Most petroleum refinery workers are granted vacations with pay after 1 year of service. Many firms also have provision for paid sick leave. A large number of the companies have adopted some type of insurance or pension arrangement for their employees, some provide life insurance plans, others have health insurance programs or retirement and pension plans. Employee stock-purchase plans are in effect in many firms.

Where To Get More Information


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1 Data are for refineries with 51 or more employees. Earnings exclude premium pay for overtime and night work.

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FUR MANUFACTURING OCCUPATIONS

The number of workers in fur manufacturing occupations is relatively small. However, a very large proportion of them are skilled. Nearly all the fur garment and fur dressing and dyeing plants are in the New York City area or in nearby New Jersey. Retail fur shops, on the other hand, are found throughout the country. Little change in the number of fur workers is expected during the 1950 decade. A small number of new job openings each year will be created by replacement needs.

Nature of Fur Manufacturing

Modern fur production consists of three branches. First, there are the dressing and dyeing plants, where fur skins are dressed, colored, and treated. In 1947, these plants employed an average of 6,800 wage and salary workers. Dressing and dyeing may be done in the same or different plants, and some plants specialize in one or a few furs. Next, is fur garment manufacturing—the production of ready-made fur apparel with about 16,000 employees in 1947. Finally, there are the fur retailers, including the fur shops, department stores, women’s clothing stores and apparel shops which are found in every principal city. The retail shops make some custom-made garments, but not very many. In the main, they service old fur coats—repairing, restyling, cleaning, and storing—and sell factory-made fur garments. About 12,000 fur workers are employed in these retail establishments.

Most of the workers engaged in fur garment manufacturing work in small shops. This is so because the finer types of furs and fur garments must be handled individually. However, there are a number of larger shops (with more than 50 workers) engaged in larger-scale production. During 1947, almost two-thirds of the employees in fur garment manufacturing worked in shops employing an average of less than 20 workers.

Fur dressers and dyers use heavy equipment and their plants are larger than those of fur garment manufacturers. Nearly half of the workers in fur dressing and dyeing in 1947 were in plants employing more than 100 workers.

New York City—principally because it is the fashion center of the country—predominates in the handling of furs from the time the raw fur pelts are received until the garment is finished. Almost all of the workers employed by manufacturers of ready-made fur apparel and by exclusive retail furriers are in New York City. Most workers in dressing and dyeing plants are also employed in the New York metropolitan area or in nearby New Jersey. Unlike the other fur workers, those in retail trade are scattered throughout the country. But employment is concentrated in large cities and in the North and East.

Employment Outlook

Prospects are that there will be little increase in the total number of workers employed in fur manufacturing during the fifties. New job openings will be limited mostly to the replacement of workers who die, retire, or leave the industry. Since the number of workers employed in fur manufacturing is small, these vacancies will be
relative few. In the long run, the fur industry will continue to benefit by the ever-increasing production of inexpensive fur garments—a trend that has been evident for the past 30 years. However, any increases in fur manufacturing operations will most likely result in a longer working season and fuller employment of the current number of workers rather than a substantial increase in the employment level.

As chart 75 shows, employment in fur goods manufacturing in 1947 was lower than in the twenties; in dressing and dyeing, the employment trend has been upward, but only lately so. These trends contrast sharply with the great expansion that occurred in most industries over this period.

The fur industry depends on general economic conditions. When times are bad, the sale of fur coats drops sharply and fur workers are especially hard hit.

Even during prosperous years, fur workers rarely work full time all year. Making fur coats has always been seasonal and many fur workers find themselves out of work during January, February, March, and April. This situation especially affects those working in plants where ready-made garments are produced. In 1947, for example, employment in fur garment manufacturing plants ranged from a little over 10,000 in January and February to almost 18,000 at the peak of the season in November. In addition, there is a large turn-over among the small garment manufacturers and many go out of business at the end of the season.

Although the number of workers in fur dyeing and dressing does not change as much during the year, many work only part time in the spring. By comparison, fur workers in the retail shops have steadier employment throughout the year than other fur workers. Their work on new coats is concentrated in the fall or winter months, but restyling and repair work help to keep them busy much of the rest of the year.

Fur Manufacturing Workers and Their Jobs

Most of the workers in the fur trades are members of the International Fur and Leather Workers. Nonunion workers are employed mainly in retail fur shops outside of New York City, particularly in many of the smaller towns. The union limits the number admitted to membership; this policy was adopted because the field is small and easily overcrowded, and because the unstable and seasonal nature of the industry has resulted in unemployment and low incomes for fur workers in less prosperous times.

It is difficult for newcomers to get into fur manufacturing occupations. A large proportion of fur manufacturing workers are highly skilled. For one thing, furs are more difficult to work with than many other materials. But even more important, they are more valuable. In fur garment manufacturing—which is essentially a hand process—skilled workers outnumber the unskilled about four to one. Restyling and repair in general require no less skill than new coat manufacture, and so in retail fur work, skilled workers also outnumber other employees. However, semiskilled and unskilled workers hold most of the jobs in fur dressing and dyeing.

Skilled workers in the fur industry are taught their trade on the job as learners. There are few organized apprenticeship programs with prescribed training schedules or wage scales. Learners generally begin at unskilled workers’ wages and their pay increases as they progress in their work.

Many learners in the fur trades attend school in the evening while training on the job. Vocational schools in the larger cities throughout the country offer needlecraft courses which are helpful as background, but do not offer direct training for fur workers. The Central High School of Needle Trades in New York City is the only public vocational school that has a department dealing specifically with fur work. Besides the training in fur manufacturing crafts, instruction is given in the technical side of fur coat manufacture, fur dressing, and fur dyeing. In addition, New York University offers courses in fur merchandising.

Fur manufacturing jobs generally are not hazardous. In fur garment making, the close attention to detail is often fatiguing and some of the jobs, particularly sewing machine operating, are monotonous. Pressing and dyeing plants are pervaded by mixed odors of raw pelts, dyes, and tanning solution. Much of this work is hard physical labor.
Most of the workers in fur dressing and dyeing plants are semiskilled workers or unskilled laborers who handle the furs as they go through the various processes. Fleshers and blenders are the skilled craftsmen in fur dressing and dyeing. They probably include about a third of the 6,000 to 7,000 people employed in fur dressing and dyeing plants.

Fleshers (D. O. T. 7–13.712) pull fur skins back and forth across a stationary knife or revolving blade in order to scrape from the inside of the pelts the thin film of tissue which must be removed to allow the tanning chemicals to work efficiently. Fleshing is a very delicate operation—one that requires considerable skill and dexterity. Any excessive pressure on the keen-edged fleshers' knife will cut through the hair roots embedded in the skin and damage the fur. Except for the substitution of the revolving blade for the stationary knife to facilitate the handling of some of the cheaper skins, fleshing has not changed much since ancient times. From time to time, automatic fleshing machines have been used experimentally. But manual methods—calling for a high degree of skill—are still in general use, and are likely to continue, since many types of skins cannot be fleshed by machine without injury to the fur.

There is generally no organized apprenticeship for this occupation: in order to qualify as a journeyman, the flesher must have several years of training on the job.

Fleshers are paid piece rates—the amount depending on the type of fur—but are guaranteed a minimum wage which amounted to $1.50 an hour ($52.50 for a 35-hour week) in union shops in the early part of 1948. However, the average wage greatly exceeds the minimum, and some fleshers receive as much as $175 a week during the busy season. However, the work tends to be highly seasonal. Fleshers usually work part time during the slack season, dividing among themselves what work there is in the shop.

Blenders (D. O. T. 7–18.921) dye furs by hand, using feathers or very fine brushes. In the most common type of blending, called “feathering”, the blender dips his feather into a pot of dye and strokes it lightly across the tips of the long over-hair until the desired depth of color is obtained. Pale or off-color pelts of high-priced furs, such as mink, are feather-blended to make them look the same as better-colored skins. Feather-blending is
also used to simulate the characteristics of rare furs in cheaper skins. Stripping—the ruling in of lines on a fur coat with a brush—is another form of blending. Muskrat, rabbit, marmot, and other less costly furs are striped to imitate such furs as sable and mink.

Formerly all furs were dyed by hand. Ground-dyes were brushed over the entire surface of the coat and pounded into the fur with especially adapted beating brushes. Now, since the development of dyes that are not harmful to the leather, many different types of furs are vat-dyed—that is, simply immersed in a vat filled with dyestuff. Then too, there are brushing or “topping” machines which apply top-dyes mechanically. However, in spite of these developments, a great many furs still require the individual attention and careful treatment that can be given only by the blender’s skillful hands. In this category are the luxurious furs such as mink and sable, and the imitations of these furs created from cheaper skins.

Blenders are usually recruited from the ranks of unskilled or semiskilled workers in the blending department or dyehouse. Beginners receive a learner’s wage until they become recognized as full-fledged blenders, but there is no formal apprenticeship.

Blenders are paid piece rates. However, they were guaranteed at least $1.50 an hour in the union contracts in force during the early part of 1948. Although average hourly earnings greatly exceed $1.50, frequent lay-offs have made annual earnings rather low in all but very good years.

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Drummers and stretchers are the most numerous of the semiskilled workers. The drummer (D. O. T. 5-57.610) has charge of the revolving drums and cages used to clean and condition fur pelts. Fur pelts are stretched in various ways. Sometimes they are stretched by hand. The stretcher (D. O. T. 7-13.704) holds the skin flat on a table with one hand and pulls it taut with the other. This is a relatively simple job, but one that calls for a lot of strength in the fingers and palms of the hands. Sometimes the stretcher (or puller) pulls softened or oiled skins over a dull vertical blade to open the fibers of the skin. For some furs, stretching or “staking” machines are used in place of the vertical blade. The pelt is slipped over a pair of staking irons. As the stretcher presses a pedal the irons are spread apart, and the skin is stretched and softened.

Other semiskilled workers include pluckers and shearers (D. O. T. 7-13.725). The pluckers remove long, coarse hairs with a knife from flat skins such as beaver. Shearers operate fur cutting or shearing machines which will cut the hair to any length desired.

In most of the less skilled work around the plant, job lines are not very distinct. Although a worker may be classed as a drummer, for example, he would be familiar with other work in the shop. It is common practice for workers to exchange jobs, or for a number of men to work as a crew.

Jobs in Fur Garment Manufacturing

Unlike the fur dressing and dyeing, a large proportion of the jobs in plants producing ready-made fur garments are skilled. Cutters, sewing machine operators, nailers, and finishers are the four principal craftsmen in fur-garment manufacturing. About four out of every five workers in shops which turn out ready-made fur clothing are members of one of these crafts. As a team, they do the job that was once done in its entirety by the traditional old-time furrier.

Most highly skilled of the specialized fur workers is the cutter (D. O. T. 4-21.210). It is his job to see that the best possible use is made of the expensive fur. First, he selects enough skins from stock to make up one garment, matching them for size, color, and texture. Then he trims each skin with his razor-edged furrier’s knife, stretches it, and lays it out on the coat pattern. When the layout is complete, the cutter shapes the fur pieces so that they may be assembled into a garment.

The sewing machine operator (D. O. T. 6-21.110) sews the skins together into sections of a coat, by means of a power-driven fur-joining machine that sews an overcast stitch. Later on, he closes the coat—that is, joins the sections, attaches the collar, and assembles the sleeves into the body of the garment. Although sewing machine operators are less skilled than cutters, they must be fast and accurate. The appearance and value of any fur garment depends to a large extent upon the skillful joining of skins.

Fur sections go from the sewing machine operator to the nailer (D. O. T. 6-21.210), who fits
them to the pattern of the coat. The nailer chalks an outline from a paper pattern on a board surface, dampens the skin side of the fur with a wet brush, and places the fur (with the skin side up) over the chalk outline. One edge of the coat section is nailed along the border and the fur is stretched, by hand or with pliers, to cover the outline. Remaining edges are nailed to the table, and the skins are allowed to dry in this stretched position. Once the coat sections are dry, they are squared—trimmed to the exact measurements of the pattern—by either the nailer or a squarer. Then they are sent back to the sewing machine operator for closing.

Now the coat is ready for the finishers (D. O. T. 4–21.110) who perform the tasks necessary to complete the garment, such as cutting, fitting, and sewing in linings, inserting shoulder pads, and attaching buttons. Some of the finishing work is done by sewing machine, some of it by hand. The work of the finisher may be broken down into various jobs depending upon the size of the shop. Some finishers may do nothing but cut linings or cut and fit linings; others may specialize in hand stitching or machine stitching.

Floor workers (unskilled laborers who run errands and do odd jobs in the production end of the business) plus a few semiskilled workers, make up the rest of the working force.

The skilled fur garment worker learns his craft on the job. The length of the training period depends upon the learner's previous experience (he is often chosen from the unskilled workers in the shop) and upon his aptitude for the work. Cutters usually qualify for work on inexpensive furs in about 2 years, but before they can be trusted with very expensive skins they must have several years of additional experience. The same thing holds true for other fur workers, except that the learning period is shorter. Finishers are often already skilled in needlework when they go into fur work, but must have additional training.

As of the early part of 1948, first-grade cutters were guaranteed a minimum of $75 for a 35-hour week by union contract, first-grade operators $64, and first-grade nailers $59. Second-grade cutters (those working on cheaper skins) were guaranteed $64, operators and nailers $54. The minimum for finishers was $53. Average weekly earnings were much higher; very few work for the minimum.

Jobs in Retail Fur Shops

In the retail establishments, there are not many specialized craftsmen such as are found in the plants which turn out ready-made fur garments. Skilled workers are known as furriers (D. O. T. 4–21.010), all-round craftsmen capable of cutting furs, operating a sewing machine, nailing, and finishing. In the smaller shop, the furrier actually performs all of these various operations. In larger establishments, he may concentrate on the work requiring the most skill, such as cutting and designing (i.e., improvising on existing designs or patterns). Apprentices, learners, and other partly trained workers may do the joining and nailing, and seamstresses the finishing work—all, of course, under the supervision of the master furrier.

Of the furriers in retail trade, the majority are employed in department stores and other retail outlets for ready-made fur garments which keep a staff of fur workers for the alteration, repair, and remodeling of fur garments. The remainder—almost half of the total—are found in retail fur shops. Many of them are the owners or managers of shops which they usually run unassisted or with a small staff. A large number of fur shops are devoted almost exclusively to fur garment repair and to cleaning and storage services; others sell fur coats, both factory-made and custom-made.

One who wishes to qualify as a retail furrier must obtain several years of experience in an established shop. The learner usually begins with unskilled work, graduates to skilled operations, and shifts from one job to another until (usually after a period of 4 or 5 years) he has acquired the versatility of a master furrier.

Furriers employed by retail fur shops and department stores in New York City made at least $75 a week in early 1948, but the majority earned considerably more. Earnings in smaller cities were somewhat lower.
Fur Designers

(D. O. T. 0-46.06)

This is a very small and highly skilled occupation. Fur designers create original designs for fur garments and invent new variations in basic designs. Considerable imagination and ingenuity is necessary to develop styles that appear noticeably different from last year's models. In addition to creating the styles, fur designers may make, or supervise the making of, canvas models from the patterns, and they often draw lay-outs showing how the skins are to be used in making a particular fur garment.

Some designers work in pattern making houses, where ideas are sketched and drafted into patterns to sell to fur garment manufacturers and retail furriers. Others are employed by manufacturing firms and by a few of the larger retail fur shops which keep a designer on the staff to sketch models and draft patterns.

There are furriers in retail shops all over the country who occasionally do some designing as a part of their regular job of making or remodeling fur coats. But nearly all of the full-time designers work in New York City, where most of the pattern making and wholesale manufacturing houses are located.

Usually fur designers break into the field by getting experience in pattern making houses. They advance from pattern cutting and pattern making to designing as they become more proficient. Furriers in fur shops and designers of cloth coats and dresses occasionally take up fur designing. Courses in sketching, pattern making, costume designing, and other related subjects are helpful.

Designers employed in ready-made fur garment plants in New York City were guaranteed at least $90 a week by union contract in early 1948. On the whole, designers regularly employed by a firm usually make anywhere between $5,000 and $10,000 a year if they have a steady job as a salaried worker. Some are partners in designing and patternmaking houses which sell their patterns to manufacturers on a fee basis.
NONMANUFACTURING

THE BUILDING TRADES

The building trades are the largest related group of skilled workers in the United States. Altogether, there are close to two million skilled building trades workers, divided among some two dozen crafts. The largest of these is carpentry, with more than half a million journeymen. Painters, and plumbers and pipefitters, are the next largest groups, with a quarter of a million men or more in each. These approximate figures refer to all workers in these trades, including men who work outside the construction field. In contrast are trades with only a few thousand workers each, a few of which are asbestos workers, elevator constructors, and stonemasons.

The building trades have many advantages: Satisfying and varied work; opportunity for development and improvement in skill; the prestige that comes from membership in a recognized, respected group of workers; much greater independence than is to be found in many other occupations; employment opportunities in all parts of the country, even for the small trades; opportunity for advancement, including a better opportunity to establish an independent business than is present in most factory occupations; and high hourly wage rates. Offsetting these are some disadvantages: Greater variation in employment with general business conditions than in many other occupations; seasonal irregularity in employment, with lost time from bad weather and other causes even during peak months; varying and sometimes inconvenient location of the place of employment; and a few others of less importance.

Where Workers in Building Trades Are Employed

Men in the building trades work mainly in the contract construction industry; some work on "force-account" construction, some are self-employed, and some use their construction skills on various types of work in manufacturing or other industries.

The Contract Construction Industry

Most building tradesmen work in the contract construction industry. This industry is made up of three groups: builders, general contractors, and special trade contractors.

The builders construct houses or other buildings on their own account, for sale or for rent, buying materials, hiring workmen, and, for the construction operations proper, doing the same management job that would be done by a general contractor.

General contractors construct buildings and other structures (dams, bridges, roads, etc.) for others, taking full responsibility for the complete job, except that specified portions of the structure or specified trades in some cases are omitted from the general contract. They are responsible for the coordination and satisfactory completion of all work within the general contract. Ordinarily they do most of the work with their own crews, subletting to others the types of work for which they are not prepared, but practice varies with respect to the types of work which are sublet. General contractors are usually classified as building contractors, highway contractors, and heavy construction contractors; most of them limit their activities to one of these fields.

Special trade contractors do the work of only one trade, or of two or more closely related trades (painting, electrical work, plumbing with or without heating, plastering with or without lathing, etc.), and, beyond fitting their work to that of the other trades, have no responsibility for the structure as a whole. The special trade contractors obtain contracts and other orders for their work on new buildings and on extensive alterations from general contractors, and also directly from property owners. Repair work is almost always done on direct order from the owners, occupants, or rental agents.

There were about 215,000 establishments in the contract construction industry in 1939, according to the 1939 Census of Construction, the last year for which detailed figures are available; tabulations of Social Security data and other information indicate that there are more establishments now. Most of the establishments are fairly small, particularly in special trade contracting. Among
all classes of contractors, however, there are firms of every size, suited to every type and size of job.

**Other Sources of Employment**

In force-account construction and maintenance, the owner hires workmen directly and provides materials and equipment, rather than using the services of a contractor. Such work is carried out by business establishments of many different kinds, by government bodies, and occasionally by individuals. Although this method is occasionally followed for large new projects, its principal field is maintenance, repair, minor alteration and additions, and similar small jobs. It is particularly important in highway maintenance, in maintenance and small recurring additions made by utility companies to their plants, and in maintenance and small alterations at many kinds of business establishments—hotels, department stores, office buildings, and factories. In the types of work done and working conditions, force-account employment on the whole is very similar to employment by contractors who specialize in maintenance, repair, and alteration jobs. Ordinarily the wage rates are lower than those paid in contract construction, but employment is usu-
ally more regular and annual earnings may actually be higher.

The principal remaining type of employment open to building trades workers is self-employment, in which a journeyman works directly for a series of property owners on small jobs. He may be paid by the hour or the day, or may be paid an agreed price for the job, either providing the materials and including them in the price or using materials provided by the owner. Self-employment is more common in carpentry and painting, but is found in other trades as well. Since a contractor's license is usually required for any person operating on his own account in plumbing and electrical work, there is less self-employment in those fields. In carpentry it has been reduced to some degree by the increased prominence of “home improvement” contractors, many of whom maintain showrooms and seem to be more capable than most journeymen in soliciting orders for small jobs of all sorts.

For a number of the trades there is also factory employment using the full trade skills, on work not related to construction. This varies in importance among the trades, but under ordinary circumstances is small except in the case of boilermakers, for whom it is a major source of employment.

In a period of defense mobilization, opportunities for factory employment increase for a number of the trades. To a considerable extent, the trades most needed in a defense construction program are also the trades whose skills are most directly useful in defense factory production. Force-account employment is increased for those trades needed in maintenance, repairs, and routine plant alterations and improvements, for example, carpenters, plumbers and pipefitters, and electricians. These men, along with painters and boilermakers, are needed for repair of ships. Sheet-metal workers are needed at aircraft plants when activity is increasing, although semiskilled workers are employed for much of the work.

Factory employment for some of the other trades is much smaller, because their skills are less directly applicable. Trades such as stonemasons, plasterers, lathers, roofers, and the marble and tile group would be adversely affected by a large scale mobilization effort.

Classes of Workers

Construction is primarily an industry of journeymen because the widely differing conditions under which the work must be done call for men with sound knowledge of what they are doing, familiarity with the related work of others, knowledge of the materials with which they are dealing, and the experience and dexterity to work in inconvenient locations and positions. On alteration and repair work these abilities are needed even more than on new work. There are some operations which can be done effectively by relatively unskilled men who are able to use a few tools and to do some of the easier jobs; but there are not many such jobs, and they are becoming fewer.

For purposes of discussion the skilled building trades may be grouped into three major classes: structural, finishing, and mechanical trades. Men in several of the occupations may do work in more than one of these classifications; for example, carpenters do both structural and finishing work. Members of all trades do maintenance, alteration, and repair work as well as new construction.

The structural trades include such occupations as carpenters, bricklayers, stonemasons, cement finishers, structural iron workers, ornamental iron workers, reinforcing iron workers (rodmen), riggers (not described in this handbook), boilermakers (see p. 221), and operating engineers.

The finishing trades include such occupations as lathers, plasterers, marble setters, tile setters, terrazzo workers, painters, paperhangers, soft floor layers (a small occupation, recognized as a separate trade in some localities but not in others, and for which a separate section has not been prepared in this handbook), glaziers, roofers, and asbestos workers.

The mechanical trades include such occupations as plumbers and pipefitters, electricians, sheet metal workers, and elevator constructors.

In the sections on the individual trades, the descriptions of their work are intended to give only a general picture. Because of local differences in custom they do not apply fully to all localities. They are not statements or recommendations on the jurisdiction of any trade, and are not valid for use as such in jurisdictional negotiations or the settlement of any jurisdictional disagreement.
In addition to journeymen there are semiskilled workers and laborers. The semiskilled workers are in two main groups—tenders and truck drivers. The tenders work mainly with bricklayers, plasterers, tile setters, and marble setters, although some work with other trades. These men mix mortar, supply the journeymen with materials, set up and remove portable scaffolding, and do numerous other supplementary jobs. They do not use tools, are not engaged in learning the trade which they are tending, and continue permanently as general assistants in a particular trade. At one time helpers who used tools and performed the simpler trade operations were numerous in many trades, and the abler of these men frequently advanced to journeyman status. Helpers of this type are now much less numerous, and their status is much less promising. They are recognized under union agreements only in elevator construction and in boilermaking (there is provision for helpers to advance to journeyman status in construction boilermaking, but not in shop boilermaking), and in other trades they are not employed on union jobs. Truck drivers in construction do not differ significantly in duties or requirements from those in many other industries. Laborers do many kinds of work for which formal training is not necessary, but for most of which experience is important. They make up a larger part of the workers in nonbuilding than in building construction. Tenders and others having higher pay scales are usually drawn from the ranks of laborers.

**Outlook**

The long-range outlook is good for almost all of the building trades. Their work is an essential part of the Nation’s economy at all times, although its volume varies more with general business conditions than does the volume of work in many other industries. The number of new workers needed to replace those lost by death and retirement will be unusually high for several years, because a high percentage of present journeymen in some of the trades are in the older age groups. This results from the long curtailment of apprenticeship training during the depression and during World War II.

Over the long run, changes in design and technological changes should continue to affect the relative needs for the different construction trades. Developments in design, materials, tools, and equipment will also change the nature of the work done by individual trades. During the past 75 years, occupations such as carpenters, bricklayers, and plasterers have declined in relative importance, although the number of workers in these trades has increased because of the growth in total construction activity. On the other hand, plumbers, electricians, and several other trades have grown rapidly since 1900, as their work became more prominent in many types of construction.

There is no danger that the trades as a whole, and only negligible risk that any of them individually, will become obsolete. During the past generation the nature of the work has changed to some degree for all the trades; for several the changes have been quite extensive, and for most of them changes are still taking place. This, however, is a continuation of an old course of development which has been absorbed by the existing trades as it occurred. Journeymen will find it necessary to familiarize themselves with new materials and new methods from time to time, just as they have in the past, but their skills will continue to be needed. Standardization of dimensions and materials, more complete factory processing, new materials, increased mechanization, and similar results of advancing technology will neither abolish journeymen’s work nor convert it into routine semiskilled operations.

Although prospects are decidedly good for construction workers as a whole, they differ among the individual trades; this is discussed in the sections on each trade.

Opportunities to enter the individual trades necessarily differ with the size of the trade, as well as with prospects for its type of work. To cite one example, the outlook for elevator constructors is excellent, as their work seems likely to increase in prominence. This will continue to be one of the distinctly small trades, however, and the rate at which it can receive additional workers is correspondingly limited. In the long run, employment is likely to increase proportionately much more in this trade than in carpentry, but because of the relative size of the two occupations the number of openings for new workers each year in carpentry is about 50 times as great.
Entrance opportunities also differ by locality with the size of the trade. Carpenters live and work throughout the country, even in many of the smallest rural settlements, and there are opportunities in small as well as large places. The same is true for a number of other trades, although not always to quite the same degree—particularly for bricklayers, painters, plumbers and pipe fitters, and electricians. Other trades are predominantly urban—marble setting and steel erection, for example. Although the contractors for such work operate in places of all sizes, whenever a job occurs, their places of business are for the most part in fairly large cities, and it is there the training opportunities exist.

Business Cycles and Construction Employment

Quite the most serious disadvantage of construction as a field of work is general unemployment during times of low business activity.

As can be seen in chart 17, page 29, employment on contract construction declined considerably during the 1930's after averaging 1,500,000 in 1929, and did not regain the 1929 level until the defense boom of 1941.

It seems likely that measures will be taken to reduce the extent of such unemployment in the future, but complete prevention would require the meeting of some extremely serious problems for which there is as yet no clear solution in sight. The industry's products—buildings and other structures—are among the most durable of all durable goods. The existing supply of houses, factories, department store buildings, or almost any other type of structure is many times as great as a single year's production. Hence when unfavorable business conditions bring reduction in the demand for housing accommodations or office space or any other kind of facilities, the existing supply meets the demand much more fully than before; if there is a large decrease in demand for total accommodations of any kind, the existing supply may be more than sufficient and may provide a high margin of vacancy. The demand for new construction necessarily decreases much more than the demand for total accommodations, and employment of construction workers goes down accordingly. This situation seems to be basic for private housing accommodations built for sale or rent, for commercial and industrial buildings, and for a considerable part of utility construction. Nonprofit private building, such as churches, schools, hospitals, etc., is reduced at the same time because it is harder to raise money during such periods.

A reduction in privately financed construction can be slightly offset by an increase in public projects, but not to any great degree. Public construction consists to a large extent of nonbuilding projects, in which labor requirements are quite different from those in building construction. Increased expenditure for highways, for example, would bring more jobs for men in some occupations (particularly operating engineers, truck drivers, and laborers), but would add very few for bricklayers, painters, and numerous other trades that are employed largely on buildings.

Public construction cannot easily be increased enough to offset a large drop in private building. Expenditures in 1949 were about 12.5 billion dollars in current prices for private building construction, and about 2.4 billion dollars for public building construction—a ratio of about 5 to 1. This ratio has varied, and in most peacetime years has been much higher. Even at this ratio, it would take a 50 percent increase in public building activity to offset a 10 percent decrease in private building activity, and a doubling of public building to offset a 20 percent reduction in private building. The expansion of public construction involves a number of very serious problems and cannot be regarded as a simple, dependable adjustment that will be provided automatically as needed.

Men in the building trades who do maintenance and repair work in industries other than the construction industry do not feel the full effects of the severe fluctuations in construction activity.

Seasonality and Lost Time

The other important disadvantage of building work is loss of time. Seasonal unemployment is a very old problem in construction. Much of the work is outdoors, where both materials and workmen are affected by the weather. Later indoor work is also affected, although usually to a lesser degree, because of seasonal variation in the rate at which buildings are ready for these operations.
Before World War II there was also some artificial increase in seasonal irregularity of residential building in many localities. This resulted from a tendency to schedule houses and apartment buildings so that they would be ready shortly before one or two annual "moving days."

In 1939, for example, employment in the low month was 25 percent below the annual average and in the high month the number employed was 16 percent above the annual average. In general, employment was most regular in those trades where alterations, maintenance and repairs indoors are important—electrical work, plumbing, glazing, and elevator construction. Painting and paperhanging were outstanding exceptions. These had the highest percentages of seasonal drop in employment despite the importance of indoor redecorating, because the winter months are unpopular for such work.

Little more than a quarter of the men in the construction industry were employed throughout 1939, not quite half for as much as 9 months, and slightly over a quarter for from 6 to 8 months, according to the 1940 Census. Seasonal unemployment has probably been considerably less since World War II but monthly employment estimates for the contract construction industry show that it has not been eliminated by any means, and the conditions under which so much of the work is done give little basis for expecting that it will be. Unemployment compensation alleviates the hardships of seasonal unemployment, but, of course, the benefits are much below full-time earnings.

The experience of individual workers with respect to seasonal unemployment varies, partly because of differences in ability, and partly because of luck. Standard practice is that workers are laid off as soon as their work at a given project is finished, unless the contractor has another project to which he can transfer them. In a lay-off he keeps the men whom he regards as most capable, and if his volume of employment does not fall to zero, is likely to employ some men continuously over a period of years. But other men, equally capable, are laid off because their employers' work falls off completely.

Apart from seasonal unemployment is the loss of time at all seasons of the year, with a corresponding reduction in earnings. The principal cause is bad weather, at least in outdoor work, but there are a number of additional causes. It may be necessary to postpone work until the related work of other trades is ready, there may be a shortage of materials, or a delay while the owner is considering changes in design, or other interruptions may occur. Time is also lost for personal reasons, such as sickness, attending to personal business, etc. Lay-offs occur during the busiest construction season, as given contractors pass their peaks. New jobs are readily available at such times, but not always without some loss of time; a man laid off at noon or in early afternoon can sometimes start work immediately at another building nearby, but in other cases may not have a new job until the next day. During the less active construction months, when there are fewer jobs available and more applicants, the time lost in hunting a job is likely to be much greater.

Effects of Defense Mobilization

Building trades employment is affected directly by the extent of the Nation's defense mobilization. If there is an increase in mobilization effort during a time of high general employment, construction comes into competition very rapidly with other civilian industries for many important materials. Unless this increase in mobilization effort is quite small, the competition is likely to lead to curtailment of construction.

The effect of such curtailment differs widely among the different trades and differs with the extent and type of mobilization effort being pursued. During World War II, housing and most of the other customary types of construction were severely restricted. At the same time there was a tremendous expansion in industrial building and in military and naval construction immediately preceding and during the early part of the war. At this stage, skilled workers in some of the trades—carpenters, electricians, plumbers and pipefitters, operating engineers, and a few others—were fully employed in the war construction program. On the other hand, many journeymen in trades, such as bricklaying, plastering, paperhanging, and several of the smaller trades, whose work was not greatly used in this program, were not able to get jobs using their trade skills.
Training for the Skilled Trades

The accepted method of training for practically all the skilled building trades is through apprenticeship. This is beyond question the most satisfactory course available thus far, even though present apprenticeship training programs cannot be regarded as beyond the possibility of improvement. In addition, however, many thousands of workers have become journeymen through informal training. After several years' experience as helpers, they acquired enough proficiency to meet local standards for skilled workmen. While still possible under some conditions, this path to journeyman status is more difficult than in the past; it has many disadvantages, and it can lead to severe disappointment.

Standard apprenticeship in any trade is carried out under the supervision of a joint committee representing the union local and the local contractors. A 4-year apprenticeship is most common, but the length of the training period varies. The minimum number of hours of work experience in each major type of work is usually specified.

During this period the apprentice is paid at an advancing rate, ordinarily starting at 40 to 50 percent of the journeyman's current hourly rate and increasing at half-yearly intervals. In the final 6 months, it is usually about 90 percent of the journeyman's rate. Often, advanced apprenticeship standing is given for skill acquired in the armed services and, occasionally, for skill acquired otherwise. The granting of such credit and its extent are always on an individual basis, ordinarily governed by demonstration of skill and knowledge.

For some of the trades, an apprentice ordinarily works for a single contractor throughout the entire training period, but is transferred by the committee to another employer if the original contractor is unable to provide continuous employment or reasonably balanced training. In other trades, where specialization by contractors is extensive, it is customary for the joint committee to transfer apprentices at intervals of about 6 months.

As an employee, an apprentice works with the tools of the trade, doing work of progressively increasing difficulty and having progressively less supervision. It is the responsibility of the journeymen on the job and the foreman to explain to him the work being done and to show him how different operations are performed and different tools are used. Ordinarily most of this instruction is given by a particular journeyman to whom the apprentice is assigned at the time.

Under approved apprenticeship agreements an apprentice also attends school, usually 8 hours a week for 36 weeks each year. Instruction varies among trades but usually follows a general outline: History of the trade; characteristics of the materials; shop mathematics as related to the trade's work; rudiments of engineering where appropriate (particularly for pipe work, ventilating, and electrical work); sketching, elementary drafting, interpretation of drawings; and special trade theory such as color harmony for painters, elementary sanitation for plumbers, etc. In small localities, where there may be only one apprentice and half a dozen journeymen in a trade, courses specially devised for apprentices are seldom offered. Here use is made of courses offered in the local high school, such as drafting and interpretation of drawings, shop mathematics, or anything else that is directly serviceable. Gaps may be made up to some degree through personal instruction by the local journeymen and contractors, or in some cases, by correspondence courses.

This kind of apprenticeship is provided under joint union-contractor auspices. In some trades and localities nonunion apprenticeship occurs also. Here the apprentice's agreement is with a single contractor, and there is no joint committee to supervise the training offered, to adjudicate differences, or to arrange a transfer in cases of personal incompatibility between the apprentice and the contractor. The apprentice's training depends to a high degree on the contractor's fortunes and policies. If the contractor lacks continuous work or has only a restricted type of work, he cannot give continuous, rounded training, however good his intentions may be, although he may be able to transfer or loan the apprentice to another contractor. If he regards apprenticeship primarily as a means of getting low-wage workers, the apprentice will probably end his course with ability to perform the commoner operations of his trade rapidly and capably but without a thorough knowledge of the trade or of the theory on which the work is based, and with little experience in the less common types of work.
There is no doubt that thousands of workmen have obtained sound training in nonunion apprenticeships, but the conditions present make some precautions quite important. Since there will not be the protection of a joint apprenticeship committee, before signing any agreement the apprentice should inquire carefully as to the contractor's responsibility and reputation, both for personal dealings and for reasonably good standards of workmanship. The written apprenticeship agreement should specify clearly the type and extent of training, the starting wage rate, and the schedule of wage advances. If the apprenticeship does not provide for classroom training, every effort should be made to obtain related instruction in a local night school or trade school or through a correspondence course. A man considering a non-union apprenticeship should recognize that there is no assurance of his being able to acquire union membership at a later date and that lack of union membership may be a serious handicap.

Many journeymen have "picked up" their trades by working as helpers for several years, and no doubt others are doing so now. Except for elevator constructors and boilermakers, for whom this procedure is recognized, it is a most unpromising course. It can be successful under favorable circumstances, including marked aptitude on the part of the worker, but there is serious risk that he may never gain enough skill or knowledge to rise above the status of handyman. Night school classes or correspondence courses are especially important for those trying to train themselves in this way; the type of knowledge gained through classroom training is just as necessary a part of journeyman ability as facility in the use of tools.

In a number of localities there are proprietary trade schools giving instruction in some of the building trades, which in some cases is offered as a satisfactory alternate to apprenticeship. These schools vary greatly in standards and responsibility, but at best do not give work experience comparable to that of apprenticeship. For those trying to learn a trade outside of standard apprenticeship, a responsible proprietary school can give useful classroom training which might otherwise be unobtainable. The poorer schools of this type are practically worthless, and enrollment in any of them is an almost complete waste of time and money.

**Wage Rates and Earnings**

Hourly wage rates in the construction trades are high as compared to hourly rates in most other occupations requiring comparable skill. Annual earnings, however, have been below those for many industries with lower hourly wage rates but more regular employment, and have varied more with general business conditions than have annual earnings in most industries.

Hourly wage rates in a number of larger cities are given in the sections on the individual trades. These rates are for work during standard working hours. The most common working hours are 8:00 a.m. to 12:00 noon and 12:30 p.m. to 4:30 p.m. on Monday through Friday, with overtime rates usually paid for work at any other time regardless of whether the standard hours have been worked. For some trades and some localities, and for certain types of work, other workweeks have been established, most of them 35 or 30 hours.

Hourly rates similar to those published for the individual trades do not apply to all construction workers, however. In small cities, and particularly in rural areas distant from metropolitan centers, the rates are ordinarily lower. Rates for maintenance journeymen employed in other industries in most cases are below the established scales for the construction industry. Even for new construction in the cities listed, the hourly wage rates would be misleading if understood to indicate full-time earnings throughout the year. For many workers there are likely to be weeks in winter with no work and no earnings, and weeks at all times of the year with a loss of time and a corresponding reduction in earnings.

For a while after World War II, premiums above established wage scales were fairly common because of labor shortages and the generally hectic conditions associated with construction. These premiums began to decline in both frequency and extent, as soon as there was an approach to more normal conditions, and at the end of 1949 they were quite unimportant. However, in late summer and fall of 1950 they were again prominent, because of the record breaking volume of construction (particularly residential building). They are present during labor shortages only, and during ordinary good times are not a conspicuous feature of construction activity even during the busiest part of the construction season. During
the busiest season, overtime work has often been fairly important, however.

Before World War II, in many localities the workers were paid union rates on all important buildings and on certain other classes of work, while ordinary houses and other small buildings were built by nonunion workers at considerably lower wage rates. This situation is now much less common, but is present in some areas; whether it will become more or less widespread, or continue as at present, remains to be seen.

Where To Get More Information on the Building Trades

A great deal of additional information is given in the following bulletin:


Carpenters

(D. O. T. 5-25.110 to .830)

Outlook Summary

The long-run outlook for carpenters is very good, but employment opportunities in the early fifties will be affected by restrictions caused by military and industrial mobilization.

Nature of Work

Carpentry is the largest single construction trade from the standpoint of the number of workers and, in some respects, is the most extensive in the range of work done. Historically, it has dealt with wood, but within recent years many other materials have been added to the carpentry field.

Most houses are of frame construction, and here the structure proper above the foundation is entirely or almost entirely the work of carpenters. Brick veneer houses, popular in many localities, are of frame construction built by carpenters, covered with an outer layer of brick. All but a few masonry houses and many other masonry buildings also use wood construction for floors, roofs, and stairs, and this work too is done by carpenters.

All finish woodwork (doors, windows, surrounding trim for both, finish floors, cabinets, moldings, etc.) with supplementary hardware is carpentry. Several kinds of acoustical materials are in the carpentry field; so are numerous other materials which have come into prominence during the last quarter century. In many localities, the materials for general building insulation have been applied to houses by carpenters. "Soft" floors of linoleum, asphalt tile, and other materials are laid by carpenters in many localities.

Carpenters build forms into which concrete is poured for buildings, foundations, bridges, etc.; they also build scaffolds and platforms, towers for material hoists, safety barricades, chutes for materials and rubbish, and temporary buildings, like material or tool sheds and contractors' field offices.

A very important classification of work is repair, alteration, and additions to existing structures. Such jobs differ greatly in extent, from replacement of a few decayed pieces in a porch to complete rearrangement of the interior of a building; they last from a few hours to several weeks or a few months.

Within recent years, modernization of old frame houses, enclosure of porches, and a wide variety of other improvements have become important as a source of employment. Carpentry is by far the most important trade in alteration and repair work.

Another branch of the trade deals with heavy timbers for docks, railroad trestles, cribbing and shoring, and similar heavy construction.

A thoroughly trained carpenter can do all of these types of work and others not mentioned, but the field is so broad that many journeymen confine themselves to selected parts as a matter of preference whenever such work is available. Some are "trimmers," installing millwork and finish hardware; others lay hardwood floors; others prefer framing and rough carpentry; others prefer alteration and repair work or the building of forms for concrete. These subdivisions are not trades in themselves, and, for the most part, basic journeyman competence is essential for competence within
the specialty. Individual differences in aptitude are important in determining the area of specialization.

Specialization is naturally most common in the large cities. In small communities carpenters ordinarily do all types of work within their trade, and in rural areas they frequently do some types of work which are performed in larger places by other trades.

Where Employed

Most carpenters work in the construction industry. A large number are self-employed on repairs, alterations, and small new buildings. In many cases, these men alternate between wage-employment for contractors and self-employment on small jobs. Some self-employed carpenters are able to expand their activity to contracting—hiring other journeymen, and perhaps awarding some subcontracts. Many thousands of carpenters work for "home improvement" firms on repairs, small alterations, modernization, and miscellaneous improvements. A great many carpenters are employed in other industries on maintenance work and alterations or force-account new construction. These men are also employed in factories of all types for maintenance and repair, for small alterations, for such work as building sheds and all sorts of factory equipment which is made of wood—racks, benches, wooden templates, etc. Carpenters are similarly employed as "house carpenters" in hotels, large office buildings, department stores, and other large establishments. They are employed by firms or individuals with large real estate holdings and by public bodies, such as cities and boards of education.

Employment opportunities also exist entirely outside of construction. Carpenters are employed in shipbuilding, in mining, and in the production of many kinds of display materials (motion-picture sets, window display, and convention display material, etc.).

Training and Qualifications

The trade of carpentry is made up of many elements. A fully qualified man must be skillful in the use of a wide variety of tools (hand tools of many types, and also several electrically operated tools) and must know the characteristics of many materials. He should have an elementary understanding of structural design and must be thoroughly familiar with the common systems of frame construction, including the purposes of the various members and the relationships among them. He should know construction practices and standards, such as customary spacing and secure fastening of parts, and of course know the relationship between carpentry and the work of other trades.

Ability to read blueprints and to compute dimensions for any part of a building is important, as well as a knowledge of simple mathematics. Ability to work without drawings (taking measurements as needed) is usually necessary in making repairs or alterations to existing work. In some situations ability to make clear sketches of work to be done is desirable, and ability to make an accurate, detailed schedule of needed materials is quite important for any journeyman wanting to work on his own account or to become a foreman. A well-trained carpenter is a highly skilled man, altogether different from a handyman able to do only some of the simpler and easier jobs.

The customary way to become a journeyman is through a 4-year apprenticeship. Most apprenticeship programs provide 144 hours of classroom work a year, covering such subjects as shop arithmetic, simple algebra, drafting and blueprint reading, and woodworking shop work.

Veterans with carpentry experience in the service may be eligible for acceptance by the union as advanced apprentices, or even as journeymen, if sufficiently capable. Provisions for such acceptance are established by each of the union locals for its own territory.

Many men have learned the trade informally, working as handymen or helpers until they became sufficiently adept to be employable for more exacting work. While this method can be successful, it has many disadvantages and at best is an undependable substitute for apprenticeship.

Outlook

The long-run outlook for carpenters is very good, but employment opportunities in new construction will be cut down markedly in the early fifties by controls resulting from defense preparations. Carpentry is the trade most greatly affected by curtailment of residential building. However, there will be many carpentry jobs in
Carpenter apprentices learn the trade through actual work experience.

Although new materials, tools, and methods have been adopted, the basic nature of carpentry work has changed less than that of several other trades. Lumber prices are rising and will possibly continue to rise, partly because of the Nation’s diminishing supply of standing timber. This may have an unfavorable effect on employment. However, carpenters already use a number of important products not made from wood, as well as some products that are or can be made from wood scrap, pulpwood, and other forms of wood not directly usable in construction. Hundreds of industrial research projects in the forest products field and in the reduction of mill waste have brought more economical ways of using wood for many applications and new products. Continued developments favorable to the use of wood may be expected from this general program.

Methods and the organization of site work have been changing. Electric hand saws, introduced in the twenties, were adopted slowly at first, but have since become standard equipment in most localities. Other electric hand tools have been adopted, although less extensively. Radial saws, introduced in the thirties, were adopted much more rapidly on large and moderately large jobs having extensive repetition of individual pieces. With their use, the work is divided between a processing crew, which cuts parts to size, and an erection crew, which installs them. On some jobs there is further division, with six, eight, or even more small erection crews, each doing only designated parts of the work on all buildings. This is a basic change from traditional practice, in which one crew did all rough carpentry on a single house, with several crews working at once on different houses in a large project. While this brings a fairly large reduction in the hours of carpentry per house under favorable circumstances, it can also be disappointing because any interference with schedule can delay the entire project rather than merely the work of one crew.

Carpentry is also the trade most directly affected by prefabrication. To date this has not reduced site employment substantially, and any increase in prefabricated houses as a percentage of the total is likely to be moderate. Capably planned and managed site construction methods have been able to compete successfully with prefabrication thus far and seem likely to continue to do so.

More highly processed materials and materials designed for easier and faster installation have become progressively more important; for example, doors and sash are frequently made to exact size and hence require no fitting at the job. Development of labor saving materials will undoubtedly continue, but it will be gradual in the future just as it has been in the past.

Self-employment will continue to be important, but probably less so than in the past. The “home improvement” companies of recent years are in most cases much more aggressive in soliciting orders for repairs, minor alterations, and additions, etc., than either the self-employed workmen or the small contractors by whom such work has been done traditionally. This does not reduce the employment in actual performance of the work, and in fact probably increases it because of an increase in volume resulting from the intensive sales effort, but for some journeymen it means a change from self-employment to wage employment, accompanied by a reduction in hourly earnings.
Carpentry is by far the largest single construction trade, although any estimate of the number of carpenters is subject to considerable uncertainty. This is a trade where census figures are probably excessive, because of reporting of handymen and other partially trained workers to the census enumerators as journeymen carpenters. The number who may reasonably be called carpenters is probably well over 500,000. In 1949, replacement through standard apprenticeship was at the rate of not over 2½ percent of the trade’s membership each year. This percentage was not sufficient to maintain the size of the trade. Unless the replacement rate is increased, there will be either a continued reduction in the size of the trade or entrance of many thousands of workers trained through other means than formal apprenticeship.

Wage Rates

Wage rates established by collective bargaining agreements in effect on January 3, 1950, are given in the following tabulation for a number of areas. In each case, the rate is for a surrounding area as well as for the city itself. These are minimum union rates for journeymen, and in some cases higher rates are scheduled for specified types of work.

In small localities wage rates are, on the whole, less than in the cities, and in rural localities they are likely to be substantially lower. This difference is more important for carpentry than for some other trades because of its much wider geographical distribution. Even in many of the largest cities, there is likely to be a noticeable amount of employment in “home improvement” work below established wage rates except in times of labor shortage. Some of the contractors for such jobs have high standards of workmanship and pay corresponding wages, while others have much lower standards and pay wages more appropriate for helpers than for journeymen.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga.</td>
<td>$1.85</td>
</tr>
<tr>
<td>Baltimore, Md.</td>
<td>2.20</td>
</tr>
<tr>
<td>Birmingham, Ala.</td>
<td>1.90</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>2.25</td>
</tr>
<tr>
<td>Buffalo, N. Y.</td>
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</tr>
<tr>
<td>Chicago, Ill.</td>
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</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>2.25</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>2.57½</td>
</tr>
<tr>
<td>Denver, Colo.</td>
<td>2.10</td>
</tr>
<tr>
<td>Houston, Tex.</td>
<td>2.12½</td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>2.30</td>
</tr>
<tr>
<td>Jackson, Miss.</td>
<td>1.90</td>
</tr>
<tr>
<td>Kansas City, Mo.</td>
<td>2.15</td>
</tr>
<tr>
<td>Little Rock, Ark.</td>
<td>1.75</td>
</tr>
<tr>
<td>Los Angeles, Calif.</td>
<td>2.12</td>
</tr>
<tr>
<td>Louisville, Ky.</td>
<td>2.15</td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>2.10</td>
</tr>
<tr>
<td>Minneapolis, Minn.</td>
<td>2.12</td>
</tr>
<tr>
<td>New Haven, Conn.</td>
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</tr>
<tr>
<td>New Orleans, La.</td>
<td>1.87½</td>
</tr>
<tr>
<td>New York, N. Y.</td>
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<tr>
<td>Omaha, Nebr.</td>
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</tr>
<tr>
<td>Philadelphia, Pa.</td>
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<tr>
<td>Pittsburgh, Pa.</td>
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<tr>
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</tr>
<tr>
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<td>2.45</td>
</tr>
<tr>
<td>San Francisco, Calif.</td>
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</tr>
<tr>
<td>Seattle, Wash.</td>
<td>2.19½</td>
</tr>
<tr>
<td>Springfield, Mass.</td>
<td>2.00</td>
</tr>
</tbody>
</table>

1 35-hour workweek.

Additional Information

Additional information on apprenticeship may be obtained from the United Brotherhood of Carpenters and Joiners of America, Carpenters Building, Indianapolis 4, Ind., or from the Apprenticeship Committee of the Associated General Contractors, 1227 Munsey Building, Washington 4, D. C.
Outlook Summary

The outlook for bricklayers is good for the long run. However, employment opportunities in the early fifties will be adversely affected by restrictions resulting from defense preparations.

Nature of Work

Bricklayers are skilled craftsmen, whose main work is the construction of walls, partitions, fireplaces, chimneys, and other parts of buildings, from brick and numerous other masonry materials. These latter include structural tile, facing tile, terra cotta, concrete-block (including cinder block and other lightweight block), gypsum block, glass block, and several less common materials. Bricklayers also build blast furnaces and coke ovens; power-plant and industrial chimneys; brick settings for power boilers and large heating boilers; manholes and catch basins for sewers; manholes, cable vaults, and tile conduit lines for underground utility cable; and install the fire-brick linings of kilns and industrial furnaces.

Bricklaying is careful, accurate work, because the inflexible materials must be made to conform to established dimensions of the building. The bricklayer or foreman computes the number of courses (layers) of brick and the corresponding thickness of the mortar joints so that the courses come out evenly with sills, the tops of windows and doors, etc., and then must keep the mortar joints close enough to this thickness for the wall to have a uniform appearance, and for the courses to come to the heights planned. A somewhat similar procedure for horizontal dimensions is followed so that the wall fits the dimensions between windows, between a window and a door or a corner, etc., without needless or irregular cutting of brick, which results in a messy appearance.

In laying brick or any other masonry unit, a bricklayer first spreads a layer or "bed" of soft mortar, then sets the brick onto this, and taps it with his trowel to the right position. This is placed with the middle above a vertical mortar joint of the course below. Next he cuts or scrapes off the excess mortar from the bottom and end joints and applies it to the exposed end or back. He keeps the courses lined up by using a gage line (tightly stretched cord) as a guide and from time to time checks the vertical and horizontal surfaces for trueness with a mason's level. As necessary, he cuts (breaks) bricks with his trowel to fit spaces too small for whole bricks. If the wall consists of two or more thicknesses of brick, at regular intervals he lays a "bond course" to tie thicknesses together. This usually consists of brick laid crosswise, but several other bond patterns are also used for the same purpose.

If he is working with concrete block, structural tile, or other materials, his work differs in a few details but is the same in all essentials.

Where Employed

About 80 percent of the bricklayers work in the construction industry, mainly on new construction. From the nature of masonry, repair work is comparatively small, consisting largely of "pointing" of mortar joints (scraping out loose mortar near the surface and refilling the joints); buildings in need of extensive masonry repairs are usually so generally deteriorated that they are not worth the expense. There is a considerable amount of alteration work, however, especially in larger cities—fire-resistant partitions to fit the requirements of new tenants in office buildings, fire walls around stairways and elsewhere in nonresidential buildings to meet new fire regulations or the regulations for a new type of occupancy, storefront and similar work in commercial modernization, residential modernization, etc.

Bricklayers are employed for maintenance work in many industries, particularly those using furnaces, kilns, and other facilities with refractory linings. There is a good deal of this work in glass factories, coke ovens, blast furnaces, and steel mills. Bricklayers are also employed on force-account for maintenance, alterations, and (to some extent) for new construction by other organizations having extensive property—large industrial firms, railroads and other utilities, large-scale owners or managers of investment property, Government agencies, and others.
Training and Qualifications

A bricklayer needs an eye for straight lines and proportions and a knack for using his hands. Since the other trades must usually fit their work to his, he should be able to picture how the parts of a structure fit together. A fair degree of physical endurance is necessary for handling moderately heavy material hour after hour, at some stages stooping very frequently to get material. He also must be able to make rough sketches, read blueprints, make measurements, and lay out the various parts of a building with respect to each other.

On small jobs, the bricklayer foreman is frequently in charge of all work for the general contractor, and, on large jobs, the general foreman is often a bricklayer by trade. For such employment, he must have a thorough knowledge of construction, including a good working knowledge of the other trades and their requirements, facility in reading blueprints and visualizing the work which they indicate, and ability to make all measurements for guide lines and other marks so that proper allowance is made for the space needed by each trade.

A man ordinarily gets his training through a formal apprenticeship of 3 to 4 years, similar in all important respects to apprentice training for the other trades. In a number of areas, the training program has been aided greatly by vocational school courses in manipulation of the tools and materials, conducted for a few weeks before the start of apprenticeship. These courses have been sponsored by the Structural Clay Products Institute and in each case have been given with the endorsement of locals of the bricklayers' union and associations of masonry or general contractors. Where classroom training is not available, instruction in these subjects must be obtained at the job or through correspondence courses.

Outlook

The long-run outlook for bricklayers is good, but in the early fifties at least, the trade will be seriously affected by the mobilization program. (See p. 305 for a discussion of the effect of defense mobilization on the construction trades.) Over the long run there is room for expansion of the trade, and every indication that it will continue to be almost as important a part of construction work as in the past, despite continuing changes in the composition of its field of work.

Within the past 60 years, changes in bricklayers' work have been startling. When steelframe and reinforced concrete construction for buildings was introduced, the exterior walls no longer had to support the floors and roof and became merely a way of enclosing the building. Walls could be made thinner, windows larger. Hence, factory and warehouse walls now consist far more of windows and far less of masonry than was formerly possible. At one time, brick was used extensively for sewers and for the lining of tunnels, but it has been replaced for these uses by other materials, although it is still used for manholes and catch basins. Curved and flat arches for the load-bearing floors in fire-resistant buildings were an important masonry field until about a generation ago, as was masonry fireproofing of structural steel, but these have passed out of use completely. Ornamental brickwork was popular a little earlier but now is exceedingly uncommon.

The trade has absorbed all of these changes, and will absorb others. In 1948, a building was completed in Portland, Oreg., with no masonry in the exterior walls above the second floor level. This is the first multistory building in the world embodying the long-discussed proposal of making the exterior walls purely insulating enclosures, without load-bearing properties. On a long-range basis, it seems likely to exercise marked influence on design and material usage in some types of buildings. If so, this will mean a gradual reduction in the employment field for bricklayers.

The over-all trend is by no means unfavorable, however. Fire-resistive partitions are very old but, until structural tile became readily available,
were so heavy and expensive that they were used only in the most massive buildings. Now, made of comparatively light materials, they are exceedingly common, and their use is becoming gradually more widespread because of stricter fire and safety regulations. Some are made of masonry units with or without a covering of plaster, and others are “solid plaster” applied to a core of metal lath or, in some cases a core of gypsum board. The long-range trend for lumber prices is upward, and this will tend to increase the use of masonry. A new system of dimensions (modular coordination) for buildings and certain of their parts, including masonry units, reduces the time and cost for almost any specific job of building brickwork but, as it becomes more widely used, is likely to increase the use of masonry and masonry veneer in ordinary houses enough to bring a noticeable net increase in employment. The structural clay products industry has for some years financed a program of industrial research, mainly at universities having colleges of ceramic engineering, for the purpose of improving its products and methods and of developing new products and new uses. This program has already brought products tending to increase bricklayers’ employment, and may be expected to bring further accomplishment. Glass block likewise has meant increased employment for bricklayers and, in combination with ventilating or air-conditioning systems, it seems likely to be used more extensively than in the past.

A special mold or form to be used in some types of bricklaying was announced near the end of 1949, and has received widespread attention. It has commonly been called a bricklaying machine, but this name is inaccurate; it is rather a bricklaying template or guide. Tests to date indicate that it brings marked improvement in both speed and quality of work for inexperienced persons, but they have not indicated any advantages for its use by competent journeymen. It is, thus, unlikely to have any substantial effect on the outlook for the trade. Hiring of relatively untrained persons who can do some types of work acceptably with the aid of such a device offers little advantage, except in times of labor shortage.

Bricklaying is one of the fairly large trades, with roughly 100,000 employed in new construction in 1949. This number is exclusive of employment (largely on a force-account basis) in maintenance.

Because of the age distribution, there is probably a loss of roughly 4,000 a year from death and retirement, and an additional loss from transfer to other occupations, including contracting and promotional building. In June 1950, there were 9,500 apprentices (including those for the combination of bricklaying with stonemasonry) known to the Bureau of Apprenticeship and an unknown but probably rather small number of others. Since the apprenticeship lasts at least 3 and in many cases 4 years, this number is at most sufficient to maintain the size of the labor force. If maintained, it will eventually reduce the average age and thereby reduce the average annual rate of death and retirement, but it obviously offers no threat of a surplus of trained workers.

Wage Rates

Minimum wage rates for journeymen established by collective bargaining are given in the following tabulation for a number of areas as of January 3, 1950. In each case these rates are effective for a surrounding area as well as for the city itself.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
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<tbody>
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<td>Atlanta, Ga</td>
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<td>Springfield, Mass</td>
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</table>

 *= 53-hour workweek.
Annual earnings in bricklaying are lower than the hourly earnings might indicate, because of lost time and seasonal unemployment. Most jobs are outdoors and are more subject to weather interruptions than is the work of a number of other trades.

Additional Information

Additional information on apprenticeship may be obtained from the Bricklayers, Masons, and Plasterers International Union of America, 815 Fifteenth St., NW., Washington 5, D. C.; from the Apprenticeship Committee of the Associated General Contractors, 1227 Munsey Building, Washington 4, D. C.; and from the Mason Training Promotion Department of the Structural Clay Products Institute, 1520 Eighteenth St., NW., Washington 6, D. C.

Stonemasons

(D. O. T. 5-24.210)

Outlook Summary

Employment of stonemasons is expected to decline gradually over the long run. Job prospects in the early fifties will be adversely affected by restrictions resulting from defense preparations.

Nature of Work

The work of stonemasons may be divided into two principal parts: setting of cut stone, mainly on more expensive nonresidential buildings, and rubble stone work in which the mason trims the rough stone to size as he sets it. In some localities, there is an occasional job using field stones in which fitting to dimensions is done by choosing stones of different sizes, with a minimum of trimming.

Stonemasons deal strictly with natural and artificial stone (concrete units made to size for an individual building just as is cut stone, and not including ordinary concrete block). In most localities, most of the work is setting of cut stone exteriors for comparatively expensive buildings—offices, hotels, universities, churches, public buildings of various sorts, and an occasional residence. There is a small amount of stone veneer work, in which a thin covering of cut stone is applied to the exterior of a house or other building which is basically of frame construction, very much like brick veneer. There are also some buildings with stonework at the principal entrance or other special locations, but with brick for the remainder of the exposed masonry. In some cases stonemasons set incidental stonework in brick walls, but usually scattered pieces are set by the bricklayers.

For cut stone work, a mason is guided by a large-scale setting diagram in which each piece is shown to scale and is identified by an individual number (in some jobs plain rectangular pieces, known as "ashlar," are not numbered individually). A tender, known as a derrickman, locates the pieces to be needed and brings them to the mason. If sufficiently large and heavy, they are set in place by a derrick or crane, but most pieces are picked up and set by hand. The mason prepares a mortar bed, places the stone in the bed, and taps it into position as needed with a wooden mallet until it is in proper alignment. Because of the expense, a wall of solid cut stone is exceedingly rare; usually the stone is a rather thin covering on the exposed surface, with brick or other less expensive materials used for the remainder of the wall thickness. Sometimes the bricks are laid by the stonemasons, but, in cities large enough for the distinction between bricklaying and stonemasonry to be observed, they are put in place by bricklayers.

Stonemasonry is much more exacting than brickwork in the details of appearance. Surfaces, edges, and mortar joints are much more easily seen and are viewed much more critically; hence, it is necessary that alignment be maintained much more accurately, that joints be uniform, and that minor chipping of the corners be avoided.

Rubble stone was an important structural material until superseded by concrete. Now it is used only for appearance in some houses and other buildings, and in some localities for a few minor uses, such as low retaining walls at the edge of steeply banked lawns. It uses rough stone, which the mason cuts (breaks) to size as he lays it. He lays the pieces in a bed of mortar but does not maintain uniform horizontal courses or vertical joints such as are used for brick work. Pieces can be cut and fitted rapidly in this manner by a
skilled man, but it is still handwork and correspondingly expensive; hence, this type of work is uncommon.

Stonemasons' employment is principally in the construction industry. There is also employment in the larger cities in building family mausoleums.

**Training and Qualifications**

Training is through apprenticeship which in some features is similar to that for bricklaying. There are also combination apprenticeships preparing for both brickwork and stonework, in localities where there is not enough stonework for reasonably steady employment.

**Outlook**

It is likely that stonemasonry will continue in use permanently, but there are strong indications that it will be used less extensively than in the past. The trend toward simpler lines means less stone ornamentation and less extensive use of moldings and other pieces than plain ashlar. The trend is also toward larger window areas in some kinds of buildings, with less exterior wall area. Changed architectural preferences have appeared in school and church buildings, and there are some indications that a similar change may come in public buildings, although perhaps rather slowly.

These considerations mean likelihood of a gradual decline in employment. This will probably be slow enough that it will not threaten present members of the trade, especially since the average age is high, and new workers will certainly be needed; but, since this is both a small and a contracting trade, the apprenticeship opportunities are limited. In the early fifties, job prospects will be adversely affected by restrictions resulting from defense preparations. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.)

**Wage Rates**

The following tabulation shows hourly wage rates effective July 1, 1949, as established by collective bargaining agreements in a number of cities. In each case, these apply to a surrounding area as well.

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<td>Springfield, Mass</td>
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1 35-hour workweek.

**Additional Information**

Additional information, including the address of the nearest union local, may be obtained by writing to the Bricklayers, Masons and Plasterers International Union of America, 815 Fifteenth St., NW., Washington 5, D. C.

**Cement Finishers**

(D. O. T. 5-26.100 and .200)

**Outlook**

An expanding trade; long run outlook is good. Employment will be somewhat reduced by defense preparations in the early fifties.

**Nature of Work**

The principal work of this trade is the finishing of the exposed surface of concrete work to the slope desired for water drainage, etc. Other work
includes patching the surface of structural concrete after the forms have been removed, laying mastic floors, and laying composition (magnesium cement) floors.

Finishing concrete floors and other concrete members is the most important source of employment. This work is done on sidewalks, driveways, curbs, roofs, stairs, and many other structures or structural members, as well as floors. Pouring of concrete which is to have a trowel-finished surface sometimes proceeds in two stages—first the main mass of material containing gravel or other coarse aggregate, which is leveled off about one-half inch below the final surface, and then a top coating of finer material without gravel which is spread over the coarser concrete. In such cases, it is mainly this fine mixture with which the cement finishers deal. In other cases there is no separate top coating, and the finishers deal with the surface of the main mass of concrete. In either case they spread the material to about the level desired by means of a straightedge, guided by strips which they have set to indicate the proper surface, and then trowel it a number of times at different stages of hardening. Finishing of curved rather than approximately flat surfaces (street curbs, curbs at the edge of driveways, etc.) is done in a generally similar manner. More similar to plastering (particularly stucco work) is the job of applying an outer covering of fine material to retaining walls and other vertical surfaces. This is done after the forms have been removed, a few days after the main mass of concrete has been poured.

Patching work occurs mainly in concrete-frame buildings and is done to correct surface defects which are exposed when the forms are removed. Fins protruding where joints in the forms were too wide are chopped off and ground with an abrasive; "honeycomb" areas, where there had been insufficient spading during placing of the concrete, are cleaned, with any loose material removed, and are filled with a cement-sand mixture; and other minor corrections are made.

Mastic floors are a layer of fine asphalt mixture, quite like that used for the top surface of street paving, and are usually laid over concrete. They are used where resistance to acid is necessary—mainly in food-products plants. The material is applied hot and is smoothed with heavy hand tools.

Composition floors are thin layers made with a type of magnesium cement laid over a rigid base. The operations involved are very similar to those for finishing a concrete floor. At one time these were popular for small commercial buildings, but now they are used mainly for deck surfaces and similar uses in shipbuilding.

Finishing of newly poured concrete usually involves overtime work, frequently quite extensive overtime, because of the characteristics of the materials. On better-grade jobs, where high standards of workmanship prevail, the finishing operation continues to a final troweling when the fine material is fairly rigid, and this is several hours after it has been poured. For reinforced floors in buildings, very often pouring is continued until after the normal quitting time in order to reach boundaries where a break in the concrete will not introduce structural weakness; this means that the cement finishers often work late at night. Such hours bring high daily and weekly earnings, but they are offset by intermittent employment, because it is exceedingly uncommon for the pouring of building concrete to go on day after day; ordinarily one or a few days of pouring are followed by days of building forms, setting reinforcing steel, and making other preparations for the next pour. These interruptions have been reduced to some degree within the past 10 to 15 years by a faster operating schedule on multistory buildings, with a shorter period between the pouring of successive floors. Projects consisting of several buildings (particularly large apartment projects) have also become somewhat more common, and on these there is usually an effort to time the operations on the different buildings so that workers can be transferred from one to another for continuous progress on the entire project. Sidewalk and driveway work is more regular, because many of the contractors for such work are able to obtain a continuous series of moderately small jobs, but on this work the overtime is usually less. The jobs are smaller, there is seldom the engineering necessity for pouring until a suitable boundary is reached, and pouring often stops earlier in the day. The finishing specifications are also less exacting in many cases.

In small localities, many journeymen are both cement finishers and plasterers, and in such places there is an apprenticeship for the two trades combined.
Where Employed

Cement finishers are employed predominantly in the construction industry. Some work for "cement contractors" doing small jobs such as sidewalks, driveways, small retaining walls, basement and garage floors, etc.; these men work fairly regularly, except that the volume of employment is low in winter, and outdoor work is postponed because of rain. Some work for city paving contractors, mainly on street curbing; this employment is rather similar to that for "cement contractors." Some work for general building contractors or for reinforced concrete contractors on finishing of floor slabs and roof slabs in concrete-frame and steel-frame buildings. There are numerous other jobs—on bridges, abutments, and most structures where concrete is used. The early concrete highways were finished by hand, but finishing machines have been used for a number of years; hand-finishing of highways is confined mainly to curves and irregular areas outside the range for which the finishing machine rails are set up, although on most concrete paving crews there are cement finishers to perform smoothing operations supplementary to that of the finishing machine.

Mastic floors and composition floors are laid mainly by finishers specializing in such work, who move to successive jobs over quite a wide area.

Government units (municipal public works departments particularly), utilities, some manufacturing firms, and a certain number of miscellaneous establishments also hire cement finishers.

Outlook

The employment outlook should be good over the long run, because this is an expanding trade. There will be some reduction in job opportunities in the early fifties because the defense program will impose limitations on construction. Use of concrete in building construction has increased and seems likely to increase further. Houses without basements, with a concrete floor slab laid on the ground, have come into use, and have been found suitable for panel (radiant) heating. Other uses are also being developed.

The prospect is for a gradual increase in the total volume of employment, but not for a change in its basic characteristics. Nothing evident to date indicates the likelihood of eliminating the alternation in most concrete frame buildings between days with extreme overtime and days of lay-off.

Wage Rates

Below are the wage rates established by collective bargaining agreements in effect on July 1, 1949, in a number of cities. In each case they apply to a surrounding area as well.

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</table>

1 35-hour workweek.

Additional Information

For additional information, or for the address of the union local nearest you, write to the Operative Plasterers' and Cement Finishers' International Association, 200 Fidelity Bldg., Cleveland 14, Ohio; or the Bricklayers, Masons, and Plasterers International Union of America, 815 Fifteenth St., NW., Washington 5, D. C. Information may also be obtained from the Apprenticeship Committee of the Associated General Contractors, 1227 Munsey Bldg., Washington 4, D. C.
**Outlook Summary**

Opportunities will be good over the long run. The field for ornamental metal work has increased noticeably within the last two decades, and further increase seems very likely. During the early fifties, this trade is not likely to be seriously affected by defense preparations.

**Nature of Work**

**Structural iron workers** erect the steel framework for buildings. Best known are the tall buildings common in downtown locations, but structural-steel framing is used extensively in one-story factory buildings, and rather commonly in commercial buildings of only a few stories. Factories may also require steelwork for crane runways and to support heavy equipment. The men in this trade also erect steel bridges and towers and install or erect certain types of tanks. They install steel floor decking, now widely used in office buildings and other light occupancy buildings. In some cases, they set structural-steel members in place when they occur in buildings not of steel framework design, such as beams over wide doors and windows in masonry walls to support the brickwork above. Structural iron workers erect steel scaffolding and sidewalk canopies for use by other construction trades and for protection of the public, both for new buildings and repair work. Other work includes the placing of vault doors with their frames and installing the steel plate work covering the exterior of burglar-resistant vaults. Structural iron workers do rigging (moving of heavy machinery, equipment, etc.), except in those localities where rigging is treated as a separate occupation.

In erecting a steel framework or structure, the structural iron workers first take the steel shapes already fabricated by other workers and hoist them into place in the proper order. They then connect them temporarily with bolts, accurately align the structure as necessary, and rivet or weld the parts together.

**Ornamental iron workers** typically handle lighter materials, such as those not used in making up the basic framework of a building. Within recent years a large part of the work, probably more than half, has dealt with other metals than iron and steel—mainly aluminum alloys, brass, and bronze. In some cases the installations are highly decorative, although along much simpler lines than 20 or 30 years ago, while other installations are strictly utilitarian.

Ornamental iron workers install metal stairways and the metal railings and handrails at stairways, balconies, and elsewhere. They install metal floor-gratings, catwalks, and ladders, used extensively in powerhouses and a few types of factories. They put in place solid metal sash and doors and their frames, including the common steel sash used in many kinds of buildings: swinging and revolving metal doors with their frames; and vestibules at the street entrances to office buildings, hotels, etc. Other work done includes doors, grilles, and screens, such as used at bank tellers’ compartments and elevators; gratings; metal cabinets of many types, such as display cases and safety deposit boxes; window and door guards; and a very wide variety of other installations.
Where Employed

Structural and ornamental iron workers are engaged largely on new construction. They are also employed on alteration work, such as insertion of a mezzanine floor in steel-frame buildings; installation of steel stairs during modernization of an old apartment or commercial building; or the addition of window guards to an existing building for burglary protection. There is even a little repair work, despite the durability of the materials—replacement of members weakened by long neglect of painting, replacement of bridge parts damaged by bad traffic accidents, etc.

The structural workers do no fabrication of their materials except reaming out mispunched rivet holes and other small corrections of shop errors. Generally the ornamental workers likewise do no fabrication, although some of the smallest contractors (especially in small communities) do not distinguish sharply between shop crews and field crews. Occasionally, larger contractors use some of their erecting crews for shop work to handle peak loads, but this practice is not prevalent because of the substantially higher wage scale for the erecting men.

Ornamental iron workers are commonly employed within commuting distance of home because establishments capable of doing a wide variety of work can be maintained on a fairly low volume of business and hence are found in many localities. Ornamental metal for an occasional elaborate building in a small city is likely to be provided by a contractor from a larger city, who ordinarily either sends his own crew or sends a partial crew and hires other workers locally.

On the whole, more traveling is involved for structural iron workers, because most localities have insufficient structural business to support an erection contractor or local crew. Consequently, workers must be brought in from outside to handle the occasional structural work that occurs, such as a steel-frame office or factory building. Workers living in the largest metropolitan centers and preferring employment there are likely at times to find that the only vacancies are for out-of-town jobs.

Training and Qualifications

The standard apprenticeship period is 2 years, with provision for another 6 months of training if necessary. Men with several years of experience as helpers sometimes become journeymen, but, as the trade is highly unionized, few enter without serving a formal apprenticeship.

Outlook

Employment outlook will be good over the long run; though not many additional workers will be needed, prospects will continue to be good for those already in the trades. The defense preparations seem unlikely to affect the prospects for structural iron workers. This is one of the trades which are important in many kinds of construction utilized in a defense period. The situation for ornamental iron workers seems less favorable.

Prospects for structural workers are improved by developments in the use of steelwork intended for buildings with light floor loads. There has also been increased recognition of advantages of steel construction in some kinds of one-story industrial buildings, and in small nonresidential buildings of other types.

For ornamental metalwork, prospects are likewise good. It is admirably suited to recent trends in architectural design; there has been steady progress in its fabrication; and it is likely to be used more extensively in buildings where cost is an important consideration, because for many uses there is now a fairly wide range of stock and semi-stock parts (such as extruded moldings). Strictly utilitarian uses are likely at least to be sustained, if not increased.

For many years ornamental metalwork has been used to some degree as an exterior covering on buildings. Within recent years this has consisted mainly of disconnected panels but one prominent new building (mentioned in the section on bricklayers) has established a precedent in having an exterior of ornamental metal rather than masonry above the second-floor level. This is likely to be the forerunner of more extensive use of exterior metalwork, but the effect will be gradual.

Wage Rates and Working Conditions

The following table shows minimum wage rates established by collective bargaining agreements for structural iron workers in 29 cities, as of July 1, 1949. In most areas rates for ornamental workers are the same or differ by only a few cents.
<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga.</td>
<td>$2.12½</td>
</tr>
<tr>
<td>Baltimore, Md.</td>
<td>2.65</td>
</tr>
<tr>
<td>Birmingham, Ala.</td>
<td>2.20</td>
</tr>
<tr>
<td>Buffalo, N. Y.</td>
<td>2.40</td>
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<tr>
<td>Chicago, Ill.</td>
<td>2.50</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>2.42½</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>2.57½</td>
</tr>
<tr>
<td>Denver, Colo.</td>
<td>2.10</td>
</tr>
<tr>
<td>Houston, Tex.</td>
<td>2.12½</td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>2.45</td>
</tr>
<tr>
<td>Jackson, Miss.</td>
<td>2.15</td>
</tr>
<tr>
<td>Kansas City, Mo.</td>
<td>2.30</td>
</tr>
<tr>
<td>Little Rock, Ark.</td>
<td>2.57½</td>
</tr>
<tr>
<td>Los Angeles, Calif.</td>
<td>2.30</td>
</tr>
<tr>
<td>Louisville, Ky.</td>
<td>2.30</td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>2.05</td>
</tr>
<tr>
<td>Minneapolis, Minn.</td>
<td>2.17½</td>
</tr>
<tr>
<td>New Haven, Conn.</td>
<td>2.50</td>
</tr>
<tr>
<td>New Orleans, La.</td>
<td>2.25</td>
</tr>
<tr>
<td>New York, N. Y.</td>
<td>3.00</td>
</tr>
<tr>
<td>Omaha, Nebr.</td>
<td>2.17½</td>
</tr>
<tr>
<td>Philadelphia, Pa.</td>
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<tr>
<td>Pittsburgh, Pa.</td>
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<tr>
<td>Portland, Oreg.</td>
<td>2.30</td>
</tr>
<tr>
<td>Richmond, Va.</td>
<td>2.25</td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>2.50</td>
</tr>
<tr>
<td>San Francisco, Calif.</td>
<td>2.40</td>
</tr>
<tr>
<td>Seattle, Wash.</td>
<td>2.39½</td>
</tr>
<tr>
<td>Springfield, Mass.</td>
<td>2.45</td>
</tr>
</tbody>
</table>

Workers in the erection crews receive much higher wages than shop workers. However, structural and ornamental workers in construction are not as steadily employed throughout the year as shop workers. Since there is little maintenance and repair work that they can do during the dull building season, annual earnings usually are low relative to the hourly wage rates.

Accidents are infrequent but in structural work are likely to be quite serious. Safety standards have been greatly improved during the past 25 years, and safety devices, such as nets and scaffolding, are used much more extensively. Nevertheless, men occasionally fall from high places, and are occasionally hit by falling objects, and once in a long while in past years there has been a catastrophe such as collapse of the structure.

Additional Information

For further information about apprenticeship for either of these trades, write to the International Association of Bridge, Structural, and Ornamental Iron Workers, Syndicate Trust Building, St. Louis 1, Mo.
Rodmen (Reinforcing Iron Workers)

(D. O. T. 7-32.251)

Outlook Summary

The employment outlook for rodmen should continue to be good throughout the fifties, because of a prospective increase in the importance of reinforced concrete work.

Nature of Work

Rodmen set the reinforcing steel for reinforced concrete work of all sorts. Most of this is in the form of steel bars, which, by the time of concrete pouring, must be assembled in proper relation to each other and supported in the forms so that each piece is in the position where it gets the intended structural load. The rodmen are guided by a drawing on which all reinforcement is indicated, and the code numbers used for the different pieces are given. They select the pieces, put them together into framelike assemblies for beam or rectangular column reinforcement, tie all intersections securely with wire, and place these assemblies in the forms on wire supports (chairs) as necessary. When occasion arises, they weld the pieces together. They assemble the reinforcing rods for slabs and concrete joists in a somewhat similar manner, but by building up the assembly in the forms. As necessary, they cut and bend the bars, when the shopwork of cutting and bending has been done incompletely or incorrectly. Some reinforcing is in the form of a coarse mesh made of heavy steel wires. The rodmen cut the mesh to the desired size and set it in place with overlapping edges where pieces join.

There are many structural uses for “plain” concrete—i.e., concrete without reinforcing steel. These applications, however, provide no employment for rodmen.

This is one of the less highly skilled trades, acquired through a 2-year apprenticeship. It requires dexterity, familiarity with established usage in reinforced concrete construction, and a full realization of the necessity for assembling the bars accurately, and fastening and supporting them securely so that each will, in fact, bear the structural load for which it was designed.

Where Employed

Rodmen are employed almost entirely in the contract construction industry. The employers include general contractors for reinforced concrete buildings, general contractors for other structures (bridges, dams, some types of sewer and water projects, etc.), special trade contractors for reinforced concrete work, and (in large cities) special trade contractors for the setting of reinforcing steel. There is some force-account employment on new construction, and probably a little employment (for utilities, municipal public works departments, etc.) in force-account maintenance, but very few maintenance and repair jobs involve rodmen’s employment.

Outlook

Because of the increasing use of reinforced concrete, the long-run outlook for this trade is good. In the early fifties opportunities for rodmen, unlike that for workers in many other construction trades, are not likely to be much affected by defense preparations. Seasonal variation in employment is important, however, because almost all reinforced concrete work is done outdoors and is hindered by cold weather. Employment in many cases is intermittent, because setting of reinforcing is only one of many activities fitted together in the over-all construction process; in a multistory concrete building, most of the rodmen are finished when a given floor is ready for pouring, and do not work again until the forms for the next floor are far enough ahead to allow them to work to advantage. As with cement finishers, these interruptions to work have been reduced within recent years by a faster schedule and more careful timing of operations. The more active contractors for setting of reinforcing have several jobs under way at once, and are able to transfer their workers from one to another. Even so, the loss of time is usually greater in a trade where so many of the jobs are brief than in trades where many of the jobs last several weeks or a few months.
Minimum wage rates in effect July 1, 1949, in a number of cities and their surrounding areas, as established by collective bargaining agreements are shown in the following tabulation.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga</td>
<td>$1.87%</td>
</tr>
<tr>
<td>Baltimore, Md</td>
<td>2.35</td>
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<td>Birmingham, Ala</td>
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<td>Boston, Mass</td>
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<td>Buffalo, N. Y</td>
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<td>Cleveland, Ohio</td>
<td>2.57½</td>
</tr>
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<td>Denver, Colo</td>
<td>2.10</td>
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<td>Houston, Tex</td>
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<tr>
<td>Indianapolis, Ind</td>
<td>2.45</td>
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<tr>
<td>Jackson, Miss</td>
<td>1.90</td>
</tr>
<tr>
<td>Kansas City, Mo</td>
<td>2.17½</td>
</tr>
<tr>
<td>Little Rock, Ark</td>
<td>1.87½</td>
</tr>
<tr>
<td>Los Angeles, Calif</td>
<td>2.11½</td>
</tr>
<tr>
<td>Louisville, Ky</td>
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</tr>
<tr>
<td>Milwaukee, Wis</td>
<td>2.11½</td>
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<td>Minneapolis, Minn</td>
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<td>New Haven, Conn</td>
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<td>New Orleans, La</td>
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<td>New York, N. Y</td>
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<td>Seattle, Wash</td>
<td>2.19½</td>
</tr>
<tr>
<td>Springfield, Mass</td>
<td>2.45</td>
</tr>
</tbody>
</table>

Additional Information

For additional information, or for the address of the nearest union local, write to the International Association of Bridge, Structural, and Ornamental Iron Workers, Syndicate Trust Building, St. Louis 1, Mo.

* 35-hour workweek.
Operating Engineers (Construction Machinery Operators)

(D.O.T. 5-23.010 to .920, 5-72.010, .210, .910, .930, .945, 5-73.010, .020, .040, .050, .060, .070, .210, .320, .520, 7-23.010 to .120 and 7-23.900 to .999)

Outlook Summary

This trade will probably expand slowly over the long run. Defense preparations will have less effect on employment in this trade than in the building trades as a whole.

Nature of Work

The types of work vary in their requirements of training and skill probably more for operating engineers than for any other construction trade. These men operate construction machinery of almost all sorts for practically every type of construction: buildings, highways and streets, airfields, sewer and water lines, underground utility work, tunnels and subways, railroad work, bridges, dams, dredging, harbor improvement, and numerous other types. Some of the machines are quite complex, requiring coordination of numerous motions and controls; others are simpler but require constant active attention; and still others are simple in operation and require infrequent attention. These differences in a sense break the trade into several levels of skill.

Among the machines operated are shovels, pull-shovels, draglines, cranes, derricks, hoists, pile drivers, stationary concrete mixers, paving mixers, bituminous paving mixers and paving machines, numerous types of rollers, trench excavators, elevating graders, pans (tractor-drawn scrapers), bulldozers, graders (self-propelled and tractor-drawn), tractors, pumps, and air compressors. In addition, there are many others. For the most part, operators learn their work quite informally and in the course of experience become familiar with a number of kinds of machines; a capable operator can ordinarily learn to handle other machines of the same general type as those on which he is experienced, within a fairly short time. Differences in requirements for operation of the various types of machines are recognized by differences in wage rates. The more experienced and capable operators, able to handle a wide range of machines, frequently prefer one or two types, and work on these when such jobs are available but at other times work on quite different machines. Naturally, the differences in wage rates cause all men who are qualified to confine themselves to the top grade of machines (shovels, cranes, trench excavators, paving mixers, etc.) as much as possible, and men who are employed on machines carrying lower wage rates want to transfer to the more difficult machines as opportunity affords.

Where Employed

Operating engineers are employed in the construction industry by general building contractors, by special trade contractors (for excavating, steel erection, and other special trade fields), by highway contractors, and by heavy construction contractors for the remaining kinds of nonbuilding work. They also work for utility companies, government bodies (highway departments, public works departments, etc.), and other organizations carrying out their own construction. In addition, they work in many industries not engaged in construction. In some cases, the machines and the duties are about the same in these other industries as in construction; operation of a crane to unload cars of coal at a factory or a power plant is very similar to operation of a crane to unload cars of sand or gravel for a paving job. In other cases the machines are the same but the duties differ; manipulation of the controls for handling heavy assemblies by crane at a factory is the same as for handling heavy objects by crane at a construction job, but the conditions governing the work are different. Still other kinds of jobs have no close equivalent between construction and factory employment, although the coordination of numerous controls makes them the same general kind of job.

Wage rates in factory employment are usually much less than in construction, but greater regularity of employment frequently makes annual earnings greater.

Training and Qualifications

In some localities there is a formal apprenticeship for operating engineers, but this arrangement
is not general. For the most part, entrance has been quite informal; a man with aptitude for machinery and often some relevant experience, such as driving a truck, may get a job operating one of the simpler machines (a pump, an air compressor, a tractor without attachments, etc.) and obtain union membership. As opportunity affords, he may get more exacting jobs (on a bulldozer, a tractor with other power attachments, a roller, various other machines) and then with more experience get a job on one of the top-grade machines.

The jobs vary greatly in their requirements. Some are quite easy, while others require continuous attention throughout the day, with careful timing and accurate coordination of numerous controls. There has been great improvement in grouping the controls for convenience and in reducing the physical work of moving them, but operation of the more complicated machines is strenuous work. Some machines (particularly bulldozers and some types of scrapers) are physically wearing, because of the shaking and jolting which the operator has to endure all day long.

For machines using steam power (mainly pile drivers) the operator must have a stationary engineer's license in most localities.

Wage Rates

The wage-rate picture for operating engineers is quite the most complicated of any construction trade. Hourly rates are established for different types of machines, often with different rates for machines of the same type but of different capacity and, in some cases, with different rates for a given machine depending on the type of construction for which it is used. Classification systems vary greatly among different areas, and machines having the top wage rates in one area do not necessarily have the top wage rate in all other areas.

Space does not permit a detailed presentation of wage rates because of the different classification systems used in different localities. Below are minimum wage rates in effect July 1, 1949, in a number of areas as established by collective bargaining for shovel operators (who have the highest rate in most but not all areas) and for bulldozer operators (who have a lower rate in most cities).

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shovels</td>
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<tr>
<td>Atlanta, Ga.</td>
<td>$2.00</td>
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<tr>
<td>Baltimore, Md.</td>
<td>2.40</td>
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<tr>
<td>Birmingham, Ala.</td>
<td>2.12½</td>
</tr>
<tr>
<td>Boston, Mass.</td>
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<tr>
<td>Buffalo, N. Y.</td>
<td>2.40</td>
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<tr>
<td>Chicago, Ill.</td>
<td>2.75</td>
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<tr>
<td>Cincinnati, Ohio</td>
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<tr>
<td>Cleveland, Ohio</td>
<td>2.52½</td>
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<tr>
<td>Denver, Colo.</td>
<td>2.15</td>
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<tr>
<td>Houston, Tex.</td>
<td></td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>2.30</td>
</tr>
<tr>
<td>Jackson, Miss.</td>
<td>2.02½</td>
</tr>
<tr>
<td>Kansas City, Mo.</td>
<td>2.37½</td>
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<td>Little Rock, Ark.</td>
<td>2.25</td>
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<td>Los Angeles, Calif.</td>
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<td>Louisville, Ky.</td>
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<td>Milwaukee, Wis.</td>
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<td>Minneapolis, Minn.</td>
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<tr>
<td>New Haven, Conn.</td>
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</tr>
<tr>
<td>New Orleans, La.</td>
<td>2.12½</td>
</tr>
<tr>
<td>New York, N. Y</td>
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<tr>
<td>Omaha, Nebr.</td>
<td>2.27½</td>
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<td>Philadelphia, Pa.</td>
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<td>Pittsburgh, Pa.</td>
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</tr>
<tr>
<td>Portland, Oreg.</td>
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</tr>
<tr>
<td>Richmond, Va.</td>
<td>1.87½</td>
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<td>St. Louis, Mo.</td>
<td>2.55</td>
</tr>
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<td>San Francisco, Calif.</td>
<td>2.52½</td>
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<tr>
<td>Seattle, Wash.</td>
<td>2.63</td>
</tr>
<tr>
<td>Springfield, Mass.</td>
<td>2.27½</td>
</tr>
</tbody>
</table>

1 40 horsepower or over, $1.60.
2 When cutting to finish grade, $2.12½.
3 Over 40 horsepower, $2.25.
4 Over 2 cubic yards, $2.35; over 2 cubic yards, $2.70.
5 Over 1 cubic yard, $2.62½.

Outlook

The long-range outlook is for an increased use of construction machinery. Defense preparations will have less effect on employment in this trade than in the building trades as a whole. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.) The construction machinery industry started with units which, although basically fairly simple, were large, heavy, expensive, and suited only for big projects. There has been development in different directions. One course has been the design and production of larger, more specialized, and more complex machines, some having constantly increasing output (such as several of those used for earth-moving), and some performing a group of related operations.
(such as some machines used in asphalt paving). Another course has led to smaller and more readily portable machines suited to progressively smaller jobs. Machines for new uses have also been brought out from time to time. These developments have been notably rapid within recent years and show every sign of continuance; small as well as large companies have been active in increasing the usefulness of their products.

**Additional Information**

For additional information write to the International Union of Operating Engineers, 1003 K St., NW., Washington 1, D. C.

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**Lathers**

*(D. O. T. 5-32.760 to .763)*

**Outlook Summary**

The long-run outlook is good. However, during the early fifties, curtailment of construction will sharply cut employment opportunities for lathers.

**Nature of Work**

A lather's principal work is installing a base to which plaster or stucco is to be applied. In houses, nonfireproof apartment buildings, and many other buildings, this base usually consists of gypsum lath (pieces of plain or perforated gypsum board) which is nailed to wood members. For more exacting work he uses metal lath, the commonest form of which is made from steel sheets by slitting and "expanding" them to give an over-all diamond pattern. This may also be nailed to wood, but usually the lather builds a supporting framework of light steel channels (light iron furring) fastened securely to the structure, and then ties the metal lath to this with wire. This is done for suspended ceilings, which are hung down from the floor above to allow room for beams, pipes, ventilating ducts, etc., and wherever there is to be plaster enclosure of structural or mechanical members in finished parts of a building. The procedure is similar for the customary type of solid plaster partitions, consisting of a core of metal lath and metal channels, plastered on both sides; a new type uses sheets of gypsum board as a core, and these are also installed by lathers.

For a plaster cornice, the lathers build out with channels and metal lath to an approximation of the desired profile. They install corner bead and many other supplementary items. For stucco over wood construction, they nail a large mesh wire fabric (much coarser than metal lath) onto the wood. Wood lath, the original material, is rarely used in most localities.

Not all plastering means a job for lathers, however. In fire-resistant construction, partitions (when not of solid plaster) are structural tile or gypsum block, to which plaster is applied directly. Exterior walls often have what is essentially a tile lining, also plastered directly. In contrast, there can be lathing without plastering—principally the building of frameworks of metal supporting channels, quite similar to those for suspended plaster ceilings, for installation of acoustical tile.

The two outstanding requirements to be met by lathers' work are accuracy and sturdiness. True vertical, horizontal, and curved surfaces must be provided within rather close limits; the lath backing for cornices must be level and accurate in profile. Unless these requirements are met, the plasterers cannot do a presentable job without using an excessive thickness of plaster, and hence an excessive weight, for some parts of their work. Channels must be fastened securely enough to the structure proper so that they withstand the pressure during plastering, and will support the weight of the plaster permanently.

**Where Employed**

Lathers work principally in the construction industry, mainly on new construction but also on modernization and alterations. There is also extensive employment elsewhere, in the lath backing for display material, scenery, etc., when this is made of plaster.
**Outlook**

Limitation of residential building because of defense preparations will severely reduce employment of lathers in the early fifties. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.) Over the long run the outlook is good. This is one of the smaller trades, so that even during high employment it cannot provide a large number of apprenticeship openings. Commercial modernization will continue to be important, and it often emphasizes types of work (new ceilings, either flat or curved) for which lathing is needed. Acoustical treatment is being increasingly accepted as a standard feature in many types of commercial buildings. Suspended ceilings are probably more common than in the past. A new method for fireproofing structural steel consists of enclosing the steel members in a framework of light channels covered with metal lath, to which a particular type of lightweight plaster is applied. This method is likely to become popular. At the same time, however, the work has been much more seasonal than that of most other trades, and in that respect has been very similar to plastering.

**Wage Rates**

Minimum wage rates in a number of cities and their surrounding areas, established by collective bargaining agreements in effect on July 1, 1949, are given below.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga</td>
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<tr>
<td>Birmingham, Ala</td>
<td>$2.00</td>
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1 30-hour workweek.
2 Residential, $2.34.

**Additional Information**

For additional information, or for the address of the union local nearest to you, write to the International Union of Wood, Wire and Metal Lathers, 2605 Detroit Ave., Cleveland 13, Ohio.

**Plasterers**

(D. O. T. 5-29.100 and .200)

**Outlook Summary**

During the early fifties, curtailment of construction will sharply cut employment of plasterers; the long-run outlook is more favorable.

**Nature of Work**

The principal work of plasterers is the application and finishing of several coats of plaster to a suitable base, to produce wall and ceiling surfaces and stucco exterior wall surfaces. In some interior work, they produce textured surfaces which get no further decorative treatment, and, in more elaborate work, they produce surfaces in imitation of stone, marble, or other materials. In some types of buildings, they produce curved ceilings and in ornamental work obtain a great variety of architectural effects using cornices, pilasters, vaulted and groined ceilings, arches, and relief ornamentation.

Plasterers are distinct from modelers, model makers, casters, and sculptors, who are engaged mainly in the shop production of relief plaster pieces for building and other uses.
Where Employed

Employment is primarily in the construction industry and almost exclusively at the construction site. Most of this is in new construction, but plastering is usually needed in extensive alterations and has become particularly important as a means of obtaining architectural and lighting effects in commercial modernization. Repairs in old buildings are restricted in both number and size by the durability of plaster.

Training and Qualifications

A 4-year apprenticeship, or its equivalent, is needed for qualification as a journeyman. During this period the apprentice is trained in a wide variety of skills, of which manipulation of the tools is only one part. He must learn the properties and appropriate handling of the different kinds of materials and the different mixtures; the characteristics of various backing materials or bases to which the plaster is applied; and procedures for getting true vertical and horizontal surfaces. He must also acquire ability to lay out curved, arched, vaulted, and other ornamental work which, when elaborate, presents difficult geometrical problems; he must learn methods of forming cornices and moldings in place, of installing shop-made ornamental pieces and fastening them securely, and of applying and forming wet plaster on to ornamental pieces to join them smoothly or to add small repetitive figures which cannot be put on conveniently at the shop. The apprentice should become familiar with the work of other trades and must learn to judge from inspection whether lathing and other preparatory work is satisfactory.

Standard apprenticeship includes 144 hours of classroom instruction each year, with particular attention to drawing, blueprint reading, and mathematics applicable to lay-out work.

Outlook

During the early fifties, limitations on residential construction will seriously reduce employment of plasterers; plastering is used comparatively little in types of construction most directly related to a defense program. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.) During recent decades the number of apprentices trained was comparatively small, but more than 7,000 have been registered by the Operative Plasterers’ and Cement Finishers’ International Association since the beginning of 1946.

The long-range outlook is affected by several conditions, some favorable and others not. Many attempts have been made to get less expensive surfacing materials for ordinary walls and ceilings, and some of the materials made in sheet form have been used widely.

Public taste and architectural usage have changed, so that ornamental plastering in large metropolitan buildings (banks, the lobbies and public rooms of major hotels, the lobbies of leading office buildings, etc.) is used much less extensively than prior to the depression. It was in such buildings, in churches, in movie theaters, and in larger government buildings that ornamental plastering had its real market. There is little doubt that such work will always be used to some degree in certain types of buildings, and it seems likely to be used extensively in a few types, particularly some churches. For nonresidential buildings as a whole, however, the trend toward simpler lines seems to be the desire of owners and architects.

Although the demand for plastering has been reduced in these directions, it has been increased in others. Within the past 20 years acoustical treatment has had widespread adoption, and plastering is one of the means by which such treatment is obtained.

During the same period, extensive attention has been given to lighting, including the effect of ceiling design. This has been most pronounced for retail stores, restaurants, and similar establishments, but is by no means confined to such places. The result here has been a marked trend toward curved ceilings, commonly with recesses for concealed lighting fixtures or with flush fixtures fitting into rather than protruding from the ceiling. This work obviously required many more man-hours than would an ordinary flat ceiling for a room of the same size. Curved surfaces as a form of architectural or decorative treatment, without special consideration for lighting effects, have also come into increasing use.

A recently developed method of fireproofing structural steel members came into use, consisting of enclosing them in metal lath to which a lightweight gypsum plaster is applied. Tests to date
indicate that this method provides satisfactory fire protection, and it has the advantage of a great saving in weight over poured concrete, which has been standard for the purpose. Widespread use of this method is likely, with resulting employment for plasterers, although in some places its adoption may be delayed until building ordinances are revised.

Late in 1949, a machine for spraying lightweight plaster onto wall and ceiling surfaces, developed by a large plastering contractor in cooperation with the plasterers' union and others, was put into trial use. This device is successful mechanically, in that it does the work for which it was designed and arrangements have now been made for manufacturing and leasing these units.

If adopted generally, this machine may be favorable rather than unfavorable to plasterers' employment. It does the least skilled part of the trade's work, that of getting the plaster onto the wall or ceiling; the later steps of spreading, smoothing, getting an accurate surface, and imparting a final finish are done with hand tools just as before. Among the principal reasons for using materials other than plaster, have been local shortages of plasterers, and the expense of the handwork which has been necessary thus far. Any improvement in these respects will bring some degree of increase in the demand for plastering, its extent depending on the cost reduction that is achieved.

Stucco finish on exterior walls has been used widely in certain parts of the country and at least to some degree almost everywhere. Greater use of this type of finish may be expected because of the increased range of finishes and colors that can be provided, suitable to almost any architectural style.

Wage Rates

Minimum wage rates in effect on January 3, 1950, as established by collective bargaining agreements for a number of cities and their surrounding areas, are given below.

Although hourly wage rates for plasterers have been high, annual earnings prior to World War II were comparatively low. In part this was caused by a workday which was in some cases shorter than that common for other trades (in some localities a 6-hour day compared with an 8-hour day for most trades) and in part by seasonal unemployment.

Plastering in a small building is a comparatively brief job, and such jobs tend to be seasonal because of concentrated rental and sales seasons for new apartments and houses. Work on nonresidential buildings is less seasonal and, when these are sufficiently large, the plastering work extends over several months. Almost three-fourths of the plasterers employed in 1939 had at least 6 months of work, but only a third had work for 9 months or more during the year.

Additional Information

The address of a union local which sponsors apprentice training in your locality may be obtained by writing to the Operative Plasterers' and Cement Finishers' International Association, 200 Fidelity Building, Cleveland 14, Ohio, or to the Bricklayers, Masons, and Plasterers International Union of America, 815 Fifteenth St. NW, Washington 5, D. C. Information on apprenticeship may also be obtained from the Contracting Plasterers International Association, 1327 Majestic Bldg., Detroit 26, Mich.

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1 30-hour workweek.
Outlook Summary

The long-run outlook for marble setters is good; for tile setters, uncertain but probably fairly good; and for terrazzo workers, decidedly good. Each of these trades is comparatively small.

Nature of Work

These trades are distinct, although they are occasionally combined in small places. The purposes served are broadly similar, but there are fairly sharp differences in the skills required and the detailed character of the work performed.

Marble setters install marble and other materials handled in a similar manner, almost entirely in the interior of buildings. These materials are used principally in nonresidential buildings (office buildings, banks, public buildings, etc.) but also extensively in hotels, sometimes in elevator-type apartment buildings, and occasionally elsewhere. The principal uses are for wall surfaces, entrances, lobbies, banking rooms, and other public spaces, for wall surfaces and stall partitions in toilets, and for the front and top surfaces of tellers' counters. There are numerous less frequent uses.

The marble setters use materials made to exact size and polished before delivery, and do no fabrication beyond what may be needed for minor fitting and for attachment of hardware. They lay out the work carefully to ensure accurate fitting, apply a special plaster mixture to the backing material (a tile or metal lath-plaster partition, a brick core for a bank counter, etc.), set the pieces in place, and when necessary brace them until the setting plaster has hardened. For toilet partitions, some of the pieces are usually mortised into others, and the setters fit these together and apply the hardware for supporting and connecting them. Usually each setter has a helper who acts as a general assistant but does not use tools. The helpers prepare plaster, do much of the carrying of the marble (large panels weigh as much as several hundred pounds each), and clean the surface of the completed work.

Tile setters deal with floor and wall tile, which is a thin ceramic material (not self-supporting) used as a final surface over other materials.

In nonresidential buildings, floor tile is installed in the entrances, lobbies, corridors, and toilets, and less frequently in stair landings, restaurant kitchens, laboratories, operating rooms, and numerous other places. In houses, it is frequently used for bathroom floors, but seldom elsewhere; in apartment buildings, it is used mainly for bathrooms, entrances, and corridors. Wall tile in residential buildings is used mainly in bathrooms. In nonresidential buildings it has many applications, of which the most important is probably in toilets, but it is used extensively in hospitals, in kitchens of well-equipped restaurants, hotels, and institutions, and to a lesser extent in many other places.

A tile setter lays out the room in which he is working so that the surfaces will be where intended and all high spots in the rough wall or floor will be covered without any bulges. He applies a backing of stiff mortar and fits the tile into place so that the pieces and joints will make the desired pattern. As necessary, he cuts pieces of tile to fit the dimensions or to fit around pipes, etc. Large pieces of floor tile are handled individually, while small pieces come in sheets of several dozen glued to a paper backing, and as far as possible are handled in sheets. In laying tile flooring, the tile setter covers the area with a stiff mortar layer and then lays the tile in sheets as far as possible, using partial sheets or individual pieces to fill out the dimensions or to give a border or other pattern different from that of the sheet-mounted pieces. He usually works with a helper, who mixes the mortar, keeps him supplied with materials, sets up portable scaffolding for high work, fills the joints after the setting is finished, and finally cleans the completed work.

Terrazzo is essentially a type of ornamental, nonstructural concrete, in which marble chips are used as the coarsest ingredient; it is ground and polished after hardening to give a smooth surface in which the marble chips are exposed against a background of other material. Shop-made terrazzo is used to varying degrees for wainscoting,
toilet stall partitions, stair treads, etc., but such pieces are installed in the same manner as pieces of marble. A terrazzo floor is usually divided into a number of distinct areas by means of thin metal strips to localize and minimize any cracks resulting from settlement of the building. Areas of different color are separated by metal strips to obtain sharp distinction. Simple geometrical patterns, such as squares of alternating color, are the most common, but lettering, symbols, trade-marks, etc., not involving fine detail, have become fairly popular for retail stores and elsewhere.

A terrazzo worker starts by laying a first course of fine, fairly dry concrete, leveling this accurately and tamping it. He then places the metal strips wherever there is to be a joint between panels or a change in color, embedding their bottom edges in this first course. If there is to be lettering or an ornamental figure, he embeds a shop-made mold for this also. Then he mixes the top course, pours it onto the lower course, and levels it; there is, of course, a separate batch for each color. After a few days of hardening, the floor is ground by abrasive blocks rotated by power, protruding down from a heavy machine which is moved slowly back and forth over the floor. This grinding is continued until there is a smooth, level surface slightly below the original top edge of the strips. Installation of a terrazzo base is generally similar but differs in detail. In these operations, the terrazzo worker is assisted by helpers in the mixing and placing of the base course but he alone does the leveling, places the metal strips, and at least supervises mixing of the top course, which (along with the grinding) governs the final appearance. The grinding is usually done by another worker.

Outlook

During the early fifties, marble setters and terrazzo workers seem unlikely to be affected much by mobilization preparations, unless there should be substantial limitations on nonresidential building and remodeling. Employment of tile setters will decline as residential building is cut.

The long-run outlook for marble setters is probably about the same as that for building journeymen as a whole. Marble is used less than formerly to give an appearance of luxury to otherwise mediocre buildings, and it is much less popular than some years ago for a few applications, particularly soda fountains. It is also used much less than formerly in the toilets of nonresidential buildings. Its excellent qualities need no description, however, and it is suitable in buildings of almost any architectural style. In buildings where initial cost is not the first consideration, it seems likely that the use of marble will maintain its present importance. Use of structural glass and some other alternate materials does not affect the work of marble setters, although it does reduce the employment of marble shop workers; where these are used as alternates for tile, they actually increase the employment of marble setters.

Although tile is a splendid material, which has been greatly improved over a period of years by its manufacturers, the outlook for tile setters is uncertain because of the active competition of other materials. For floors, it has been replaced to a considerable degree by terrazzo. While the architectural possibilities of tile have been more fully appreciated and more fully developed within the last quarter century, the same is even more true of terrazzo. Improvements in asphalt tile (laid by soft-floor layers or carpenters) have made it a strong competitor of ceramic floor tile in buildings where first cost is important. For wall surfaces, structural glass has established a definite place for itself, and increasing use of plastic and plastic-coated wallboard seems likely. Partitions of glazed finishing tile have been used in some applications in place of rough partitions covered with plaster and wall tile; this is a type of structural tile, and is installed by bricklayers. There is no question that tile will continue to be an important material because it has a combination of desirable qualities not fully obtainable otherwise. There is serious doubt, however, that it will continue to be used as extensively as in the past, in view of the active development of competing materials.

Terrazzo work is likely to expand, with very good long-range prospects, as recognition of its possibilities continues to increase. Despite expansion, from its nature it will remain one of the small trades.

For tile work and also for terrazzo work and especially for the two in combination, there is probably an opportunity in many of the smaller cities (mainly 10,000 to 25,000 population) for a capable journeyman to establish himself as a small
contractor, working on the jobs himself. These trades have been practiced mainly in larger places, and use of these materials has been hindered in the smaller cities by absence of a local man able to do a competent job and to advise local owners, builders, and contractors on just what can be done with tile and terrazzo. This opportunity does not extend to marble setting, because marble contracting requires a more extensive shop than can be supported by the local volume of work in most small cities.

Wage Rates

Minimum wage rates in effect July 1, 1949, as established by collective bargaining agreements for a number of cities and the surrounding areas of each, are given below.

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Additional Information

For additional information about any of these trades, or the address of the nearest union local, write to the Bricklayers, Masons, and Plasterers International Union of America, 815 Fifteenth St., NW., Washington 5, D. C.

Painters and Paperhangers

(D. O. T. 5-27.010 and 5-28.100)

Outlook Summary

Opportunities for new workers are limited in each of these trades, and the outlook is not encouraging. There has seldom been an excess of fully competent men, but both trades have been overcrowded with partially trained workers much of the time.

Nature of Work

Painting and paperhanging are recognized as separate trades, but many men (including the great majority of those doing redecorating) perform both types of work.

Painters are skilled workmen who prepare surfaces and then apply paint, varnish, enamel, lacquer, and similar materials, to buildings and other structures. Some work is on the exterior, for protection from the weather as well as for appearance; indoor work is primarily for appearance but may be for protection also. Repainting and redecorating houses, apartments, and commercial buildings make up a large part of the work; in such work, painting and paperhanging are usually done by the same men. An important maintenance field is repainting for protection of factories, warehouses, etc., and of outdoor structures, such as tanks and bridges. In small places, the painters also do glazing, and "combination men" skilled in both trades are recognized.

The most important part of many painting jobs is preparing the surface, especially in repainting
old work. On high-grade jobs, rough spots must be sandpapered, nail holes and other imperfections filled, dust brushed off and grease washed off, and any loose paint removed by scraping or, if it is in sufficiently bad condition, by heating with a blowtorch and then scraping. Areas scraped down to the wood must be primed to give a suitable surface for the new paint. Then the new paint is applied with a brush or, in some cases, a spray gun.

A painter must be able to mix paint of all standard types from the basic ingredients, to match color samples by mixing colored pigments with either the basic ingredients or with prepared paint, and to set up safe scaffolding appropriate for whatever working conditions he encounters. He must know the characteristics of all common types of paints and finishes from the standpoint of durability and suitability for different purposes and also from the standpoint of handling and application. He should have a good knowledge of color harmony, because owners and tenants will frequently want his suggestions on choice of colors. He must be skillful in handling brushes and other tools in inconvenient positions, such as directly overhead, and be able to apply the materials uniformly, thoroughly, and rapidly, to any type of surface.

Paperhanging involves trimming off the edges of a sheet of wallpaper; pasting it; folding it for temporary storage until several sheets are ready; placing it on the wall or ceiling; cutting it as necessary to fit window trim, etc.; adjusting it until its pattern matches that of the next strip; smoothing it so that it adheres firmly and evenly; and rolling the joint. In redecorating work it may be necessary to remove the old paper by soaking or, if there are many layers, by steaming; it is also necessary in many cases to do minor plaster patching in order to get a smooth surface for the paper. Paperhangers also handle other materials calling for generally similar operations—cloth-backed wood veneer, imitation veneer, and some others.

Where Employed

About 80 percent of the painters described in this section, work in the construction industry, either as employees or as self-employed workmen. The remaining 20 percent are employed as maintenance painters in almost all industries. Hotels, office buildings, railroad and other utility companies, manufacturing firms, school boards, other government units, and organizations of every sort that own extensive property commonly employ maintenance painters. When interior redecorating involves papering also, as in hotels or apartment buildings, usually the maintenance painters must be able to do paperhanging as well. Some of these maintenance jobs also involve nonconstruction work, such as refinishing of furniture at a hotel, or painting window display material at a department store. There is some degree of nonconstruction painting requiring full journeyman skill, as in the painting of large pieces of machinery during manufacture, but most painting of factory products (whether by brushing, dipping, or spraying) is handled as semiskilled work.

For paperhangers, the percentage of employment in the construction industry is even greater than that of painters. There are many maintenance jobs, but in most cases they require competence in painting also; maintenance employment for paperhanging only is much less frequent than for painting only.

Training and Qualifications

A 3-year apprenticeship is provided for either of these trades, although less formal training has been fairly common. A number of the union locals have offered special courses by which journeymen competent in one trade could be trained in the other. In some cases applicants without formal training have been accepted into membership after an oral examination and a demonstration of their ability. Policies in this respect are decided by the locals. While acceptance as a journeyman has been easier for those without formal training than is the case in many of the other trades, it should be kept in mind that a high level of competence (which means thorough training) is particularly important for those wishing to be accepted and paid as craftsmen in a field having a large number of mediocre workmen.

Outlook

Opportunities for new workers are limited in both painting and paperhanging, and the long-run outlook is not encouraging. There has seldom been an excess of fully competent men, but both trades have been overcrowded with partially trained workers much of the time. Moreover, these trades
will be seriously affected during the early fifties by limitations on residential building—a principal field, particularly for painters. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.) Painting is a trade in which labor cost usually exceeds material cost. The latter is negligible for some of the most important operations such as washing of walls preparatory to repainting, scraping or burning off loose or scaly old paint, and other preparatory jobs. Any saving in labor cost makes a greater proportionate saving in total cost than in trades where material expense is high; thus pressure for saving in labor cost is greater than for most other trades.

In the painting and paperhanging fields, the number of self-employed workmen and small contractors is unusually large, so that ordinarily there is keen competition for work, particularly redecorating work. Since owners’ standards of workmanship are frequently low, and for rental property the desire in many cases is merely to give a fresh surface until it is time for another redecorating job, much of the work is awarded strictly on a price basis and is done by poorly trained men at correspondingly low wages.

There seems also to have been a great increase within recent years in the extent to which property owners and occupants do their own interior decorating. New types of paint intended mainly for such use have been marketed actively and sold in very great quantity. Other new types of interior paint with improved “covering power” (opacity) have made it easier for inexperienced persons to do work meeting their own standards of acceptability; even though these latter products were not brought out primarily for the householder market, they are sold in great quantity through consumer outlets, such as drug stores and hardware stores. Probably workmanship has been poor and final results disappointing in many cases of strictly amateur redecorating of this sort, but there are no indications of a decrease in such work.

The same conditions of competition from informally trained workers hold, although probably to a lesser extent, for exterior repainting. Competition from property owners doing their own painting is much less. The amount of exterior repainting done has been cut by two factors: improvement in paint materials and formulas, so that painting is needed less frequently; and covering of wood exteriors with other materials (asbestos shingles, imitation brick with or without insulating backing, etc.) which do not need painting, although the time-consuming “trim” work at door and window openings is not reduced thereby.

Long-range trends in building design and an unmistakable trend toward the use of more completely processed material are also unfavorable to the painters to some degree. Many items formerly painted at the building site now come from a factory ready for installation, with at least a priming coat and often with a final, permanent finish. Even prefinished hardwood flooring has been brought out and has met with a ready acceptance. Aluminum products, requiring no painting either at the factory or at the job, have been introduced within fairly recent years and made in increasing quantity—garage doors, roof gutters and downspouts, window sash and frames. While these are still luxury items, they are less so than in the past, and expansion into a still wider market seems likely. The trend in design has been toward simpler lines and simpler ornamentation; this change, simplifying the work of painters and of other trades as well, seems still to be in progress.

From an employment standpoint, spray painting is unfavorable but probably less so than is commonly supposed. The painters’ union has accepted spray work, provided methods and equipment protecting the health of the workers are used. Conditions differ greatly from those in painting of factory products, however, and the time saving possible in factory work can seldom be realized in construction painting. Commonly, it is necessary to cover nearby areas with masking tape or to use other measures to keep the paint off places where it is not wanted. Wind can be a serious hindrance outdoors. A spray outfit is obviously not applicable to preparing the surface before the paint is applied, and, unless this work is done carefully and thoroughly (especially in repainting old surfaces), the results will be unsatisfactory, regardless of how the paint is applied.

The situation is not greatly different for paperhangers, despite the fact that in some areas there are only a few thoroughly competent men. Like painting, this field has had the problem of a large number of semitrained men who, however, do work well enough to satisfy many property owners.
Paperhanging by property owners has always been done to some degree, but it has never been common and it seems unlikely to affect employment prospects substantially. Much more serious has been the painting of walls by householders with the new types of interior oil paints and especially with resin-emulsion paints. The latter particularly have been used in tremendous quantity for redecorating work, most of it done by the occupant.

While the outlook for residential work has been deteriorating, that for nonresidential work has been improving. The importance of an attractive interior for retail establishments is recognized as never before. For factories of many types, the standards for interior painting have risen greatly—to obtain better lighting, to improve morale, to increase safety, in some cases to designate trucking lanes and storage spaces, etc. While such improvement is already widespread, the trend toward higher standards still seems to be in effect.

All of these considerations mean that painting and paperhanging cannot be regarded as expanding trades, but they are not by any means in process of disappearing. Under these conditions there is need for additional well-trained men. Such men will, however, find competition much keener than in expanding trades or in trades where inferior work done by property owners and poorly trained workmen is less acceptable. Real aptitude for the work and thorough training are important for a person expecting to be recognized in his locality as a craftsman and to obtain corresponding earnings.

**Wage Rates**

Minimum wage rates for painters and paperhangers in a number of cities and their surrounding areas, as established by collective bargaining agreements and in effect on July 1, 1949, are given in the table below. In many places established rates are higher for some types of painting such as use of a spray gun from a swinging scaffold, and painting of structural steel. These rates should be considered with recognition of the high seasonal unemployment to which painting and decorating work has been subject.

Wage rates for maintenance painters are ordinarily well below the established scales paid in new construction. Annual earnings may actually be higher, however, because of more regular employment. In some cases it is necessary for organizations having their own maintenance painters to concentrate their work within a brief period (school redecorating during the summer vacation period, for example), but many establishments are able to carry on repainting and redecoration work throughout the year. When they can do so conveniently, they usually prefer to employ one or a few painters continuously, rather than a larger gang intermittently.

**Additional Information**

For additional information, write to the Brotherhood of Painters, Decorators and Paperhangers of America, Painters and Decorators Bldg., Lafayette, Ind., or to the Painting and Decorating Contractors Association of America, 12 S. Twelfth St., Philadelphia 7, Pa.
Glaziers

Outlook Summary

Over the long run, the employment trend is upward. However, during the early fifties, defense preparations will reduce the need for glaziers but not so much as for some of the other construction trades.

Nature of Work

Glaziers install all types of glass, although not in all places where glass is used. In many localities the largest single part of their work has been the installation and replacement of plate glass in store windows. They also install ordinary window glass (sheet glass) in the windows and doors of houses, apartments, and business or factory buildings, put wire-glass in skylights and fire resistant doors and windows, set mirrors when these are not already mounted; and install any unusual items, such as pre-assembled stained glass or leaded glass panels.

Since it became available about 25 years ago, glaziers have installed structural glass (a non-transparent plate glass, usually polished on one surface only, made in a number of colors) as an ornamental surfacing on the exterior of buildings (usually for stores, above and below their display windows). Structural glass used in the interior of buildings is handled by marble setters. Glaziers install glass blocks under some conditions, but these are used mainly in exterior walls, where they are set in mortar by bricklayers.

Ordinary glazing work consists of cutting the glass to size (except where stock sizes fit without cutting, which is commonly the case with steel sash), spreading a bed of putty around the edges of the opening, pressing the glass into place, fastening it with wire clips pressed into small holes in steel sash or with triangular metal points driven into the edge of wood sash, and then placing and beveling a strip of putty on the outside to keep out moisture. Plate glass, cut to size at the shop or at the job, is held in a special supplementary frame built into the store front and partially disassembled for the removal and replacement of glass.

In many localities the wood sash and doors used in ordinary residential building are glazed at the millwork factory. Factory glazing is much less practical for steel sash, because of greater difficulty in protection during transportation, handling, and installation. In the past, shop glazing has been done mainly by semiskilled factory workers rather than by glaziers, and in most localities such sash have not been used on buildings constructed under collective bargaining agreements. During 1948, the international union removed its objection to installation of shop-glazed sash, provided the glass was installed by its members. This action is likely to mean greatly increased use of shop-glazed sash in numerous localities.

Glazing is primarily an urban trade. In large and moderately large cities it is done by men who are strictly glaziers, but in small cities it is frequently done by "combination men" who also do painting and, in many cases, paperhanging. In places too small to support an establishment with a stock of plate glass, ordinary glazing is done as a side line by painters and often by carpenters or other journeymen, while occasional plate glass or structural glass jobs are handled by a crew from a larger city nearby.

Where Employed

The great majority of glaziers work in the construction industry as employees of glazing contractors. These men work on new construction, on alterations and modernization, and on replacement of broken glass, particularly in store windows. A few are employed in the manufacture of glass and in various industries as maintenance workers. Some have also been employed in millwork factories for shop glazing of sash, doors, etc., but, in the past, most of the men employed for such work were semiskilled rather than journeymen. Some have also been employed in factories for shop glazing of cabinets, store fixtures, etc., but much of this work has also been done by semiskilled workers.

Training and Qualifications

Glazing is a skilled craft customarily requiring a 3-year apprenticeship. In most areas the trade
can be entered only by way of formal apprenticeship, but in some localities helpers with several years of experience may qualify and be admitted to the trade as journeymen.

Outlook

In the long run, additional workers may be added to this relatively small occupation, but most of the job openings will be to replace workers who leave the trade. During the early fifties, defense preparations will reduce the need for glaziers but not so much as for some of the other construction trades. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.)

The importance of glass in building construction, and hence the importance of glazing, show definite signs of increase. There is a trend toward the use of more glass in residential buildings. Any increase in the extent to which shop-glazed sash are used will bring some reduction in the total work of setting glass, but there may be a small increase in the total employment of glaziers through their replacement of factory operatives.

In recent years there has been a very marked development of the use of glass in commercial buildings, especially retail stores. Store modernization has often been centered around improved store windows, which involves a completely new glass installation. It is also likely that structural glass will be used more widely than before. Architectural publications indicate a rather strong interest in larger glass areas for office buildings and other major commercial buildings. Replacement of store windows broken by windstorms or other accidents is, of course, a year-round employment source for glaziers.

Wage Rates

The minimum wage rates established by collective bargaining agreements as of July 1, 1949, are given in the table below for a number of cities and their surrounding areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
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<td>Seattle, Wash</td>
<td>1.96</td>
</tr>
<tr>
<td>Springfield, Mass</td>
<td>2.00</td>
</tr>
</tbody>
</table>

1 35-hour workweek.
2 $1.52½ for shop work.

Additional Information

For additional information, or for the address of the nearest union local, write to the Brotherhood of Painters, Decorators, and Paperhangers of America, Painters and Decorators Bldg., Lafayette, Ind.

Roofers

Outlook Summary

The long-run outlook for roofers is substantially the same as that for construction workers as a whole. Their employment will be better sustained than that of many other trades during the early fifties, because of the importance of maintenance, repair, and re-covering of the roofs of existing buildings, and because of the need for roofing in defense construction.

Nature of Work

Roofers' work includes the application of composition roofing, such as built-up roofing; the in-
stallation of roofing tile, roofing slate, and a number of other roofing materials; and the waterproofing and dampproofing of wall surfaces, etc., for building and other structures. The first of these is the most important as a source of employment.

For built-up roofs, the roofers cover the surface with strips of asphalt impregnated felt, coating each strip thoroughly with tar, pitch, or other bituminous material. They lap each strip over the preceding strip sufficiently so that all parts are covered with the desired number of thicknesses, and coat each over its entire width before the next strip is laid down. Then they cover the entire exposed surface with bituminous material, and usually with gravel or slag to hold it down and protect it from the elements. Formerly hot tar or hot pitch was used almost exclusively and was applied by mopping. Emulsified asphalts applied without heating are now also used and recent products of this general type can be applied by spraying. Built-up roofs are used mainly on nonresidential buildings and apartment buildings. Within recent years new types of material have been developed, permitting use of built-up roofs on steeper slopes than was formerly practical.

There are many types of waterproofing. It is used largely but not entirely below ground level and primarily on nonresidential buildings and some types of nonbuilding structures. While commonly used on large apartment buildings and hotels, it is seldom applied for houses, except where the ground water conditions are usually bad. Among the locations where it is used are basement and area wall, to a lesser degree walls above ground level, floors below ground level, swimming pools and other tanks, and nonbuilding structures (such as cable vaults) below ground level. Waterproofing of walls is often done by coating them with hot bituminous material, covering this with felt or cloth, and then coating them again. Waterproofing of floors (between a lower and an upper layer of concrete) or of a sidewalk above a basement (between the concrete of the basement roof and the concrete of the sidewalk itself) is more similar to roofing. Some types of waterproofing are applied by spraying.

Dampproofing is a coating applied to interior and exterior surfaces to prevent penetration of moisture. Ordinarily it is applied by spraying.

Use of this treatment has been increasing, and seems likely to increase further.

Slate and tile comes as separate pieces and are nailed into place individually. Tile roofs are popular for houses in some parts of the country but elsewhere are used mainly on nonresidential buildings having steep roofs—churches, some public buildings, some school and college buildings, etc. They are also used for ornamentation on various types of small retail buildings (gas stations, lunch stands, miscellaneous others), but the total amount of work involved for these is comparatively small. At one time slate roofs were used extensively on good houses but because of the great improvement in other materials such use has been infrequent for a number of years in most parts of the country and seems unlikely to increase. Slate is used on the same types of nonresidential buildings as tile. In larger areas the men doing slate and tile roofing are different from those doing composition roofing. In general, slate and tile have been losing ground to other materials.

Where Employed

Roofers work almost exclusively in the construction industry on new construction and on maintenance and repair. For built-up roofing there is a lot of maintenance and repair work. Although high-quality roofs often last longer than the guarantee period, a great many owners choose lighter, cheaper roofs which usually need repair after a very few years, and re-covering after a few more. Waterproofing is usually not subject to maintenance and repair work; it lasts longer. Slate and tile never wear out, but individual pieces may break. On a nonresidential building or an unusually expensive house, the broken pieces are replaced at intervals, but on a good house below luxury grade, if the breakage is extensive, the owner is likely to replace the entire area with some less expensive material such as asphalt shingles.

Outlook

There is nothing to indicate a noteworthy change in roofers' employment over the long run. However, the effect of defense preparations seems likely to be unfavorable for this trade, but less severe than for many other trades. Defense types of construction, such as industrial plants, are im-
important employment fields, and repair and replacement of existing roofs is a necessity at all times. The importance of repair work on composition roofs helps to even out seasonal unemployment. There is time lost at all parts of the year because of rain or snow; the principal work that can be done during wet weather is trying to locate leaks that have been baffling at other times.

**Wage Rates**

Wage rates in effect for composition roofers and slate and tile roofers on July 1, 1949, in a number of cities and the surrounding area for each, as established by collective bargaining agreements are shown below.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Composition roofer</td>
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<table>
<thead>
<tr>
<th>Area</th>
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<td>Springfield, Mass</td>
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</tr>
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</table>

Additional Information

For additional information, or for the address of the nearest union local, write to the United Slate, Tile, and Composition Roofers, Damp and Waterproof Workers Association, 130 North Wells St., Chicago 6, Ill., or to the National Roofing Contractors' Association, 313 West Madison St., Chicago 6, Ill.

**Asbestos Workers**

*(D. O. T. 5-33,110)*

**Outlook Summary**

The outlook for asbestos workers is good. This trade is employed extensively in some kinds of defense construction and is important in peace-time.

**Nature of Work**

Employment is mainly for two principal types of work, plus one minor type. The first of these, around which the trade was originally formed and from which its name is taken, is insulation against heat loss of boilers, pipes, kettles, tanks, and a wide variety of industrial equipment intended to contain steam or other hot substances. Insulation is applied to save fuel, to maintain the desired operating pressures or temperatures with greater uniformity, to keep down the temperature in the rooms where the equipment is located, and for several less frequent reasons. Straight runs of pipe are usually covered with short sections of prepared material, which are placed around the pipe and fastened. Boilers, tanks, kettles, etc., may be covered with prepared material in sheet form, or with a paste of asbestos mixed with other materials, followed by an outer wrapping of cloth. This last procedure is used for irregular surfaces, which are encountered to some degree in industrial insulating jobs and in most other jobs also. Insulation is installed in powerhouses (public utility, and at factories), in the boiler rooms of large buildings of many types, on the main steam lines, and in other locations.
and sometimes on the branch lines of large heating installations (hotels, department stores, office buildings, large apartment projects, etc.) and, of course, in manufacturing establishments having industrial processes using steam, hot liquids, or hot gases.

The other principal type of work is insulation against absorption of heat. Some of this is done on the pipework, etc., of refrigeration installations (for cold storage, for freezing or other processing of foods and other commodities, for drinking-water lines, under some circumstances in air-conditioning installations); this work is very similar to insulation of hot pipes or vessels against loss of heat. Related to this, although quite different in the materials used and the method of installation, is the insulation of enclosed cold-storage spaces too large for economical use of factory-made panels such as those from which ordinary "walk-in" cooling rooms are assembled. This cold-storage lining is applied to the walls, ceiling, and floor of a large space—in some cases an entire building. Often there are insulating partitions on the interior also, to permit maintenance of different temperatures in different portions.

In many localities a subdivision of this trade installs home insulation. This work is less skilled than the activities described above and has a lower wage scale.

Where Employed

Employment is mainly in the construction industry, but there is a substantial amount of employment in numerous other industries for alterations and maintenance. Some types of chemical plants and others having extensive steam installations for power and heating are engaged in more or less continuous alteration and maintenance of their insulated pipework and apparatus, and employ asbestos workers for this work. Force-account maintenance employment for cold-storage installations is much more limited, and is uncommon unless at the very largest establishments in the major cities. There is also a substantial volume of employment at shipyards on new work, maintenance, and repairs.

Outlook

While asbestos workers will necessarily constitute one of the smallest trades, the employment outlook is good. Their work is closely tied to the increasing importance of pipework and related equipment in industrial plants and to the increasing importance of refrigeration installations. This includes cold-storage locker buildings and other establishments, smaller than were formerly common, but too large for portable equipment and factory-made assemblies. Also, important types of defense activity which in the past increased the demand for journeymen in this trade are likely to continue in the early fifties.

Wage Rates

Wage rates in effect on July 1, 1949, in accordance with collective bargaining agreements are given in the following tabulation for a number of cities and their surrounding areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
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1 Home Insulators, $1.75.  2 35-hour workweek.  3 Home Insulators, $1.72½.  4 Home Insulators, $1.55.

Additional Information

For additional information, write to the International Association of Heat and Frost Insulators and Asbestos Workers, Ninth St. and Mount Vernon Pl., NW., Washington, D. C.
Outlook Summary

The outlook for plumbers and pipe fitters is good for the 1950 decade. There has been a long continued trend toward greater emphasis on plumbing and other pipework, and this is likely to continue. While defense preparations will hurt some employment fields, they will increase others.

Nature of Work

Journeymen in the plumbing and pipe-fitting industry install, alter, and repair the piping systems (including fixtures and similar parts) for household and other water use, and for heating, steam power, refrigeration, fire sprinklers, industrial processing, and numerous other purposes. This broad field has been divided among several trades, but a few years ago the international union representing all of them adopted the policy of combining the entire pipe field into a single trade. The carrying out of this policy in any particular locality is decided by vote of the members of the union’s locals there, and in many places (including many large cities) the craft distinctions are observed by journeymen as fully now as in the past.

The plumbing field takes in water supply and waste plus the fixtures themselves and their “trimmings” for houses, for other buildings, and elsewhere (outdoor drinking fountains, for example). It includes many items for special uses, such as hospital plumbing fixtures, restaurant sinks, built-in dishwashers, commercial and nonportable domestic washing machines, etc.; gas piping; the public water-supply lines under streets and elsewhere; and a variety of infrequent installations (swimming pools, ornamental fountains, etc.).

The general pipe-fitting field includes hot-water and steam heating systems (including vapor and vacuum systems), high-pressure steam plants for power generation and for steam used otherwise (as for heating of materials in manufacturing operations), sprinkler systems for fire protection, refrigeration systems for processing and storage of perishables and for air conditioning (but not the ventilating work connected with air conditioning), lines for compressed air and industrial gases, and piping for industrial processing. This last type of work is used most extensively in oil refineries, chemical plants, and food-processing plants, but occurs to some degree in many other industries.

This is a field where adeptness in the use of tools and in handling materials, although necessary, is less important than a thorough knowledge of the work. A truly skilled workman must be familiar with a wide variety of materials and an extremely wide variety of fittings and specialties, including their particular uses, their limitations or disadvantages, and the proper methods of handling. He must know the operating principles for different kinds of systems and the operating relationships between the different parts. He must be able to lay out the system so that it fits the building where it is being installed and be able to avoid unnecessary damage to other work in any cutting that is needed. For plumbing, he must know the State laws and city ordinance so that his work will pass inspection.

For a major installation, there are separate piping drawings showing where all the pipes are to be placed, with sizes and the location of valves and other special items, thus giving a complete picture of the installation. At the other extreme the plumber may merely be told the fixtures wanted and their approximate locations. From such information, plus measurement of the building, the journeyman or foreman decides where and how the pipes will go. Then the necessary pieces are cut to length and assembled with necessary fittings, valves, and other parts. At the end of this “roughing-in” stage, there is usually an inspection of plumbing by the city or State inspector, including a test under water pressure. When carpentry, plastering, and the other trades are far enough advanced, the job is finished by installation of the plumbing fixtures with their “trimmings” (faucets, drains, traps, etc.) or the corresponding parts of the heating system (radiator, etc.).

Examples of changes in the work within recent years are the rapid adoption of copper pipe with
brass fittings for plumbing, the very recent growth of panel (frequently known as radiant) hot-water heating, and the use of copper pipe for some of the panel heating installations. The use of welding has grown rapidly since about 1930. New kinds of pipe are now used (including aluminum, stainless steel, rubber-lined steel, nickel alloy, plastic, and brass). Such changes, combined with the exceedingly wide range in types of work included, give particular importance to over-all knowledge and an understanding of principles.

Where Employed

Most journeymen work in the construction industry, primarily on buildings but on other construction as well. Others work for municipal water departments, other utilities, and in shipbuilding. Commercial and industrial establishments also employ plumbers and pipefitters for maintenance work and alterations, and some companies in other industries employ them for force-account construction work. They are employed in almost every locality; although they are most numerous in large cities, opportunities have been increasingly good in small places because of rising standards in village and farm sanitation.

There is at all times a considerable amount of alteration and improvement work in addition to new construction. This includes home modernization, store and office modernization, alterations and installation of new equipment in industrial plants, and preparation of business property for new occupants. Soda fountains, restaurants, even dental offices, use equipment which must be connected to water-supply pipes and waste lines. Since these are usually not at the locations where the equipment is to be placed, they must be extended.

Repairs and replacements are more important in plumbing than in many other types of work and help greatly in providing a sufficient volume of business in small localities. They are the mainstay of many of the small plumbing establishments.

Opportunities for jobs in heating and industrial piping are more limited geographically than are those for plumbing. Steam and hot-water heating systems are naturally uncommon in the warmer parts of the country and in the north are most frequent in cities having many apartment buildings and nonresidential buildings. Industrial piping is greatest where the industrial operations include processing of fluids but is used to some degree in factories of many other types as well (for steam, compressed air, oil, and other substances). Refrigeration and fire-sprinkler systems are installed in industrial and commercial buildings of many different types.

Training and Qualifications

A person interested in becoming a journeyman should have an interest in and the ability to master elementary physical science and be skillful at using his hands. He must learn to make clear working drawings, to read architectural and piping blueprints, and to take measurements for laying out his work. Average physical strength is needed, but no more than for several other trades. As in other building trades, at times it is necessary to work under inconvenient and uncomfortable conditions.

Generally, the trade is learned through a 5-year apprenticeship. The apprentice signs an agreement, commonly with a joint committee representing the union and the local employers, about training, related school instruction, and wages and hours. Under the usual program, all-round training is given on the job, and an apprentice
is likely to be transferred to several employers in order to get experience in different kinds of work.

At least 144 hours of classroom work are given a year, including elementary mathematics applicable to pipe work; physics, with special attention to liquids and gases, the elements of hydraulics, and heat; mechanical drawing; and theory, which includes materials, sanitation and elements of bacteriology, and piping systems. Also covered in school courses are piping drawing, shop work, and acetylene and electric welding. A new training course covering the entire piping field has been prepared by the international union. In localities where apprenticeship is for the separate trades (plumbing, steam fitting, sprinkler fitting, refrigeration fitting) rather than for the entire plumbing and pipe-fitting field, the classroom training for any of these usually omits the material dealing almost entirely with the other trades. It seems likely that in localities where the apprenticeship is for the entire pipe field, many of the apprentices on reaching journeyman status will prefer to specialize in a particular type of work whenever such jobs are available.

In some localities a journeyman's license is required for plumbing work, obtainable after satisfactory completion of apprenticeship. A master's license is very commonly required for those engaged in plumbing contracting or in self-employment on repairs and other small jobs done directly for property owners.

**Outlook**

Prospects for the early fifties are good, because defense work will tend to offset declines in employment in other types of construction. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.) Thereafter the outlook for those already in the trade will continue to be good. A larger than usual number of replacements will be needed during the 1950 decade to fill openings left by those who leave the trade because of death or retirement. A large part of the journeymen plumbers and pipe fitters are in the older groups.

Plumbing and other pipe work have been increasing in importance in many types of building construction. This trend is almost certain to continue. It is encouraged by active development of new products and improved products carried on by a large number of manufacturers.

For houses and apartments, mere observation shows change in the general standards. Currently the high level of building cost has brought less complete plumbing installations in many houses than would have been used otherwise, but this is a temporary departure from the trend; it is not a lowering of the standard regarded as desirable. In addition to the standard bathroom and kitchen fixtures, permanently connected appliances (especially washing machines and dishwashers) have become popular enough to be regarded as a significant part of the field.

Heating is another field showing signs of expansion. For domestic heating, panel (radiant) hot-water installations have been accepted very rapidly. The excellent results obtainable from a first-class installation seem likely to bring a noticeable increase in the use of hot-water heating. For large buildings meeting even moderately good standards, the heating installation is designed for the lowest annual cost (including fuel expense) rather than the lowest initial cost. This means a more elaborate installation than would otherwise be used and, because of improvements in the specialty products available, a more elaborate installation than would have been used some years ago.

Industrial pipe work is far from a new field, but its importance has increased steadily and seems likely to increase further. Chemical plants and others dealing with fluids are the principal users, but it is used in industries of almost all types. Means for reducing the handling of materials and supplies are emphasized in the design of modern factories, and piping is one of the important means of achieving that purpose. Internal transportation of liquids through pipes rather than in portable containers contribute to good factory housekeeping, with reduction of the accident hazard and in some cases reduction of the fire hazard as well.

The trend toward greater use of refrigeration equipment is apparent for cold storage, for air-conditioning, for processing of foods and other commodities. Sprinkler work is not likely to increase much in importance but will continue to be needed for protection of the inflammable contents of buildings, regardless of whether the structure proper is fire-resistive.
Modernization has been an important field. For domestic plumbing it means replacement of fixtures and often of supply pipes as well; in some cases rearrangement of fixtures; in other cases provision of an additional complete or partial bathroom. This work and also nonresidential modernization of plumbing will continue. Modernization of domestic steam or hot-water heating occurs where there is extensive remodeling and sometimes obtrusive old-fashioned radiators are replaced; this latter has been stimulated by the development of baseboard radiators. Installation of automatic firing equipment and automatic controls is also important. Nonresidential heating modernization is always present to some degree, for the purpose of saving fuel by converting older systems to take advantage of improved steam specialties.

Repair work is traditional for plumbing. Correction of leaks, stoppages, and other mishaps can seldom be postponed, and unless very simple, these jobs are beyond the capacity of most householders and occupants of business property. Repairs are also needed from time to time on heating systems, although less frequently than for plumbing. Servicing of automatic firing equipment and refrigeration and air-conditioning equipment has, however, become an important source of employment.

**Wage Rates**

Minimum hourly wage rates for plumbers and steam fitters (pipefitters), according to the terms of collective bargaining agreements in effect on July 1, 1949, for a number of cities and their surrounding areas are given in the following tabulation.

Although plumbing work on new construction is seasonal, repair and maintenance work makes for more regular year-round employment than in most other building trades. Commercial alterations and modernization are less seasonal than new construction.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Plumbers</td>
<td>Steam fitters</td>
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</tr>
<tr>
<td>Atlanta, Ga</td>
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<td>$2.50</td>
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<tr>
<td>Baltimore, Md</td>
<td>2.25</td>
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<tr>
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<td>2.42½</td>
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<tr>
<td>Jackson, Miss</td>
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<td>2.00</td>
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<tr>
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<tr>
<td>Springfield, Mass</td>
<td>2.35</td>
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</tbody>
</table>

1 30-hour workweek.
2 35-hour workweek.

**Additional Information**

For information on where to apply for apprenticeship in a given locality, write to the United Association of Journeymen and Apprentices of the Plumbing and Pipe-Fitting Industry, Ring Building, Eighteenth and M Sts., NW., Washington 6, D. C.; to the Heating, Piping and Air Conditioning Contractors National Association, 1250 Sixth Ave., New York 20, N. Y.; or to the National Association of Master Plumbers, 1105 K St. NW., Washington 5, D. C.
**Outlook Summary**

The long-run outlook for electricians is good, but defense preparations begun in 1950 are likely to result in a drop in employment.

**Nature of Work**

Construction electricians install electric wiring and related devices, lighting fixtures, and numerous types of electrical equipment; they make the electrical connections to electrical machinery, equipment, etc., and its control apparatus. These men are distinct from stage and motion-picture electricians, electrical equipment repairmen, appliance repairmen, linemen, men working on telephone equipment, and many others working with electrical materials.

On a large job there are drawings showing the various circuits and the approximate location of outlets, load centers, panel boards, etc., plus specifications describing the materials to be used. On small jobs the electric outlets may be indicated on the general drawings, there may be a simple sketch, or the electrician may be merely told what is wanted.

Whether the job is large or small, the electrician must follow the electrical laws of the State and, unless it is in a small community, the municipal electrical ordinances. For example, under most codes he installs metal boxes wherever there is to be an outlet or switch. If a conduit system is used, the wiring is enclosed in metal pipes (or conduits) connecting the metal boxes. Frequently, instead of conduit systems, wires wrapped with a continuous strip of steel (BX) or with a flameproof fabric are used, but the codes (laws and ordinances) specify that certain minimum requirements must be met both in the material and the way it is utilized. For high grade building, the electrical installation is better than the minimum called for by the State or municipal electrical code. Unless there is an electrical drawing showing which outlets are to be on each circuit, the electrician arranges them according to his own judgment so that the loads will be properly distributed and no circuit will have a heavier load than is suitable for the gage (diameter) of wire used. A somewhat different class of construction work is heavy electrical installations at power plants, steel mills, and other establishments with unusually large electrical requirements. Such work is done mainly by journeymen who move to successive jobs in different localities.

Remodeling work provides a considerable part of total employment, as does also the installation of additional business or factory equipment in existing buildings.

**Where Employed**

Construction electricians are principally employed along with the other building trades in the construction of residences, apartment buildings, stores, office buildings, and industrial plants, and in remodeling work. Some, however, work for electric utility systems, city or Federal Government departments, or work in coal and metal mines, manufacturing plants, and large buildings, where they install, change, and maintain wiring systems and electrical equipment. There are also various types of specialists, such as those who restrict their work to the construction and installation of electric signs.

Employment is naturally greatest in densely populated areas, partly because of the large amount of commercial and industrial wiring. However, small cities, towns, villages, and rural areas are offering more new opportunities than previously; at the end of June 1948 almost 70 percent of all farms had central-station electric service.

**Training and Qualifications**

A 4-year apprenticeship or, in some cases, several years as electrician’s helpers, is necessary to learn the trade. Learning the trade informally through employment as a helper was fairly common at one time but is much less prevalent now. The union does not recognize helpers; they are, however, still employed in some cases on non-
A big part of the electrician’s job is installing electrical wiring.

union jobs. In many localities an electrician is required to have a journeyman’s license, for which he must pass an examination showing a well-rounded knowledge of the job and of State and local regulations. In most cities of any size, in many of the States, a man must have a contractor’s license to engage in electrical contracting. Men who held ratings as electricians in the Armed Forces usually will not qualify as journeymen without further training, but their past experience may afford an opportunity to enter the trade as advanced apprentices.

Outlook

The long-run outlook for electricians is good, but defense preparations begun in 1950 are likely to result in a drop in employment. Because of the need for electrical workers in defense activities, however, the outlook for this trade is likely to be affected less than for construction workers as a whole. There were about 18,000 apprentices in June 1950, according to the Bureau of Apprentice-ship records. A considerable number of these will probably be employed in industries other than construction. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.)

This is the newest of the large recognized trades, dealing with a new group of materials and a new type of work; the present stage has been reached in about two generations. Development over these two generations has been rapid and almost continuous, standards have changed, and changes are occurring at the present time. Several of these reduce the time needed for specific operations but separately and in combination they have helped to raise the general standards of electric wiring, have encouraged modernization of obsolete or overloaded wiring in old buildings, and have tended to increase the total volume of electricians’ employment.

The uses of electric current continue to increase. One illustration is the continuous increase in the use of electric ranges and water heaters. Permanently installed electric heating panels for individual rooms were put on the market recently. While these seem unlikely to become common in the near future, they are significant in illustrating the increase in the range of current-using products available. Electrically charged dust collectors are another fairly recent product adapting electric current to a new purpose. The employment outlook is good for any trade in which real improvement in the products (as distinct from mere novelty or style change) proceeds rapidly, and electric work is one of the trades in which this condition is met most fully.

Since most of the work is indoors, it is relatively free from interruption by bad weather, although, of course, the volume of new work in progress varies seasonally. Alteration and modernization work are less seasonal, and help to smooth out annual employment.

Wage Rates

Wage rates as of January 3, 1950, established through collective bargaining agreements for a number of cities and their surrounding areas are given in the following tabulation.
BUILDING TRADES

Hourly Area rate
Atlanta, Ga _______________ $2.25
Baltimore, Md__________________________ 2.25
Birmingham, Ala _______________________ 2.25
Boston, Mass___________________________ 2.50
Buffalo, N. Y__________________________ 2.58
Chicago, Ill___________________________ 2.52½
Cincinnati, Ohio________________________ 2.45
Cleveland, Ohio________________________ 2.52½
Denver, Colo___________________________ 2.41
Houston, Tex__________________________ 2.50
Indianapolis, Ind_______________________ 2.37½
Jackson, Miss__________________________ 2.00
Kansas City, Mo________________________ 2.42½
Little Rock, Ark________________________ 2.00
Los Angeles, Calif______________________ 2.50
Louisville, Ky__________________________ 2.42½
Milwaukee, Wis________________________ 2.30
Minneapolis, Minn_______________________ 2.35
New Haven, Conn_______________________ 2.25
New Orleans, La_______________________ 2.30
New York, N. Y________________________ 3.00
Omaha, Nebr____________________________ $2.35
Philadelphia, Pa_______________________ 2.87½
Pittsburgh, Pa__________________________ 2.80
Portland, Oreg__________________________ 2.35
Richmond, Va___________________________ 2.10
St. Louis, Mo___________________________ 2.50
San Francisco, Calif____________________ 2.50
Seattle, Wash___________________________ 2.39½
Springfield, Mass_______________________ 2.35
35-hour workweek.

Additional Information

Additional information on apprenticeship may be obtained from the International Brotherhood of Electrical Workers of America, 1200 Fifteenth St. NW., Washington 5, D. C., or from the National Electrical Contractors Association, Ring Building, 1200 Eighteenth St., NW., Washington 6, D. C.

Sheet Metal Workers

(D. O. T. 4-80.010)

Outlook Summary

The long-run outlook for sheet metal workers is good; this has been an expanding trade, and its principal type of work is more prominent in building operations now than at any time in the past. However, in the early fifties, defense preparations will bring some reduction in employment.

Nature of Work

Sheet metal workers fabricate and install a rather wide variety of building products made from thin metal sheets. The largest field is that of ventilating, with or without heating or air conditioning, but there are many additional kinds of work. This is a highly skilled trade, and should not be confused with semiskilled factory occupations in the routine production of articles from sheets or strips of metal by stamping, die-forming, or other repetitive methods.

The customary type of ventilating system consists basically of a system of ducts for the supply of air and the removal of stale air throughout all or certain parts of a building, combined with a blower and other apparatus. It is usually but not always combined with a heating system, and frequently with the other apparatus (for cooling, filtering, humidifying, and dehumidifying) needed for an air-conditioning system. Sheet metal workers make and install the ducts, the blower, and the other apparatus except that used for heating and cooling. They perform similar work on more restricted air-moving systems, such as for removal of fumes in factories or for collection of shavings or dust at woodworking machines and elsewhere.

Hot-air heating systems (furnaces) are installed by sheet metal workers. While these are popular for detached houses, most installations are quite simple and the total volume of employment afforded is much less than that in ventilating work. The work consists mainly of assembling the furnace from factory-made parts, installing a blower and air filter if these are to be used, and installing ducts to the hot-air registers in the various rooms and to the return registers. This duct work is far simpler than that for a ventilating system, and a comparatively small range of sizes and shapes is sufficient in most cases. Hence, these are commonly bought ready-made by the contractor, although in other cases they are made in his shop.
Sheet metal workers install metal roofing where this is used, and also metal siding. These usually come as large sheets, corrugated or else grooved for stiffening, and require no further processing beyond such cutting as is needed to fit the building. Sheet metal workers install roof gutters and (except when soil pipe is used for the purpose) downspouts for drainage of rain water, in conjunction with all types of roofing. They make and install flashings (formed metal strips) at roof valleys, at chimneys, and elsewhere, to prevent seepage of rain or melted snow. They make and install skylights. Altogether, these roof and exterior materials are fairly important as a source of employment. Since they are exposed to the weather, they are subject to deterioration and require repair or replacement from time to time. On expensive buildings, the gutters and downspouts are usually made in the contractor's shop, but for ordinary buildings factory-made parts are frequently used. Stock design skylights, made in advance as a standard item, have become important for industrial and warehouse buildings. For the most part they are made by sheet metal workers rather than by factory operatives.

Factory-made doors, window sash, frames, partitions, etc., are commonly used in nonresidential buildings. Sheet metal workers frequently install these. They also install some types of concrete forms made of sheet metal, such as those for round columns and conical column heads, but these are a small part of the total work on concrete forms. Other minor fields are commercial signs and the like for theaters, stores, etc.

Some contractors make ducts and duct fittings at the building where they are to be installed, sending out the machines needed for the purpose. Others make them at a permanent shop from the drawings and measurements taken at the building. In either case, however, shop work is a basic part of the trade. Use of standard factory-made ducts and fittings for a ventilating installation, comparable to standard parts frequently used for furnace installations, has been entirely impractical to date, and it is difficult to see how this condition can change, because of the almost unlimited variation in conditions to be met.

**Where Employed**

Most sheet metal workers are employed in making and installing equipment for new buildings or for new installations in existing buildings. A very small number specialize in repair work. Apart from this work on buildings, sheet metal workers employed in small shops manufacture, often to special order, a variety of kitchen equipment, such as steam tables, dish racks, canopies, sinks, steel or copper kettles, and similar products, for hotels and restaurants. Another specialization is the coppersmith work in constructing vats and stills for breweries and distilleries and hand-made fittings for marine work. But the number so employed is quite small.

Sheet metal workers are also employed in a fairly wide range of manufacturing industries, though there are only a comparatively small number in each. Probably the largest number are employed in the machinery industries, particularly those making blowers, exhausts, electrical generating and distributing equipment, food products machinery, and steam engines and turbines. Here they make and assemble sheet-metal parts on an individual order basis—enclosures and parts.
for special machinery, industrial ovens, and a
great many other items. This work requires the
same skills, tools, and equipment as does sheet
metal work for buildings, and is totally different
from repetitive operations found in many fac-
tories, where one worker stamps out thousands of
identical parts. During World War II the airc-
craft and shipbuilding industries employed large
numbers of men in work with sheet metal. Many
of them were trained only for quite specific opera-
tions, however, and in skill were not comparable to
journeymen.

Training and Qualifications

An apprenticeship of 4 or sometimes 5 years is
required, including a minimum of 144 hours a year
of classroom instruction in pattern drafting, ele-
mentary mathematics, blueprint reading, estimat-
ing, basic principles of heating and ventilating,
and related subjects. Workers with several years
of experience as helpers sometimes become jour-
neymen, or their equivalent, without serving a
formal apprenticeship.

Although it is necessary to acquire skill in the
use of tools and to become adept at working from
difficult positions, these qualities alone are not
enough to make a person a thoroughly capable
workman. This is a trade where rounded knowl-
edge of the work being done and good elementary
knowledge of the principles being followed are
necessary, particularly for ventilating work. Some
knowledge of the characteristics of air flow
is necessary for a competent journeyman. Al-
though journeyman knowledge is much less tech-
nical than engineering knowledge, it requires
thorough training and cannot be acquired cas-
ually. Even for furnace work, a corresponding
knowledge is needed. For example, a journey-
man should be able to estimate the heat loss
from each room of a house and measure the stack
temperature (temperature of the combustion gases
near the bottom of the chimney) and know what
it means regarding heating efficiency of the
installation.

Outlook

The long-run outlook for sheet metal workers
is good both in construction and in several other
industries. In late 1950, there was a shortage
of apprentices in this trade.

During the early fifties, however, defense prepa-
rations are likely to have an adverse effect on con-
struction sheet metal workers, particularly if
defense requirements make it necessary to curtail
commercial building and installation of air con-
ditioning systems. On the other hand, many sheet
metal workers will be able to use their skills in
defense activities.

The use of air conditioning in major buildings
has been increasing, and further increase is very
likely. It is used for improving the quality of
the product in manufacturing operations. While
an installation is expensive and operating cost is
substantial, there are many situations in which it
brings an over-all saving rather than additional
expense. For numerous kinds of factory opera-
tions, it improves the quality of the product and
cuts down the percentage of rejects and seconds;
for office work and some kinds of factory activities,
it increases the efficiency of workers in hot weather.
These advantages are being more widely recog-
nized. Its effectiveness in attracting and retain-
ing customers in hot weather for retail
establishments, restaurants, and amusement places
is already well known. It is not on the horizon
as a common feature in ordinary houses, however,
because of the initial cost.

Ventilating installations without air condition-
ing may increase also, though already widely used.
Other parts of the field are unlikely to change
enough to have an important effect on total em-
ployment.

Wage Rates

Wage rates established by collective bargaining
agreements for a number of cities and their sur-
rounding areas as of July 1, 1949, are given in the
table below.
Elevator Constructors
(D. O. T. 5–83.351)

Outlook Summary

The long-run outlook for elevator constructors is good. Because of maintenance and modernization work, seasonal irregularity of employment in this small trade is better than for other construction trades. However, a limitation on new commercial building and modernization as a result of defense mobilization would sharply reduce employment in this trade.

Nature of Work

Elevator constructors assemble in place and adjust elevators, dumbwaiters, moving stairways, and a number of specialized devices which are useful for specific purposes but not common enough to be important as a source of employment. They use factory-made subassemblies and parts. Ordinarily all real fabrication is done at the elevator company’s factory, or (in the case of some of the smaller companies) at factories from which it buys parts, or at which it has custom shop work performed.

An elevator job starts with the shaft opening, usually with all adjoining shafts enclosed by a surrounding partition. The work is done by teams, each consisting of an elevator constructor and a helper. They first install the guide rails for the car and the counterweight. They install the car frame and platform, the counterweight, the machine itself, and the control apparatus, and connect the car frame to the counterweight with cables (wire ropes) which pass over the sheaves at the top of the shaft. Other parts of the installation are the cab body and roof, the cab door, and the control wiring. If there is mechanical operation of doors, the operators and control apparatus are put in by the elevator constructors. The job ends with careful adjustment and testing.

Maintenance and repair work is important. This consists of thorough inspection, periodic replacement of cables, adjustment of worn parts (brake surfaces, contact surfaces in the control apparatus), and replacement of worn parts as necessary. Commonly, it includes periodic lubrication and adjustment.

Modernization of elevator installations has also been important for a number of years, because of the rapid rate of improvement. This is quite similar to a partial new installation, in many cases...
using the old rails, car frame, platform, and counterweight, but replacing almost everything else.

Where Employed

Elevator constructors are employed almost entirely in the construction industry, mainly by elevator contractors whose principal business is new installations and modernization. For the most part these firms operate nationally or regionally, but a number of them are active within smaller territories. Some workers are employed by small local contractors specializing in maintenance and repair, and in some cases doing an occasional new job. A small amount of maintenance and repair is done on essentially a self-employment basis. There is also a certain amount of employment by city building departments and similar organizations as elevator inspector. Force-account employment for maintenance is very slight; the work is so specialized that few property owners find it economical to employ a journeyman regularly.

Training and Qualifications

Although this is unquestionably one of the more highly skilled trades, training is comparatively informal and is obtained through employment as a helper for a number of years. Among the principal requirements are mechanical aptitude and an interest in machinery. Assignments at first are to simple jobs which can be done without experience and to work done directly with the journeyman.

It is necessary to acquire fairly extensive knowledge during this period as a helper—detailed knowledge of the many different kinds of circuits used in present-day and old installations, the many different kinds of mechanical arrangements that have been used, the proper sequence of actions in making adjustments, interpretation of symptoms of faulty adjustment, indications of needed replacements in the parts most subject to wear, and many other subjects. In addition, of course, it is necessary to become adept in the use of tools and in the particular operations involved.

Outlook

The long-run outlook for elevator constructors is good. This is probably an expanding trade but from its highly specialized character will never be able to take any large number of entrants at one time. However, the restrictions on apartment construction as a result of the defense program will bring a small reduction in employment in the early fifties. A large part of such construction is made up of walk-up buildings. If commercial building and modernization are restricted as a result of defense mobilization, employment in this trade will be sharply reduced.

Standards of elevator service have been rising steadily, largely as a result of the noteworthy improvements made over a period of years by the large companies and by some of the other companies also. On the average, new installations are more elaborate than was the case some years ago, requiring more work for installation and initial adjustment; much modernization is going on, to bring equipment in older buildings up to current standards; and the maintenance needed is obviously greater for an installation with automatic door operation, automatic leveling at the floors, etc., than in older installations without such features. The market for moving stairways has been increasing also.

The trade of elevator constructing is urban but is not confined to the largest cities. One of the elevator companies has offices in about 250 cities, some of which had a 1940 population well below 50,000, and a few of which were below 25,000. Some of the moderately large regional companies also have branch offices, and there are many small local firms for maintenance and repair in cities of moderate size.

The work is almost entirely indoors, and in most cases a particular job continues steadily over a period of at least a few weeks. Modernization, repairs, and maintenance smooth out seasonal irregularity of employment very greatly. There are probably a few opportunities for self-employment and for establishment of small contracting businesses in maintenance and repair work. Establishment of a contracting business primarily for new work cannot be termed impossible for a journeyman and has been done successfully in the past—in one case with the most conspicuous success. Nevertheless, the capital requirements and other considerations make this one of the decidedly difficult contracting fields to enter.
Wage Rates

Below are wages rates for elevator constructors and for elevator constructors' helpers in effect on July 1, 1949, for a number of cities and their surrounding areas, as established by collective bargaining agreements.

<table>
<thead>
<tr>
<th>Area</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elevator constructors</td>
</tr>
<tr>
<td>Atlanta, Ga.</td>
<td>$2.32½</td>
</tr>
<tr>
<td>Baltimore, Md</td>
<td>2.43</td>
</tr>
<tr>
<td>Birmingham, Ala.</td>
<td>2.25½</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>2.40</td>
</tr>
<tr>
<td>Buffalo, N.Y.</td>
<td>2.41½</td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>2.38</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>2.46</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>2.37½</td>
</tr>
<tr>
<td>Denver, Colo.</td>
<td>2.22</td>
</tr>
<tr>
<td>Houston, Tex.</td>
<td>2.42½</td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>2.33½</td>
</tr>
<tr>
<td>Little Rock, Ark</td>
<td>2.17½</td>
</tr>
<tr>
<td>Los Angeles, Calif.</td>
<td>2.46</td>
</tr>
<tr>
<td>Louisville, Ky.</td>
<td>2.39</td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>2.20</td>
</tr>
<tr>
<td>Minneapolis, Minn.</td>
<td>2.23</td>
</tr>
<tr>
<td>New Haven, Conn.</td>
<td>2.41</td>
</tr>
</tbody>
</table>

In considering the helpers' rates, it must be kept in mind that they are in a sense informal apprentices, with the expectation that in time they will advance to journeyman status.

Additional Information

For additional information, or the address of the nearest union local, write to the International Union of Elevator Constructors, 12 South Twelfth St., Philadelphia 7, Pa.

Building Laborers and Hod Carriers

Outlook Summary

Restrictions on building construction will sharply reduce employment opportunities for laborers in the early fifties. The outlook for hod carriers (bricklayers' tenders and plasterers' tenders) is probably about equal in each case to that of the trade which they serve.

Nature of Work

Building laborers and corresponding laborers on other types of construction (highways, sewer and water projects, engineering construction, etc.) do work which requires no formal training. Laborers' work is commonly known as unskilled, but this term can be misleading. The work covers a wide range in its requirements; in most of the operations experience is valuable, in some of them it is necessary, and experienced laborers have a large fund of knowledge of methods and working conditions.

One type of work is hand excavating, for footings, small trenches, and other places where a machine cannot be used or is not economical. This work is a good illustration of the proficiency gained by experience. Anybody can dig a hole for a footing, but without experience he will have serious difficulty in preventing excess size and in getting a firm and reasonably level bottom. This is not skilled work; neither is it work which can be done efficiently by a strong but completely inexperienced person. Other work is hand backfilling and grading, and conveying of materials by carrying or by wheelbarrow, handcart, etc. Laborers move the smaller units of machinery and equipment. They set bracing in place to prevent cave-in of trenches, and drive sheet piling at the sides of excavations, unless a power pile driver is...
used. Where concrete is mixed at the job, they charge the mixer with ingredients, and in any case place the concrete, spread it out, and spade it to prevent air pockets. They do the general cleaning up and removal of rubbish at successive stages of the job. In alteration and modernization jobs they tear out the old work and then perform the operations that they would on a new building.

In nonbuilding construction laborers do comparable work, and usually form a much larger part of the crew than in most building projects. In highway work and also in heavy engineering work, there are numerous jobs generally similar to those done in building, although not exactly the same. A few examples in concrete highway paving are handling and placing the side forms which also act as rails for the strike-off machine and finishing machine; setting up and moving hose lines to supply the mixer with water; covering the new pavement to prevent excessive drying during the curing period. A fairly large volume of employment is provided by such work as cutting through city pavements for underground utility work, excavating for whatever is to be done, backfilling and tamping, and replacing the pavement; there is also extensive employment in track maintenance for streetcars, where these are used. On the whole, individual jobs last longer than those in building construction.

The work of masons’ tenders and plasterers’ tenders is mentioned in the sections on bricklayers and plasterers. These men serve the journeymen of their respective trades, supplying them with materials, setting up and moving portable scaffolding for them, and providing the other services needed for performance of the journeyman’s work. These duties require familiarity with the work of the journeymen, a limited knowledge of the materials used, alertness, and some degree of judgment.

A number of other types of work are done also, including demolition of ordinary buildings and many other structures, excavation through rock, application of “gunite” (a cement-sand mixture sprayed into place by compressed air), and all operations carried out under compressed air. These last occur mainly in construction of tunnels and caisson foundations. These special jobs are almost always regarded as quite distinct from the work of building laborers. They require specific on-the-job experience, and carry higher pay rates. The men working under compressed air must pass quite rigid physical examination. They do all work back of the air lock, including operations which would be done by journeymen if located elsewhere; some of these men, such as those doing blasting, have very serious responsibilities.

**Where Employed**

Laborers and tenders are employed primarily in the construction industry but are also employed in many other industries for force-account construction and maintenance. Large numbers are hired by public bodies (public works departments, highway departments, etc.) and by public utility companies. Those in special fields are employed almost exclusively by contractors specializing in particular types of work—demolition, tunnel work, etc. Factory laborers are usually regarded as quite distinct from building laborers.

**Training and Qualifications**

Training for these occupations is obtained on the job. Laborers enter the construction industry by getting a job, plus obtaining membership in the union if they are working on union projects. Contractors naturally prefer experienced workers, and this first job is usually on the simplest type of work. Experience as a laborer is the usual background for bricklayers’ and plasterers’ tenders and for men in other special fields. New workers for jobs done under compressed air (tunnels, caisson foundations, etc.) are ordinarily chosen from men having experience in aboveground employment at similar projects.

**Outlook**

In considering the outlook, the range of work done and the range of individual abilities must be kept in mind. Experienced men are proficient in a wide range of operations, know construction practices, and understand conditions that they encounter, such as the stability of types of earth they encounter in hand excavating. Such men are, of course, employed more steadily than those with little experience. However, the field of work has been reduced by mechanization, and this process is still going on.
When there is a general drop in employment, many workers laid off from other industries try to get jobs as construction laborers. In areas where there is strong union organization they may not be able to break into the construction field. Although not as qualified as experienced building laborers, these men constitute an employment threat because there are some jobs that they can do well, and some others for which they can obtain the necessary experience within a fairly short time. Hence wage rates for nonunion laborers can drop sharply and rapidly during a period of general unemployment.

There is a considerable amount of time lost because much of the work is outdoors, where it is interrupted by bad weather, and because of the seasonal nature of many kinds of construction. There are numerous long jobs for experienced, capable laborers, but there are also many brief jobs. Not uncommonly men are hired for a few days or even a few hours, for pouring of a concrete slab or some other peak requiring more men than the regular crew.

Because of the importance of physical strength in many operations, the employment situation is likely to be less favorable for laborers than for journeymen as they become older. There are, however, a fair number of steady jobs for elderly laborers whose main employment assets are dependability, good judgment, knowledge of construction operations, and adeptness at the types of work for which experience is most important.

Restrictions on building construction will sharply reduce employment opportunities for laborers in the early fifties. (See p. 353 for a discussion of the effect of defense mobilization on the construction trades.)

Experience as a laborer is the customary background for tenders and for those in special fields such as caisson and tunnel workers. Although not a preparation for any of the skilled trades, it may lead to an opportunity for apprenticeship. Cases are known in which contractors have operated semiformal training programs, hiring inexperienced young men as laborers, advancing them to helpers, and ultimately advancing them to journeymen.

Wage Rates

Below are wage rates for building laborers, bricklayers' tenders, and plasterers' tenders established by collective bargaining agreements, and in effect on July 1, 1949, in a number of cities and their surrounding areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Building laborers</th>
<th>Bricklayers' tenders</th>
<th>Plasterers' tenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Ga.</td>
<td>$0.90</td>
<td>$1.00</td>
<td>$1.00</td>
</tr>
<tr>
<td>Baltimore, Md.</td>
<td>1.25</td>
<td>1.35</td>
<td>1.35</td>
</tr>
<tr>
<td>Birmingham, Ala.</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>1.65</td>
<td>1.65</td>
<td>1.60</td>
</tr>
<tr>
<td>Buffalo, N. Y.</td>
<td>1.65</td>
<td>1.65</td>
<td>1.75</td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>1.80</td>
<td>1.80</td>
<td>1.80</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>1.53</td>
<td>1.73</td>
<td>1.73</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>1.85</td>
<td>1.85</td>
<td>1.85</td>
</tr>
<tr>
<td>Denver, Colo.</td>
<td>1.40</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Houston, Tex.</td>
<td>1.07</td>
<td>1.27</td>
<td>1.27</td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>1.50</td>
<td>1.70</td>
<td>1.70</td>
</tr>
<tr>
<td>Jackson, Miss.</td>
<td>0.90</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Kansas City, Mo.</td>
<td>1.57</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Little Rock, Ark.</td>
<td>0.87</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Los Angeles, Calif.</td>
<td>1.48</td>
<td>1.75</td>
<td>2.15</td>
</tr>
<tr>
<td>Louisville, Ky.</td>
<td>1.40</td>
<td>1.65</td>
<td>1.65</td>
</tr>
<tr>
<td>Milwaukee, Wis.</td>
<td>1.55</td>
<td>1.65</td>
<td>1.62</td>
</tr>
<tr>
<td>Minneapolis, Minn.</td>
<td>1.45</td>
<td>1.55</td>
<td>2.02</td>
</tr>
<tr>
<td>New Haven, Conn.</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
</tr>
<tr>
<td>New Orleans, La.</td>
<td>1.02</td>
<td>1.25</td>
<td>1.22</td>
</tr>
<tr>
<td>New York, N. Y.</td>
<td>1.95</td>
<td>1.95</td>
<td>2.30</td>
</tr>
<tr>
<td>Omaha, Nebr.</td>
<td>1.30</td>
<td>1.30</td>
<td>1.42</td>
</tr>
<tr>
<td>Philadelphia, Pa.</td>
<td>1.37</td>
<td>1.37</td>
<td>1.95</td>
</tr>
<tr>
<td>Pittsburgh, Pa.</td>
<td>1.50</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Portland, Oreg.</td>
<td>1.70</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Richmond, Va.</td>
<td>0.90</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>St. Louis, Mo.</td>
<td>1.50</td>
<td>1.90</td>
<td>2.00</td>
</tr>
<tr>
<td>San Francisco, Calif.</td>
<td>1.55</td>
<td>2.25</td>
<td>2.10</td>
</tr>
<tr>
<td>Seattle, Wash.</td>
<td>1.79</td>
<td>2.04</td>
<td>2.04</td>
</tr>
<tr>
<td>Springfield, Mass.</td>
<td>1.37</td>
<td>1.62</td>
<td>1.62</td>
</tr>
</tbody>
</table>

1 35-hour workweek.
2 30-hour workweek; $2.40 in Brooklyn.
3 30-hour workweek.
Rates for those doing special types of work are higher in most localities, and for the most part these men are recognized as separate occupational groups. The higher rates common for work under compressed air are a reflection of the exacting physical requirements, the discomforts, and the occupational hazards of such work.

Additional Information

For additional information, write to the International Hod Carriers', Building and Common Laborers' Union of America, 821 Fifteenth St., NW., Washington 5, D. C.
RAILROAD OCCUPATIONS

Importance of Railroads

The railroad industry is one of the giants of American enterprise, with about $1 \frac{1}{2}$ million workers and a vast network of lines connecting all parts of the United States. Railroads carry more freight and passengers and employ more people than all other intercity transportation agencies combined. They have more workers than are employed in automobile plants or in factories making all kinds of clothing and other finished textile products; half again as many as are engaged in all types of mining.

In an industry as large as this, thousands of job openings arise each year as workers die, retire, or transfer to other fields of work. Openings occur in every State, in the great number of communities of all sizes which are served by the railroads. These jobs are so varied that people with very different interests and personalities can find satisfactory positions in railroading. Regardless of the occupation they enter, however, new workers must expect to start at the bottom of the ladder and work up slowly as they prove their ability and acquire seniority with the company.

The Railroad Industry

The big, well-known railroads are all in the group known technically as class I line-haul railways. There are 132 companies in this group, each with over $1,000,000 of revenue a year and lines connecting two or more cities or towns. In 1949, these roads employed, on the average 1,216,000 workers.

Besides the class I roads there are numerous smaller line-haul railroads and companies that operate railroad yards and terminals. Altogether, the small railroads and switching and terminal companies employ only about 5 percent of the workers in the industry. Other employers in the industry are the Railway Express Agency and the Pullman Co.

To outsiders, carrying passengers may seem to be the most important function of the railroads. The railroader knows, however, that freight business brings in far more revenue. In 1949, 82 percent of all class I railroad revenues were from freight and only 10 percent from passenger traffic. The remaining revenue came from mail, express, and various other sources.

Railway lines spread over the country like a giant web, connecting every State and city and thousands upon thousands of towns and villages. Chicago is the hub of the Nation's railroad network. Here, the great eastern and western systems meet, and connections are made also with routes to the North and South. However, there were more railroad workers living in the New York City metropolitan district than in the Chicago district in 1940 (69,000 compared with 66,000). Other areas where more than 10,000 railroad workers lived in 1940 were: Pittsburgh, Philadelphia, St. Louis, Minneapolis, San Francisco-Oakland, Los Angeles, Boston, Buffalo-Niagara, Cleveland, Kansas City, Kans.-Kansas City, Mo., Baltimore, Detroit, and Cincinnati.

These 15 major centers, with their large stations and yards and company main offices, were the homes of about 335,000 railroad workers in 1940. But twice this number of employees lived elsewhere, many of them in small communities. Some of the big shops (where heavy repairs are made on cars and locomotives) and therefore many shop workers are in other localities. Altoona, Pa., for example, has the largest shops in the country, although it is a relatively small city. Small stations and yards, switch towers, and other railroad facilities and the workers who operate and maintain them are scattered all over the country.

The States where the largest numbers of railroad employees live are Pennsylvania, Illinois, New York, Ohio, and California. These five States have about two-fifths (600,000 in 1947) of the country's railroad workers. Pennsylvania, with about 150,000 workers in 1947, is the leading railroad State. Even Rhode Island, the State with the fewest railroaders, had about 2,500 of these workers.

Railroad Occupations

It takes a great variety of workers to keep the trains running. Locomotive engineers, track la-
borders, car repairmen, telegraphers, machinists, and clerks are but a few of the occupational groups employed by a big railroad.

Chart 77 shows the number of persons employed in these and a number of other occupations on class I roads in 1949. The occupations shown in the chart were chosen from the much longer list of all railroad jobs because of their importance to people considering a career in railroading.

Other railroad occupations, not listed in the chart, range from top executive and professional positions to unskilled laundry and cleaning jobs. Practically every road has a president, vice president, general manager, secretary-treasurer, other officials, and their assistants. Big roads also have staffs of lawyers, engineers, and accountants and other professional groups. In addition, they have sizable numbers of foremen, truckers, cooks and waiters, stenographers and secretaries, crossing and bridge flagmen, claim agents and investigators, watchmen, stationary firemen and engineers, telephone operators, and a great variety of other occupational groups.

Practically all the workers in train and engine service occupations and maintenance jobs are men (except for some women who work as cleaners). Clerical occupations have the highest proportion of women workers, but even in these groups men predominate.

At present, Negroes are not often employed in skilled jobs. There are a few thousand Negro brakemen and firemen in the South and some Negro helpers in the shop crafts, but very few have been promoted to higher grade positions. On the other hand, most of the workers in service occupations such as cook, waiter, and porter are Negroes.

**Outlook**

The number of workers employed on railroads will tend to decrease over the long run, even if the amount of freight and passenger traffic handled remains about the same or increases slightly. However, if the stepped-up defense program of mid-1950 results in heavy increases in traffic, the downward trend in employment will be at least temporarily reversed. The main reason for expecting declining railroad employment over the long run is the prospect of further technological improvements in the industry. The trend toward employing fewer workers to handle a given volume of traffic has been very marked in the past. It is likely to be equally marked in the future, as the railroads install more and more Diesel-electric locomotives and other labor-saving equipment. The effect on employment will differ considerably from road to road and from occupation to occupation, however, as indicated in the
Because the total number of workers employed by the railroads is so great, there will be many thousands of job openings each year owing to deaths, retirements, and transfers to other fields of work. Turn-over probably will be much greater in the early fifties than during the early postwar years because it will be easier to get jobs in other industries and because some workers will enter the military services. The number of beginners hired to fill vacancies will vary considerably from road to road and from one part of the country to another. One railroad may be taking on new workers while, in the same occupation, another road has lists of furloughed workers with first claim on any openings in their seniority districts.

Working Conditions and Earnings

Most “nonoperating” employees worked an 8-hour day and a 40-hour week in mid-1950. They got premium pay at time and a half for overtime work. “Non-ops” in the passenger service occupations—dining car cooks and waiters, Pullman porters, and other train attendants had a basic 205-hour month; those with regular assignments were guaranteed pay for at least this amount of work. These workers got straight time pay for hours worked between 205 and 240 a month and time and a half for hours worked beyond 240 in a single month.

These work schedules do not apply to “operating” employees—train and engine crews and yard workers. For train and engine crews in road freight and passenger service the rules governing the length of the workday are complex. They also differ from one occupation to another. Generally, when the worker has “run” a specified number of miles or done a certain number of hours’ work—whichever happens first—he is considered to have completed a “basic day’s work”; additional pay is given for any extra work beyond that point. Train and engine crews in yard service and other yard workers, like the “non-ops,” are paid by the hour, but they do not receive premium pay for work on the sixth or seventh day in the week.

Because the shippers and traveling public must be served continuously, many stations are open 24 hours a day and trains, roundhouses, and other facilities operate at all hours. Hence, in a good many occupations, some employees must work at night. The employees affected include engineers, firemen, conductors, brakemen, hostlers, telephone and telegraph operators, shop workers, clerks, and many others. Rates of pay for night work are no higher than for day work.

With so many different occupational groups employed—ranging in skill from common laborers to craftsmen and professional and administrative employees—rates of pay in the industry vary widely. Wage rates depend not only on the degree of skill and length of experience required to perform a job satisfactorily but also on the amount of responsibility for safe and efficient railroad operations involved in the work and on many other factors. Earnings data for many occupations are presented in later sections of this report.

A substantial majority of railroad workers are covered by collective agreements. For the most part, they are organized on a craft or occupational basis. Contracts between the unions and the railroad companies regulate wage rates, hours of work, seniority, and many other matters affecting railroad jobs. The principal unions representing the occupational groups covered in this handbook are listed in the separate statements.

Where To Go for Jobs and Additional Information


Locomotive Firemen and Helpers
(D. O. T. 5-42.100)

Outlook Summary

Long-run downward employment trend likely to be interrupted during early fifties. Turn-over rates will increase and thousands of newcomers will be taken on each year.

Nature of Work

The fireman on an old-style coal-burning locomotive has the extremely heavy, hot job of shoveling coal from the tender into the firebox, taking care to distribute it well so that the fire will burn properly. Over two-thirds of the locomotives now in use, however, are mechanically stoked, oil burning, or electric, and hand-fired locomotives are becoming fewer. This development has meant a revolutionary change in the work of the fireman. Physical labor has been reduced; on an oil-burning or mechanically stoked engine the fireman (or helper) regulates the flow of fuel by operating certain valves. On the other hand, higher-speed trains and complicated modern locomotives have increased the responsibility and skill involved in much of the fireman’s work.

Keeping a lookout for obstructions on the track, hotboxes, dragging equipment, and for the frequent wayside signals, is another important part of a fireman’s job. He, as well as the engineer, is held responsible for any accident due to failure to obey signals. Moreover, every fireman or helper has to be prepared to take over immediately in case the engineer should suddenly become sick or disabled.

In 1949 about 51,000 locomotive firemen were employed on class I railroads. About half these men were on freight trains; over a third were in yard work—on the switching engines which move cars around as required in serving various industries, and in making up and breaking up trains and classifying cars—and the remaining seventh were in passenger service. Besides the firemen on class I roads, there are a few thousand who work for smaller line-haul railways, for switching and terminal companies, or in such industries as coal and-metal mining, quarrying, and iron and steel manufacturing, where large companies have their own plant railways.

Qualifications and Lines of Promotion

Applicants for fireman jobs have to pass medical examinations, with very rigid standards as to eyesight and hearing. On most roads they must be at least 21 years of age and not more than 27. A high school education or its equivalent is required by most railroad companies.

A new fireman must make trial trips for a brief period lasting only 10 days or even less on some roads; as much as 3 weeks on others. After this, he begins on the “extra board,” which is a list of workers who take assignments in order as men are needed. He may remain on extra work for several months or longer before he obtains a regular assignment. On roads which do not have separate seniority lists for yard and road service, firemen may progress from yard to freight service and eventually to passenger work, where hourly pay is highest. Some men, however, prefer to remain in yard service, because a “yard bird” has the chance to live a more regular home life.

A fireman may qualify as an engineer in 3 or 4 years, but ordinarily he has to have much more seniority than that to bid successfully for an engineer assignment. Before World War II, a fireman often had to wait 10 to 15 years to become an engineer. After that he was likely to spend several years on the engineers’ extra board, working irregularly, and might have to go back to firing again if traffic fell off in his division.

While on the job, the fireman should be constantly absorbing the knowledge and obtaining the skills which will make him eligible for a locomotive engineer’s job. As a rule, he must take progressive examinations on engine machinery, air brakes, fuel economy, timetables, train orders, and other operating rules at specified intervals. If he fails to pass after several tries, he may be dismissed.

Outlook

There will probably be moderate numbers of openings for newcomers in “firing” jobs every year except when railroad traffic is dropping sharply. In this large occupation several thousand men who quit, are promoted, or leave for other reasons
each year must be replaced. During 1946, 7,400 new entrants were taken on as firemen by class I roads.

Over the long run, employment will probably tend to decline in this occupation. Increasing use of powerful new Diesel engines will cut down employment of firemen, because the same amount of traffic can be hauled with fewer engines and engine crews, especially in mountainous areas where the extra "helper" engines can be eliminated. The resulting decrease in the number of firemen needed is expected to come about slowly on many roads, somewhat faster on others.

Although employment is expected to decline over the long run, the number of firemen may increase slightly during the early fifties. Because of the expanded defense program begun in mid-1950, the railroads may need a small number of additional firemen to handle increased freight and passenger business. Moreover, the generally favorable job market and withdrawals to enter the armed services are likely to bring about more turn-over.

Earnings and Working Conditions

Yard firemen had a basic daily rate of $11.29 on the lightest locomotives used in yard work in early 1950. On heavier locomotives their rates were higher; the average rate was about $11.58. They have a basic 8-hour day, and for work beyond 8 hours they are paid one and a half times their regular hourly rate.

In road service, both hours worked and miles run play a role in determining earnings. All road firemen have basic daily wage rates which vary with the weight and type of locomotive and class of service. In early 1950 in freight service, daily rates started at $11.07 and ranged up to about $14 for work on some of the heaviest locomotives in use. In passenger service, firemen were assured earnings of at least $11.08 a day, and basic daily rates went above $11.50 on some of the biggest locomotives in service.

Men who run more than 100 miles in a day get additional mileage pay. A fireman gets overtime if the average speed of his train is less than his "speed basis"—which is 12 1/2 miles an hour for freight firemen, 20 miles an hour for passenger firemen. Primarily because of extra mileage on fast runs in passenger and through-freight service, and because of the long hours of work in local and way-freight service, where trains have to make many stops and have low average speeds, the men frequently earn more than their basic daily rates.

The amount road firemen may earn in a month is generally restricted by "mileage limitations," agreed upon by the unions and the railroad companies. If a fireman reaches the top mileage limit, he lays off for the rest of the month while another man takes over his assignment.

Men with regular runs have the best chance of reaching the maximum mileage allowed. Conversely, firemen on extra boards, where the junior men start out, tend to have less work and lower incomes than those with regular assignments. The amount of work for firemen also varies from one season of the year to another on many roads.

Since trains run at all hours of the day and night, firemen often have to do night work. This is true for many senior men with regular assignments as well as for those who are on extra boards. Extra work has the further disadvantage of involving very irregular hours. Men on extra boards are on call at all times and must work whenever and wherever they are needed.

Road service often requires firemen to be away from their home stations overnight. When away from home, they pay their own living expenses.

Workers in this occupation are covered by union contracts on all major railroads. They are represented mainly by the Brotherhood of Locomotive Firemen and Enginemen; in some cases, by the Brotherhood of Locomotive Engineers.

Where To Apply for Jobs

Men seeking jobs as student firemen may apply at the nearest road foreman's office. Those interested in laborer jobs which may help them to get preference for future openings as firemen may apply to roundhouse foremen or master mechanics.

See also Locomotive Engineers, page 409, and Hostlers, page 414.


**Locomotive Engineers**

*(D. O. T. 5-41.010)*

**Outlook Summary**

Engineer jobs are filled by promotion of qualified firemen on a seniority basis. Promotions likely to be slow.

**Nature of Work**

An engineer is held accountable for the efficient and safe operation of his powerful engine. Before each run, he carefully inspects the locomotive and checks the supply of fuel, water, sand, and other items needed for the trip. En route, he operates the throttle, air brake, and other controls and watches to see that the track is clear, noting the position or color of every signal and checking his reading of it with the fireman to make sure he has observed it accurately. He must obey signals instantly. If he should delay in applying his brakes when approaching a “stop” signal, for example, his engine might crash into the rear of a train ahead.

While on the road the engineer instructs the fireman regarding the steam pressure which should be maintained in the boiler, train orders, operating rules, and other subjects. At the end of the run he checks the engine again and makes out a report on any mechanical defects which need attention. In addition he states the reasons for any unscheduled stops or delays.

Most locomotive engineers—about 49,000 in 1949—are employed by class I railroads. A few work for small railroads and switching and terminal companies.

**Line of Promotion**

When a fireman is promoted to engineer he starts out on the engineers’ extra board, and later, gets a regular assignment. The usual line of advancement is from yard work to road freight service and, finally, to passenger service, except on lines which have separate seniority lists for yard and road service. On these railroads yard firemen become and remain yard engineers, while road firemen move directly to “extra” work as engineers in road service. The men with greatest seniority, who have their choice of the available jobs, frequently pick the new Diesel locomotives. Some “old-timers,” however, prefer to remain on the older steam engines where the work is more exciting and not “too easy.” A few engineers in road service may work up to supervisory positions such as road foreman of engines.

**Outlook**

Positions as engineers are generally filled by promotion of qualified firemen on a strict seniority basis. During World War II, the great increase in traffic and the loss of some engineers to the Armed Forces led to much faster promotions than in the prewar period, when firemen usually had to wait many years for an engineer assignment. Employment of engineers is expected to have a downward trend over the long run and openings will rise mainly as a result of deaths and retirements. Men who accumulate enough seniority to become engineers are secure in their jobs as long as they are able to pass the physical examinations required at regular intervals.

**Earnings and Working Conditions**

Yard engineers are paid on a daily basis like yard firemen. Earnings of engineers in road service are based on the same system of wage payment as those of road firemen (see p. 408).

In each class of locomotive the rate of pay for the engineer is higher than that for his fireman. In early 1950, engineers had a basic daily rate of $12.97 on the lightest locomotives used in yard work, as compared with $11.29 for firemen. On bigger locomotives daily wage rates were higher. Engineers, like other yard employees, have a basic 8-hour day, and for work beyond 8 hours they are paid one and a half times their regular hourly rate.

Basic daily rates for engineers in freight service started at $12.97 and ranged up to about $16 on some of the biggest locomotives in early 1950. In passenger service, engineers had assured earnings of $12.97; the highest rate was about $13.50 on a few giant engines. Engineers frequently operate trains over greater distances than their basic daily
mileages and thus increase their earnings for the trip. In local and way-freight service, they, like firemen, may have very long working hours with pay for overtime under some circumstances (see p. 408).

Engineers on extra boards work very irregularly, at any hour of the day or night when they are needed. They are also likely to have less work and lower earnings than men with regular assignments.

Primarily because of extra mileage in passenger and through-freight service and because of long hours of work in local and way-freight service, the men frequently earn more than their basic daily rates. Like other members of train and engine crews, engineers have to pay their own living expenses while on duty away from their home bases.

Union contracts covering locomotive engineers are in effect on all major roads. On most roads the engineers are represented by the Brotherhood of Locomotive Engineers. But on some they have chosen the Brotherhood of Locomotive Firemen and Enginemen, or, occasionally, still another union as their collective bargaining agent.

See also Locomotive Firemen and Helpers, page 407.

Brakemen

Outlook Summary

Turn-over rates likely to rise during early fifties. Thousands of newcomers will be hired each year. Number of brakemen may increase in next few years but likely to decline over long run.

Nature of Work

The occupation of brakemen is by far the largest one in the train and engine service group. In 1949, about 100,000 men were employed in this occupation on class I roads; a few thousand more worked for switching railways and other companies.

Brakemen are employed in freight, passenger, and yard service. Both freight and passenger trains generally carry rear brakemen (or “flagmen”), whose main duty is to protect the rear end of trains from being run into during stops or delays by signaling with flags, flares, and other devices. Freight trains usually carry at least one other brakeman, whose work includes transmitting signals from one end of the train to the other, making frequent inspections of the train, operating hand brakes, and coupling and uncoupling cars and air hose. Passenger brakemen (often known as “trainmen”) perform many of these same tasks, look after the needs of the passengers, collect tickets, and assist the conductor in other ways. Yard brakemen (frequently known as “switchmen” or “yard helpers”) assist in making up and breaking up trains, riding on the cars as they are shunted about the yard.

Qualifications and Lines of Promotion

Applicants are usually required to be at least 21 years of age (only 18 on some roads) and not older than 28 or 30. Physical and educational requirements are similar to those for firemen. (See p. 407.) Student brakemen make 3 to 10 trips under the
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Instruction of a brakeman or conductor. After this brief period, they usually start out on the extra board, although it takes a long time to learn the job thoroughly. From the extra board, they move to other assignments in the same way as firemen.

To qualify as conductors, brakemen need at least 2 or 3 years' experience. They must pass written and oral examinations covering signals, timetables, brake systems, operating rules, and other subjects. On some roads those failing to pass examinations after several tries may be dismissed. Promotions are made according to seniority rules as openings occur, and a man may have to wait 10 years or more for his first assignment as conductor.

Brakemen may also bid for baggagemen jobs, and on many roads, may transfer from yard work to road freight service and eventually to passenger work—which is generally considered the most desirable, since it is cleaner and less strenuous and usually involves shorter working hours. Occasionally, men prefer to stay in yard service to avoid the many nights away from home which may be necessary on road freight and passenger runs. A few others wish to stay in freight service, where they do not have to “dress up” in uniform and cater to passengers.

Outlook

There are likely to be many more opportunities for newcomers in brakeman than in fireman jobs, not only because the former occupation is much the larger of the two but also because the proportion of jobs left vacant each year owing to turn-over is higher among brakemen than among firemen. In 1946 about 18,000 new entrants were hired as brakemen by class I roads, compared with 7,400 hired as firemen.

As with firemen, employment of brakemen will probably decrease over the long run. Introduction of improved methods of handling yard traffic, including radiotelephone communications between yardmasters and crews, will reduce the number of yard brakemen needed to handle a given amount of traffic. Longer trains with heavier loads, made possible by the use of improved locomotives and cars, will reduce the number of road brakemen needed to handle a given amount of tonnage. Decreases in employment are likely to come about slowly, however. Whenever employment has to be cut among train crews the brakemen are laid off first because they have less seniority than the conductors.

Although employment is expected to decline over the long run, the number of brakemen may increase slightly during the early fifties. Because of the expanded defense program begun in mid-1950, the railroads may need a small number of additional brakemen to handle increased freight and passenger business. Moreover, the generally favorable job market and withdrawals to enter the armed services are likely to bring about more turn-over.

Earnings and Working Conditions

Yard brakeman on most roads had a basic daily wage rate of $12.06 and a daily earnings guaranty of $12.26 in early 1950. They have a basic 8-hour day, and for work beyond 8 hours they are paid one and a half times their regular hourly rate.

In road service, earnings of brakemen are determined in the same manner as those of road firemen and engineers (see p. 409). For brakemen in through-freight service, basic daily wage rates, in early 1950 were $10.64 on eastern roads and $10.59 on western roads. In local and way-freight
service the rates were $11.07 and $11.02, respectively. Men who run more than 100 miles in a day get additional mileage pay.

Brakemen in passenger service had a basic daily wage rate of $10.49 in the East and $10.45 in the West in early 1950. Those on eastern roads were guaranteed that their total earnings would be not less than $10.79 for any workday and not less than $314.70 monthly. On western roads, the guaranteed amounts were $10.75 and $313.50, respectively. In passenger service, additional mileage pay does not begin to accrue until after men have run 150 miles in a day (a longer basic mileage than in freight service).

A brakeman gets premium pay for overtime if the average speed of his train is less than his “speed basis,” which is 12 3/4 miles an hour in freight service, 20 miles an hour in passenger service. As in the case of engine crews, extra mileage in passenger and through-freight service and long hours of work in local and way freight service frequently enable men to earn more than their basic daily rates.

The newer brakemen, who are on extra work, tend to have lower earnings than men who have secured regular assignments. They also work very irregular hours. Like other members of train and engine crews, brakemen have to pay their own living expenses while on duty away from their home bases.

Men in yard and freight service face a considerable accident risk. Yard brakemen are injured more often, per million man-hours worked, than any other major group of railroad workers; the accident rate among freight brakemen is not quite as high. Passenger brakemen are not injured as frequently as these two groups but, like most train and engine service workers, they have a much higher accident rate than railroad workers as a whole.

**Labor Organization**

Brakemen are highly unionized. They are represented mainly by the Brotherhood of Railroad Trainmen. However, the Order of Railway Conductors of America has organized freight and passenger brakemen on a few roads; the Switchmen’s Union of North America (AFL) holds the contracts for yard brakemen in certain instances.

**Where To Apply for Jobs**

Men seeking positions as student brakemen, may apply at the nearest division superintendent’s or trainmaster’s office. Those interested in laborer jobs that may help them to get preference for future openings for brakemen may apply to roundhouse foremen or master mechanics.

*See also Baggagemen, page 413, Conductors, page 412, and Switch Tenders, page 415.*

**Conductors**

(D. O. T. 0–92.01 through .29)

**Outlook Summary**

Positions as conductors generally filled by promotion of qualified brakemen or baggagemen on strict seniority basis. Promotions tend to be slow.

**Nature of Work**

Conductors act as “captains” of trains. They are responsible for the safety of the train and its cargo or passengers, for carrying out all orders regarding the operation of the train, and for the work of all members of the crew. Before a train leaves the terminal, the conductor determines that it has been thoroughly inspected and that all members of the crew understand the train orders. Between stops the freight conductor prepares detailed reports on such items as times of arrival and departure and the numbers of the cars and their contents. On passenger trains the conductor keeps records of passenger traffic and collects tickets and fares. Yard conductors (also called yard foremen) are in charge of switching crews which make up and break up trains.

In 1949, employment of conductors working for class I railroads averaged 46,000.

Like other members of train and engine crews, new conductors usually begin on the extra board. On some roads a conductor’s seniority is confined to either yard or road service while other companies have “universal” seniority. On the latter roads conductors generally move from yard assignments to freight service, and finally to pas-
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senger service. It takes many years to reach the top of this ladder, however. Promotion to still higher supervisory or administrative jobs is possible for a few experienced and exceptionally able men.

Outlook

Promotions to conductor positions, as to engineer jobs, were stepped up during the war, owing to the great increase in traffic and the loss of some conductors to the Armed Forces. Employment in the occupation is expected to have a slow downward trend over the long run; so openings will arise mainly as a result of deaths and retirements. Like engineers, conductors have much job security, provided they are able to pass the physical examinations required at regular intervals.

Earnings and Working Conditions

Conductors are paid on the same basis as brakemen (see p. 411), but they have higher wage rates. The basic day for conductors is the same as for brakemen. Yard conductors on most roads have a basic daily wage rate of $12.91 and a daily earning guarantee of $13.11 in early 1950. Like other yard workers, they have a basic 8-hour day, and for work beyond 8 hours they are paid one and a half times their regular rates.

In the eastern part of the country, in early 1950, through-freight conductors had a basic daily wage rate of $12.06 and local and way-freight conductors a rate of $12.62; passenger conductors had a basic daily rate of $12.64 and a guaranteed minimum of $12.94 daily and $379.20 monthly. Corresponding rates in the western part of the country were 6 or 7 cents less a day.

Conductors, like brakemen, often earn more than their basic rates (see p. 412). Men who are conductors usually have had many years of service and therefore are more likely to have year-round employment than brakemen. Extra-board conductors, however, like all other train and engine personnel on such duty, have very irregular working hours, and tend to earn less than conductors with regular runs. Conductors pay their own living expenses when away from their home bases.

Labor Organization

There are union contracts covering conductors on every major railroad. Freight and passenger conductors are represented mainly by the Order of Railway Conductors of America, but in some instances by the Brotherhood of Railroad Trainmen. Yard conductors on the other hand have been organized largely by the BRT, though on some roads by the ORC, the Switchmen’s Union of North America (AFL), or a system association or local union.

See also Brakemen, page 410, and Train Baggageemen, page 413.

Train Baggageemen

(D. O. T. 1-43.01)

Outlook Summary

Openings in this small occupation almost always filled by transfers of qualified brakemen on a strict seniority basis. Employment stable.

Nature of Work

Baggagemen are part of the train crew on passenger trains which have baggage cars. At railroad stations they receive trunks and other baggage checked by passengers, articles sent by Railway Express, and mail bags (unless there is a separate mail car). During the run they sort these items and see that each one is delivered to the proper station. Baggagemen keep records of all baggage, express packages, and mail bags received and put off. When a train has to stop on the road, the baggageman may be required to leave his car (which is always near the locomotive) and go forward along the track to protect the train by signaling.

How To Enter

Positions as baggagemen are filled by transfers of qualified brakemen (or, occasionally, conduc-
Earnings and Working Conditions

Baggage men in Western Association territory had a basic daily wage rate of $10.62 and a guaranteed minimum of $10.92 daily and $318.60 monthly in early 1950. In Eastern Association territory the corresponding rates were $10.66, $10.96 and $319.80, respectively. As for other train and engine personnel in road service, their earnings are based on a combination of daily rates of pay and mileage rates plus certain allowances (see p. 408).

The Brotherhood of Railroad Trainmen represents the baggage men on most roads, although on a few they have been organized by the Order of Railway Conductors of America or some other union.

See also Brakemen, page 410, and Conductors, page 412.

Hostlers

Outlook Summary

Hostler jobs are filled only by men with railroad experience; occasional openings for newcomers as helpers. Employment likely to decline slowly over long run.

Duties

Hostlers take railroad locomotives to the coal dock (or fuel-oil station) for refueling after they have completed runs; supply them with water, lubricating oil and sand; service them in other ways, and deliver them to road engine crews. Inside hostlers handle locomotives only inside and around the engine house or on engine tracks at tie-up points. Outside hostlers have unrestricted territory within the limits of the railroad yard; they may have to take locomotives from the station to the engine house or vice versa and must be acquainted with signal systems used on the main tracks. Hostler helpers assist outside hostlers in watching for signals and in other duties.

How To Enter

Some outside-hostler jobs are filled by men who began as helpers; some inside-hostler positions by men with experience as laborers in the engine house. More often, however, both types of jobs are filled by firemen who either prefer work near home to road service or have been disqualified for some reason—often a limited physical disability. There is little chance for advancement to higher positions; in fact, hostling is often called a fixture job.

Outlook

This is a small occupational group; in 1949, there were about 2,000 outside hostlers, 3,600 inside hostlers, and 1,400 outside hostler helpers working for class I railroads. Only a few openings as hostlers will occur each year, as a result of turnover, and these will be filled by men with railroad experience. There may, however, be occasional openings for outsiders as helpers.

Over the years there is likely to be a slight downward trend in employment, even assuming high traffic levels. Should there be a marked drop in traffic, employment would fall sharply in this as in most other railroad occupations.
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in early 1950. The rate for inside hostlers was $11.29 and for outside hostler helpers, $10.68.

Hostlers are highly unionized, like most other groups of railroad workers. On the great majority of roads they are covered by the collective bargaining agreements of the Brotherhood of Locomotive Firemen and Enginemen.

Where To Apply for Jobs

Men seeking jobs as hostlers may apply to the roundhouse foreman or master mechanic at the nearest railroad station.

See also: Locomotive Firemen and Helpers, page 407.

Switch Tenders

(D. O. T. 7-44.020)

Outlook Summary

Very small occupation offering few if any opportunities to men without railroad experience. Long-run downward trend in employment.

Nature of Work

Switch tenders are stationed at fixed points in railroad yards to throw certain track switches. The jobs are almost always filled by men already employed in the yard—often by disabled yard brakemen, since the occupation does not require as much stamina and agility as most yard work. Yard clerks sometimes take switch-tender jobs; from there, advancement to yard brakeman is possible.

The majority of switch tenders are employed by the class I line-haul railways; most of the remainder by switching and terminal companies.

Outlook

About 8,000 switch tenders were employed by class I railroads in 1949. Over the long run employment is expected to decrease, owing to replacement of hand-operated switches by automatic equipment. The few openings which occur through turn-over will be filled, as a rule, by men with railroad experience.

Earnings and Working Conditions

Switch tenders are among the lowest-paid workers in the train and engine group. Their basic daily rates were $10.51 and $10.71 in early 1950.

The Brotherhood of Railroad Trainmen represents switch tenders on most railroads. However, in a few cases the agreement covering them was negotiated by the Switchmen’s Union of North America (AFL) or some other organization.

Where To Apply for Jobs

Men seeking positions as switch tenders may apply to the yardmaster who may be located by inquiring at any railroad station.

See also: Brakemen, p. 410.

Pullman Conductors

(D. O. T. 0-92.21)

Outlook Summary

Few opportunities in this small occupation. Probably slight rise in employment during early fifties.

Nature of Work

Pullman conductors are employed on trains with several sleeping cars or other Pullmans. They collect the special tickets for the berths, bedrooms, or other space which passengers occupy and are responsible for assigning space to passengers who come aboard without reservations or wish to change their accommodations. These conductors’ duties also include keeping records of the tickets collected and space assigned and supervising the porters and other employees on the Pullman cars. Although employed by the Pullman Co., they are under the supervision of the railroad conductor during a run.
Qualifications and Lines of Promotion

Pullman conductors are recruited from many different sources. Clerks in company offices sometimes transfer to such positions, temporarily or permanently. During the depression a number of college graduates were hired.

Prospective conductors must be able to read and write and to handle figures and simple bookkeeping, and they must be adept in dealing with all types of people. Pre-employment physical examinations are required.

New conductors go through an instruction period of not more than 60 days (during which time they are paid at the regular daily rate). After that they are on probation for 4 months and may be dismissed without a hearing within this probationary period. Experienced conductors with better-than-average ability may advance to minor supervisory positions; a few go on up the ladder to still bigger jobs. Also, Pullman conductors frequently transfer to clerical jobs in Pullman Co. offices.

Outlook

Few job opportunities will be available to newcomers in this small occupation during the early fifties. Employment, which was only 1,830 in January 1950, may rise slightly as defense preparations stimulate railroad passenger business. Like other groups whose employment depends mainly on first-class passenger traffic, Pullman conductors will probably decrease in number over the long run.

Earnings and Working Conditions

Earnings of Pullman conductors ranged from $323.20 to $356.20 for a basic 225-hour month as of January 1950. Pay increases are given at the end of the first year of employment and at specified intervals thereafter until the top of the range is received after completing 15 years' service. Overtime for work above 225 and under 235 hours calls for straight-time rates; for work over 235 hours, time-and-a-half rates.

The collective bargaining agent for Pullman conductors is the Order of Railway Conductors of America.

Where To Apply for Jobs

Job seekers may apply to their local Pullman Co. office.

Pullman Porters and Passenger Attendants

(D. O. T. 2-91.10)

Outlook Summary

Openings for newcomers after furloughed workers rehired. Downward trend in employment may be temporarily reversed in early fifties.

Nature of Work

Sleeping-car porters make up berths, keep the cars in order, see that the washrooms are clean and adequately supplied with towels, handle baggage, and look after the passengers' well-being in many other ways. Parlor cars also carry porters who have these same duties—except making up berths. On club and other cars where refreshments are served there are "attendants," who prepare and serve beverages and food in addition to handling any needed porter work. Bus boys assist the attendants on large club cars.

About 7,800 porters were employed by the Pullman Co. in January 1950, mainly on sleeping cars. In addition, the company employed nearly 800 attendants and about 135 bus boys. The class I roads also have a sizable number of attendants, parlor-car porters, and other passenger-service workers; in 1949 they employed about 4,100 men in these types of work.

Qualifications, Training, and Advancement

Pullman Porters. Pullman Co. hiring requirements for porters call for men between 21 and 45 years of age who can read, write, and work elementary arithmetic problems. All prospective employees undergo character investigations. Porters must pass medical examinations before being hired and those who handle food are rechecked every 90 days thereafter; others are rechecked an-
nually. Many Pullman porters have been recruited from among the friends and relatives of employees. Most of the men now hired are Negroes, although a few are Filipinos.

When a new porter is hired he goes through a training period of approximately 2 weeks. Part of the time is spent in instruction under a porter-instructor and part in road work under an experienced porter. After this training period the employee is given regular porter work but is on probation for 6 months.

New porters are always put on the extra board at first. They then bid for regular runs and are assigned to them on a seniority basis. Experienced porters may bid for any "porter-in-charge" positions which open up in their districts. Porters-in-charge are employed on some trains which have only one or two Pullman cars and therefore no Pullman conductors; they collect Pullman tickets, sell space, and keep records, besides handling regular porter work. The positions are filled according to fitness, ability, and seniority.

Porters may advance to jobs as porter-instructors or porter-investigators. The company selects the workers it considers most qualified for these supervisory positions.

**Attendants and Bus Boys.** Experience as a bus boy is generally needed to qualify for attendant jobs. For bus boy positions, applicants should have an aptitude and interest in handling food. They must also be able to meet requirements with regard to health, character, and education similar to those for porters.

Bus boys are generally promoted to attendant positions on the basis of seniority. It is possible to advance to such jobs as attendant cooks on club cars which serve substantial meals.

**Outlook**

A number of porters who were furloughed after World War II and also some inexperienced men will be taken on in the early fifties. Railroad passenger business, on which employment in this occupation depends, will be stimulated by defense preparations and may well reverse the 1945-50 downward trend. Moreover, men will be hired for porter and attendant jobs to meet temporary seasonal needs for workers—notably, the expanded need for employees on runs to Florida and other Southern States in winter and on those to northern vacation spots in summer. Even the largest railroad systems do not cover enough of the country to meet these seasonal needs by transferring workers from one region to another, as the Pullman Co. does to a great extent. During 1946 class I roads hired about 900 new entrants for attendant, porter, and related jobs.

Employment of porters, attendants, and bus boys would probably tend to decline over the long run. In periods of depression, employment has dropped more sharply in these occupations, which are dependent on the amount of first-class passenger travel, than in many other types of railroad work.

**Earnings and Working Conditions**

Porters, attendants, and bus boys who have regular jobs with the Pullman Co. had a minimum guaranteed monthly wage based on 205 hours of
work as of January 1950. Extra men do not have a guaranteed wage, but the collective bargaining contract stipulates that they should have “as nearly as possible, minimum earnings of approximately two-thirds of the basic month’s pay.” If men work more than 205 hours a month, they receive straight-time rates for the first 35 additional hours; work beyond 240 hours will be paid for at time and a half.

The basic monthly rates for Pullman porters ranged from $233.45 to $255.55 as of January 1950, for attendants $245.95 to $255.55, depending on the type of work and years of service. These rates do not include tips, which are heavy on some runs, light on others, and tend to vary with the type of work. The monthly rates are increased at the end of the second year of service and at specified intervals thereafter—up to top figures about $10 to $20 higher than the beginning rates, after 15 years’ service. Bus boys receive a flat rate of $232.75 a month regardless of years of service.

Sleeping-car porters are provided sleeping accommodations on night runs and may catch a few hours’ sleep after the passengers are checked in. The porter in the adjacent car “guards” the car of the porter released for sleep. Except under certain conditions, sleep of more than 2 hours is not counted as time worked. Employees may buy dining-car meals at approximately 60 percent of regular prices.

Porters, attendants, and bus boys employed by the Pullman Co. are represented by the Brotherhood of Sleeping Car Porters. Those working for the railroads are organized by the BSCP, the Hotel and Restaurant Employees’ and Bartenders International Union, and the United Transport Service Employees of America.

Where To Apply for Jobs

Those seeking jobs as Pullman porters may apply to their local Pullman Co. office.

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Dining Car Cooks

(D. O. T. 2-26.41)

Outlook Summary

Small occupation with some openings each year owing to turn-over and to increase in passenger travel during vacation months.

Nature of Work

Dining car meals are cooked in a compact and highly efficient kitchen at one end of the car. The number of cooks employed in this kitchen depends on the size of the car and the number of customers expected. On some runs one or two cooks may be enough; on others three or four may be needed.

Where four cooks are employed, the crew is generally made up as follows: First there is a chef who supervises the kitchen and instructs other members of the crew; he also roasts and carves meat and poultry, garnishes dishes, and takes inventories of supplies. Next in line is a second cook who fries and broils meat, bakes muffins and rolls, dishes up meals, and does related tasks. A third cook prepares soup, vegetables, and coffee and works at the steam table. A man designated as fourth cook, or “helper,” rounds out the crew. He is the vegetable peeler, dishwasher, and general clean-up man.

Practically all dining car cooks work for class I railroads. In 1949 these roads employed only about 4,800 cooks, including some in restaurants as well as all grades of dining car cooks above the helper level.

Qualifications and Lines of Promotion

Applicants with at least a grade school education are preferred for jobs. All prospective cooks must pass very strict physical and medical examinations before being hired and are tested for communicable diseases every 90 days thereafter. On most roads only Negro men are hired at present, although some western and northern roads employ white cooks. Applicants with experience in food preparation are usually given preference.

New workers generally begin as fourth cooks. After 2 or 3 years’ experience a man may be promoted to third cook, providing he demonstrates the proper skills and there is an opening. Many remain in this position for about three more years.
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before becoming second cooks. Then it takes from 3 to 5 years to work up to the position of chef.

Outlook

This is a fairly small occupation and the total number of workers employed has declined since the end of World War II. However, this downward trend may be interrupted in the early fifties because passenger traffic will benefit from expansion of the Armed Forces. Moreover, even when employment is declining, the railroads take on a number of new cooks each year. New recruits are hired for temporary seasonal peaks in passenger traffic and to replace men who die, retire, or leave the occupation for other reasons.

For the long run, a slow downward trend in employment of cooks is in prospect, owing to the continued decline expected in railroad passenger business. The new labor saving kitchen devices and methods envisaged at present will probably not have much effect on employment; they are likely to ease the work rather than reduce the number of cooks needed. Use of precooked meals or instantaneous electronic cooking probably would cut down the number of cooks required, but general introduction of such innovations is still a long way off.

Earnings and Working Conditions

Cooks and chefs working for class I roads had average straight-time earnings of about $1.29 an hour in September 1949. This figure is an average for all grades of cooks above the helper level. The earnings of individual cooks vary with the grade of job and other factors. Extra workers, generally, have less employment and lower earnings than men with more seniority who have been able to get regular assignments.

Hours of work are long and often irregular. Sometimes a cook may work 18 or 20 consecutive days, or he may work a number of “long” days and then rest a few days. The standard work month was 205 hours in late 1949. For hours over 205 and under 240, straight-time rates are paid; on most roads time and a half rates begin after 240 hours. Cooks are provided free meals and sleeping quarters when they are away from their home terminals.

The kitchens where dining car cooks work are small and cramped. The work is done near hot stoves. It involves handling hot food and utensils and sharp knives. Even on a smoothly running train these working conditions involve risk of injury, and sudden jerks or swaying of the car multiply the chances of being burned or cut or of falling. The risk of accidents faced by cooks is revealed by accident data for 1945 and 1946. In both years disabling injuries to cooks were more frequent, in proportion to man-hours worked, than to any other group of railroad workers except yard and freight brakemen. Injuries to cooks are likely to be less serious, however, than those to brakemen and other workers in train and engine service. In fatalities per million man-hours worked, cooks are well down on the list of railroad occupations.

Where To Apply for Jobs

Job seekers may apply to the superintendent of the dining car department of any carrier.

Labor Organization

Dining car employees are not as highly organized as most other groups of railway workers. The Hotel and Restaurant Employees and Bartenders International Union is the major union in the field. The United Transport Service Employees of America (CIO) and the Order of Railway Conductors of America represent the cooks on a few roads.

See also Cooks and Chefs, page 479.
Dining Car Waiters

(D. O. T. 2-27.95)

Outlook Summary

Long-run downward trend in employment may be interrupted in early fifties as defense preparations stimulate railroad passenger travel.

Nature of Work

Several thousand waiters are employed by the railroads to serve dining car meals. This hard, skilled work is handled by crews of from two to six waiters.

In addition, the waiters have other duties to perform. On a car with a full crew of six waiters these duties are usually divided as follows. Two workers serve as “pantrymen” and are responsible for the proper storage of food and the preparation of salads. The four others set the tables and have additional specific tasks. One takes care of the linen and water bottles. A second washes, cleans, and polishes the larger pieces of silverware, such as sugar bowls, ice tubs, and finger bowls. A third is responsible for the flat silver and the glassware. The remaining waiter keeps the floors clean. When the crew of waiters is smaller each man handles two or more of these duties.

In addition, waiters sometimes go through the coaches selling sandwiches, milk, and other items. They get extra pay for this type of work.

Qualifications and Advancement

Railroads give preference to applicants who are in their early twenties, fairly tall, and of pleasant appearance. Ability to read and write is a must, and previous experience as a waiter is an asset. Each man undergoes a character investigation before being hired. He is also given a thorough physical and medical examination. Throughout his employment he is tested for communicable diseases about four times a year.

Most dining car waiters at present are Negroes, although some northern and western railroads employ white waiters. There is little opportunity for advancement for Negro waiters, since the stewards who are in charge on most dining cars are white men. A few Negro waiters become waiters-in-charge, who supervise the other employees on cars with a total work force of less than four including both cooks and waiters.

Outlook

Both the short- and long-run prospects for dining-car waiters are similar to those for dining-car cooks (see p. 418).

Earnings and Working Conditions

Waiters’ wage rates are lower than those of cooks, but their earnings are supplemented by tips. When the amount received in tips is large, waiters are likely to earn more than cooks. When dining car business is slack and tips are light, cooks generally earn more.

Average straight-time earnings for the group of workers including waiters were about $1.11 an hour in September 1949. Waiters generally get a 1-cent-an-hour increase for each year of service up to 5 years. Those who serve as pantrymen are paid a few dollars extra a month. Men selling
sandwiches and other items in coaches receive a small commission on sales.

Waiters generally have the same basic month and overtime arrangements as cooks.

Waiters are organized mainly by the Hotel and Restaurant Employees and Bartenders International Union (AFL). However, they are represented on some roads by the United Transport Employees of America (CIO) or the Brotherhood of Railroad Trainmen.

Where To Apply for Jobs

Men seeking jobs in this occupation may apply at the office of the superintendent of the dining car department of any carrier.

See also Waiters and Waitresses, page 480.

### Telegraphers, Telephoners, and Towermen

(D. O. T. 1-41.22 and 5-44.020)

**Outlook Summary**

Job openings fairly numerous in early fifties. Employment expected to decline over long run.

**Nature of Work**

Telegraphers and telephoners are employed in most stations and many towers. Railroad towers overlook yards, approaches to terminals, and other places where two or more tracks come together or cross or where special care must be taken to prevent accidents.

These workers are responsible for receiving train orders from dispatchers and passing them on to train crews either in written form or by signals, besides handling other types of communications relating to the railroad’s business. Telegraphers employed in stations often have combination jobs involving ticket selling and other duties as well as handling of train orders and messages. Telegraphers and telephoners are employed also as “block operators,” who control the manually operated block-signal systems which have been installed along many routes.

Towermen operate switches and sometimes signals. They may also transmit train orders. Those who merely operate the levers controlling switches in either mechanical or electrical towers are generally known as levermen. Men who do telegraphing in addition to this work are generally known as levermen-telegraphers, or towermen-telegraphers. In large towers where several men are employed a “tower director” is in charge. Some of the telegraphers with the greatest speed in sending Morse Code work in relay offices, which relay messages regarding reservations, freight shipments, and other matters to other telegraph offices all over the railroad system. In addition, relay offices employ printer operators, who handle messages by teletype or other kinds of automatic telegraph printing machines.

In 1949 the class I roads employed about 14,500 telegraphers, telephoners, and towermen (including printer operators, block operators, and all towermen regardless of whether they were required to do telegraphing or telephoning). In addition, there were about 900 chief telegraphers and telephoners and wire chiefs and 9,400 workers who combined telegraphing or telephoning with clerical duties in stations.

**Qualifications, Training, and Advancement**

For positions as student-telegraphers, the railroads desire young people not over 21 years of age, preferably not more than 18 or even younger. Sometimes girls are hired, but young men are generally preferred. The physical examination for telegraphers pertains particularly to eyesight and hearing. A high school education is required by almost all roads; legible handwriting is necessary.

Most student telegraphers receive 6 to 12 months of on-the-job training at a small station, under the supervision of the station agent or of an experienced telegrapher. They not only learn Morse Code but are instructed in such subjects as train orders, operating rules, routes, rates, and accounts. Less often, beginners start by taking a course (which generally lasts 6 months) at a railroad telegraph school and then spend 2 or 3 months “cubbing” at a station. For men with previous telegraphic experience, the training period may be shorter. On many roads, trainees have to pass a written or oral examination on train and operating rules and a practical test on code speed and handling of train orders in order to qualify for a
Telegraphers are responsible for receiving and dispatching train orders, handling all the railroad's intercity communication other than mail or conversation, operating block signal systems and many other jobs.

telegrapher job. Levermen who are not required to do telegraphing can generally learn their work in a few weeks.

Newly qualified telegraphers usually begin as extra workers and then bid for regular assignments. The men with greatest seniority have first chance at the shifts they prefer and at the various kinds of jobs within their seniority district (which, for most telegraphers, is the railroad division). They may bid not only on straight operator and block-operator jobs but also on towermen, telegrapher-clerk, and telegrapher-station-agent positions. Later on, they may work up to such positions as station agent in a major station, dispatcher, or wire chief.

Outlook

Over the long run, employment will have a downward trend but there will be some openings each year owing to turn-over. The amount of turn-over will depend on such factors as the volume of railroad traffic, the availability of other jobs, and the number of workers called into military service. In the early fifties openings will probably be fairly numerous.

Among the factors which have in the past reduced the number of Morse telegraphers needed and will continue to do so in the future are the use of telephone in place of telegraph in train dispatching and the introduction of teletype machines in relay offices. Workers in the telegrapher craft receive preference for telephone and teletype jobs, however, and these developments tend to change the nature of the work done by some men rather than to eliminate positions. As centralized traffic control systems (commonly referred to as CTC) are introduced, they eliminate some telegrapher, telephoner, and towerman jobs, but installations of CTC are likely to be spread out over a number of years. What the effects of radio telephone will be upon railway communication jobs is not yet clear. Many railroad officials believe that telegraphers or telephoners will always be needed regardless of radio.

Earnings and Working Conditions

Clerk-telegraphers and clerk-telephoners had average straight-time earnings of $1.56 an hour in September 1949. Wages vary greatly from one station to another and are based on factors such as geographical location and the amount and character of business transacted at the station. The wage rates for students are far below those for qualified telegraphers.

Employees in jobs involving only telegrapher, telephoner, or towerman duties made $1.59 an hour on the average in September 1949. Within this group, also, there is wide variation in rates. Telegraph operators in relay offices have better-than-average pay, and there are many other differences.

The wage rates for chief telegraphers and telephoners and wire chiefs are naturally higher. In September 1949 these workers had average straight-time earnings of $1.88 an hour.

Telegraphers, telephoners, and towermen are represented by the Order of Railroad Telegraphers (AFL) on nearly all major roads.

Where To Apply for Jobs

Men seeking jobs as telegrapher or telephoner may apply at the office of the superintendent of telegraph or the chief dispatcher in cities where there are such officials. Those interested in towerman jobs may apply to the signal supervisor or division superintendent. In smaller towns, station agents can provide information on how to apply for jobs.

See also Station Agents, page 423.
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Station Agents
(D. O. T. 1-44.22)

Outlook Summary

Positions filled by railroad telegraphers or telegrapher-clerks. Employment much more stable than in most other railroad occupations but may decline slightly over long run.

Nature of Work

A station agent is the railroad's official representative in all dealings with the public at his station. At small one-man stations, the agent has to do all the work himself—selling tickets, checking baggage, calculating freight and express charges, loading and unloading freight and express packages, even taking care of the station and grounds. At most stations, the agent also serves as telegrapher and telephoner, with responsibility for receiving and delivering train orders and messages pertaining to the company's business. The larger the station, the more work is delegated to clerks, cleaners, and other employees working under the agent's supervision. Men who have worked up to agent positions in major freight or passenger stations have mainly administrative and supervisory duties and perform little of the detailed work themselves.

Altogether, about 21,000 station agents were employed in 1949. Two-thirds of these men (14,000) were agent-telegraphers or telephoners; the next largest group (4,800) had nontelegraph jobs at the smaller stations, while 2,300 had supervisory positions at major stations.

Qualifications and Lines of Promotion

Positions as agent in a small station or assistant agent in a larger one are filled, as a rule, by promoting experienced telegraphers who bid for the jobs. (For jobs in small nontelegraph stations, telegraphic experience is not required.) A wide knowledge of routes, rates, accounting methods, signals, and other matters connected with railroad operations is needed for all station-agent positions.

Agents may move up the ladder by going from smaller to larger stations. Another frequent line of promotion is from assistant agent to agent, and possibly to station supervisor or inspector and stationmaster.

Outlook

Employment is likely to be more stable in this occupation than in most other railroad jobs, although it may decline slightly over the long run. There will probably be several hundred openings in station agent jobs each year owing to turnover, but these will continue to be filled, in the main, by telegraphers already on the payroll.

Since the early twenties the number of agents employed has declined slowly but steadily, as more and more stations were closed. It was possible to eliminate these stations because automobiles enabled people to travel farther to reach railroad stations than they could in the horse-and-buggy days. The number of stations and agents may continue to decline, but at a slow rate. Most of the stations which could be easily eliminated have already been closed.

Earnings and Working Conditions

Station agents in nonsupervisory jobs are sometimes paid by the hour, sometimes by the month; the much smaller group in supervisory positions are paid by the month. For both groups, pay varies with such factors as the location of the station and the amount and character of business done there. Where agents handle the business of the Railway Express Agency they receive a commission averaging 10 percent on the business transacted.

Nontelegrapher agents at smaller stations had average straight-time earnings of about $1.66 an hour in September 1949. Agent telegraphers and telephoners averaged about $1.58 an hour. Supervisory agents at major stations averaged considerably more, about $2.09.

Most full-time station agents are represented by the Order of Railroad Telegraphers (AFL).

See also Clerks, page 424, and Telegraphers, Telephoners, and Towermen, page 421.
Clerks

(D. O. T. 1-11)

Outlook Summary

Thousands of newcomers will be hired each year in the early fifties to fill vacancies in this large occupation. Long-run employment trend probably downward.

Nature of Work

About 127,000 clerks worked for class I railroads in 1949. The largest group (101,000) were employed as ticket sellers, rate clerks (who determine the charges for freight shipments), timekeepers, bill clerks, yard clerks, baggage-room clerks, and in related jobs. In small offices or stations, one man may handle several different types of work; in large offices with many clerks each one may be highly specialized.

A smaller group of clerks (about 11,000 in 1949) had higher grade jobs involving more responsible or technical work. Some prepare the statistics on employment, traffic, equipment, and other subjects required by the Interstate Commerce Commission. Among the other types of workers in the group are cashiers, who deal with the public on such matters as uncollected freight bills and undercharges made by the road.

Supervisory and chief clerks numbered about 14,500 in 1949. They not only supervise other workers and assume responsibility for major or minor departments but may be called on to solve highly complex problems.

Qualifications and Advancement

Beginning clerical jobs are filled either by hiring newcomers or by promoting office boys, messengers, or, in some instances, laborers already employed by the company. Positions of higher grade are almost always filled by promotion from within. Men are preferred for most jobs, but large numbers of women are employed in some clerical occupations. A high school education is required by some roads, and clerical aptitude tests are given by a few. Training or experience in working with figures is helpful.

The line of promotion depends on the department in which the clerk is working. In many offices, he may hope to advance to assistant chief clerk, chief clerk, and, conceivably, still higher administrative positions. Some clerks have a chance to move from routine beginning jobs to work demanding special knowledge of accounting or statistics, which may lead eventually to positions such as that of auditor. Clerks in traffic departments may become traffic agents; those in supply and stores departments may advance to jobs such as buyer or storekeeper; those in stations have a chance to become ticket and station agents.

Outlook

The railroads will take on thousands of newcomers as clerks during the early fifties. This occupation is so large that many vacancies will arise each year through quits, deaths, retirements, and men leaving to enter the armed services. In 1946, more than 14,000 new entrants to the railroad industry were hired as lower grade clerks.

Employment in the occupation will probably tend to decline over the long run. Further mechanization and more efficient office procedures will make it possible for fewer and fewer clerks to handle a given amount of work. Since new machines are introduced gradually and much clerical work does not lend itself to mechanization, the total number of clerks needed will probably decrease slowly, however.

In periods of declining railroad business, layoffs have been heavy among some groups of clerks, including ticket sellers, rate clerks, and others who are directly concerned with passenger or freight traffic. In the audit and accounting departments and certain other branches of the railroads, the amount of clerical work to be done and the number of clerks needed are much less affected by changes in the volume of traffic.

Earnings and Working Conditions

For clerks in lower grade jobs, average straight-time earnings were $1.57 an hour in September.
1949. Senior clerks and clerical specialists had average wages of $1.85 an hour. Supervisory and chief clerks had still higher average hourly earnings.

The Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees (AFL) represents the clerks on all major roads. On some roads ticket sellers are represented by the Order of Railroad Telegraphers (AFL).

Where To Apply for Jobs

Job seekers may apply at central employment offices maintained by railroads or at individual offices such as the auditor’s office or station agent’s office. In smaller communities where there are no such offices they may apply to local officials such as station agents, who hire clerks.

See also Station Agents, page 423, Telegraphers, Telephoners, and Towermen, page 421.

Redcaps

Outlook Summary

Small occupation. Number of openings depends on turn-over and volume of railroad passenger traffic. More openings in early fifties than in years following World War II, mainly owing to increased turn-over. Long-run employment downward.

Nature of Work

The redcap’s primary job is to carry baggage for railroad passengers, either by hand or with trucks. They also check baggage, buy tickets, make telephone calls, and perform other services for travelers. In addition, they must be prepared to answer questions on such subjects as train schedules and the tracks on which particular trains will arrive or depart. At a few stations, they call out the names of trains, stock the timetable racks, and do cleaning and other work.

This small occupation had a few thousand workers in late 1949.

Qualifications and Lines of Promotion

Hiring standards for redcap jobs vary from company to company. As a rule, applicants are required to be at least 18 and not over 45 years of age. They must be able to read and write and pass physical examinations. Redcaps must be strong enough to carry heavy baggage. Most of them are Negroes.

There are few promotion opportunities for redcaps, although a small number may advance to the positions of assistant captain and captain in their stations.

Outlook

Several hundred openings will arise each year in the early fifties as redcaps die, retire, or leave the occupation for other reasons. Turn-over probably will be higher than during the years following World War II, and employment may rise slightly as railroad passenger traffic increases.

Over the long-run, employment of redcaps is likely to decline slowly. The number of jobs is closely related to the amount of passenger traffic, particularly Pullman travel, and it is the railroads’ Pullman business which is likely to suffer most heavily from airline competition. A limited number of openings will arise each year owing to turn-over, which is reported to be low in this occupation.

Earnings and Working Conditions

Most redcaps had a regular hourly wage of about $1.16 in late 1949. In addition to their wages, they keep any tips which passengers give them over the regular charge for baggage. The standard fees are collected by the redcaps and turned in to their employers. The amount received in tips varies greatly, depending on the city, the station, the individual worker and many other factors. In general, “positions” at automobile or taxi entrances to stations are more profitable than those at trolley-car or foot-passenger entrances. Many companies assign the preferred positions to men with greatest seniority.

Redcaps who have worked at least 130 days during the previous year receive vacations with pay—5 days a year with less than 5 years’ service, 10 days with 5 years or more.
These workers are covered by union contracts at most large stations. They are represented by the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees (AFL) and the United Transport Service Employees of America (CIO).

Where To Apply for Jobs

Men seeking jobs in the occupation may apply at the stationmaster's or terminal superintendent's office at any railroad passenger station having redcap service.

Shop Trades

Outlook Summary

Downward trend in employment will be offset by increasing railroad traffic in the early fifties.

Nature of Work

The employees responsible for the building, maintenance and repair of cars and locomotives on the railroads are divided into six main "shop crafts." In descending order of size these are: carmen, machinists, electrical workers, sheet-metal workers, boilermakers, and blacksmiths. About 146,000 journeymen mechanics were employed in the six crafts in 1949. In addition, there were about 10,000 apprentices and 67,000 helpers.

Carmen, of whom there were about 72,000 on class I roads in 1949, are engaged primarily in building and repairing railroad freight and passenger cars. They also do some work on locomotives and on smaller vehicles of various kinds, such as the motor cars used in transporting workers along the tracks. Because of the wide variety of jobs they may be called on to handle, most carmen are skilled in both carpentry and metalworking and can use many power machines as well as hand tools. However, the carman group also includes some upholsterers, car painters, and patternmakers, skilled only in their particular specialties.

Carmen are usually assigned to some one branch of work. The largest number are employed in freight car shops and on repair tracks. A smaller group do passenger car (or "coach") work in the passenger car shops. Another group, designated as car inspectors, examine cars in the yards and stations for defects such as worn or damaged parts that might cause train accidents or delays. There is also a small group, called locomotive carpenters or tender repairmen, who are assigned to work in the engine houses and locomotive shops.

The other major shop crafts are found in many other industries as well as on the railroads. Railroad shop men in these crafts generally do the same kinds of work as members of their trades who are employed elsewhere, but they must have special knowledge of railroad equipment.

Machinists are, next to carmen, the largest group of skilled shop workers, numbering about 39,000 on class I railroads in 1949. They assemble and dismantle machinery, make and repair parts, and do related work, mainly on locomotives although to some extent on cars and other equipment. Electrical workers numbering about 11,500 maintain equipment, install and maintain wiring and electrical equipment on locomotives, passenger cars, and cabooses as well as in the shops and other buildings owned by the railroads. Boilermakers (of whom 9,600 were employed in 1949) also work mostly in locomotive shops, where they maintain and repair locomotive and stationary boilers, fireboxes, tanks, and other parts made of sheet iron or sheet steel. Sheet-metal workers (there were about 9,800 in 1949) install and maintain light sheet-metal parts and do pipe fitting on cars, locomotives, and other equipment. Blacksmiths (who numbered 4,800) forge and fabricate parts for locomotives and other equipment; these include springs, side rods, and many other parts which are subject to great strain.

Qualifications, Training, and Advancement

The usual way of entering the shop crafts is to work either 4 years as an apprentice, or 2 years as a helper and then 3 years more as a helper-apprentice. Workers with related experience in other industries may be able to qualify as journeymen in less than 4 years.

To become a regular apprentice, one must be at least 16 and not over 21 years of age; to become a helper-apprentice, not older than 30 or 35,
although younger men are desired. A few roads require candidates for regular apprentice positions to pass mathematical- and mechanical-aptitude tests. Most union agreements provide that preference shall be given to relatives of railroad employees, providing they meet hiring standards.

The railroad industry has one of the best systems of apprentice training in the country. Some of the industry's training programs date back over a half century. Definite standards for the training of apprentices are incorporated in the agreements negotiated by the shopmen's unions with the railroad managements. Apprentices receive training in all branches of their respective trades and upon completion of their training receive a certificate from the carrier certifying that they are qualified journeymen.

**Outlook**

Employment will decline over the long run in most shop crafts. In the early fifties, however, this tendency to decline will be offset as increasing railroad traffic creates a greater volume of repair work. Increasing substitution of Diesel-electric locomotives for steam engines will continue to have a strong downward effect on shop trades over the long run. The great majority of new locomotives now being bought by the railroads are Diesels. Not only do these locomotives require much less maintenance work than steam engines, but with the greater availability of Diesel-electric power, fewer locomotives will be required to perform the same service. This will result in reduced employment.

The craftsmen already most affected by dieselization and most likely to have a long-run downward trend in employment are the boilermakers, who work primarily on the boilers of steam locomotives. Increasing dieselization also means less work for each locomotive in use for most of the other crafts. The effect of dieselization on employment in the locomotive department will vary greatly from road to road, depending on when and how fast Diesel-electric power is substituted for steam.
The amount of work for electricians, on the other hand, is expanding with the growing use of Diesel-electric power. The number of workers in the occupation was at an all-time peak in 1949 and will probably continue to grow, at least in prosperous years, owing both to dieselization and to the expanding use of electric and electronic train-communications equipment.

Carmen are not directly affected by dieselization. Employment of carmen probably will remain at a high level during the early fifties, since defense preparations are likely to make heavy demands on the Nation's railroad cars.

In the past when railroad traffic and income have declined, maintenance work has been deferred as much as possible and cuts in employment have tended to be more drastic in maintenance departments than in other major departments of the railroads. Even when traffic is heavy and there is maintenance work needing to be done, some shop workers may be laid off temporarily if a road's maintenance budget is unexpectedly exceeded or there are shortages of materials or other unforeseen developments.

Vacancies occur every year owing to turn-over. Whenever there are furlough lists, laid-off workers must be rehired before any newcomers can be taken on. In good years, however, there are thousands of opportunities for newcomers in the helper and apprentice classifications. Class I roads took on about 14,000 new entrants as skilled trades helpers in 1946. Opportunities for apprentices are less numerous than for helpers, who are a much larger occupational group. Only about 2,000 new entrants became apprentices to skilled craftsmen on Class I roads in 1946.

Earnings and Working Conditions

Passenger carmen and locomotive repairmen, machinists, boilermakers, blacksmiths, sheet-metal workers, and electrical workers have the same hourly wage rate. This rate was generally $1.74 an hour outside the South and $1.73 an hour on southern roads in late 1949. The rates for freight-car men were somewhat lower, about $1.65 an hour. In each craft, an additional 6 or 12 cents an hour is paid for special types of work; men doing autogenous welding, for example, receive 6 cents more than their basic rate.

 Helpers in all crafts had a basic wage rate of about $1.46 an hour. Helper apprentices start at about $1.46 an hour and, through increases at regular intervals, work up to the journeyman's rate at the end of 3 years. Regular apprentices start at a lower rate, typically about $1.23 an hour, and work up to the journeyman's rate after 4 years.

Most work on cars is done outside on uncovered tracks, and workers are on the job in all kinds of weather, even when it rains or snows. On some roads, the men themselves decide when the weather is too bad for them to work; they do not receive pay for time lost on this account. Major repairs on locomotives are generally made indoors.

These shop crafts are represented primarily by the following unions: Brotherhood Railway Carmen of America; International Association of Machinists; International Brotherhood of Boilermakers, Iron Ship Builders and Helpers of America; International Brotherhood of Blacksmiths, Drop Forgers and Helpers; Sheet Metal Workers' International Association; and International Brotherhood of Electrical Workers. In collective bargaining, these unions operate through the Railway Employes' Department, AFL, and have "federated" agreements with the railroads covering all six crafts. In a few instances, shop workers have been organized by the Brotherhood of Railroad Shop Crafts of America, a system association, or some other union.

Where To Apply for Jobs

Those seeking jobs as apprentices and helpers may apply to shop or roundhouse foremen or master mechanics.

See also All-Round Machinists, page 189; Electricians (Building Trades), page 393; Sheet-Metal Workers, page 395; Blacksmiths, page 220; and Boilermakers, page 221.
Trackmen

(D. O. T. 0-98.71, 7-23.121, and 9-32.01)

Outlook Summary

Employment trend downward for group as a whole, but many openings each year owing primarily to turn-over in section gangs and to need for large numbers of extra gang men each summer. Number of machine operators employed expected to increase.

Nature of Work

A railroad’s regular, year-round track work force is organized into “section gangs.” These crews are made up typically of about five or six men and a foreman. They are responsible for day-to-day maintenance of sections of a railroad line which average 9 miles in length but may range from 2 miles to more than 30, depending on whether the line has more than one track and how heavy the traffic is. Either the foremen themselves or certain section men designated as “track walkers” make regular inspections, looking for cracked rails, weak ties, washed-out ballast, and other defects. Crews make the repairs under the supervision of foremen.

About 23,500 section foremen were employed by class I roads in 1949. The number of section men employed ranged from 108,000 in mid-January to 120,000 in mid-June, the peak month. During the spring, summer, and fall, trackmen repair the ravages of the past winter and put their roads in good condition for the next. On some roads, the section gangs take on additional workers during the good-weather months to handle the heavier work load.

Besides the section gangs, many roads have “extra gangs,” which do big repair jobs and new construction work. Employment of extra-gang men increases greatly during the summer months; class I roads employed 55,500 such workers in July 1949, compared with only 31,000 in January.

To operate the larger roadway machines, many roads have special crews which do no other type of work. Some crews run machines which spray chemicals on weeds along the roadway. Others operate ditching machines over the entire length of the road. Crews also specialize in reclaiming rails and ties, welding rails, and cleaning ballast. Automatic hand tools such as tampers and power wrenches are frequently operated by members of section and extra gangs.

Qualifications and Advancement

Men applying for jobs as trackmen or mechanical equipment helpers need to be strong enough to do heavy work. Prospective track workers are given physical examinations; foremen must be re-examined periodically. Many roads require that applicants be between 18 and 45 years of age. As a rule, educational qualifications are less strict for trackmen than for most other railroad jobs. Some roads, however, hire promising men with a high-school education as apprentice foremen.

Some trackmen may transfer to helper jobs on roadway machines or in the shops where these machines are repaired. Others may become foremen or assistant foremen, but this usually requires many years of experience. A few of the best qualified foremen may reach higher positions—track supervisor, division engineer, and division superintendent. Section men have a better chance of advancing to supervisory positions than those in extra gangs. However, the latter can often transfer to section work.

One of the entrance jobs for roadway machine operator is that of helper. Helpers, and sometimes men from roadway machine maintenance shops, are promoted to operator positions according to seniority, providing ability is sufficient. Seniority in this department typically extends over several divisions and sometimes the entire system.

Outlook

Many thousands of track workers will be hired annually for an indefinite number of years, although further mechanization of track work will mean decreasing employment of trackmen. Large numbers of workers without previous experience in railroading are hired each year to meet the expanded need for trackmen during the summer months and to fill vacancies created by the high turn-over rate. In 1946, class I roads hired 78,000
new entrants as extra-gang workers and 79,000 as section men. The numbers hired vary with the volume of maintenance and repair work, which in turn depends on the amount of business done by the railroads.

Mechanical-equipment operators and helpers will continue to take over more and more track work. In both the short and long run, there will be a number of openings in this occupation each year, owing both to expanding employment and turn-over. Because the introduction of the 40-hour week in September 1949 brought higher labor costs, mechanization of track work is expected to speed up. It is likely that railroad companies will continue to add mechanical track equipment even in years when business is not good.

Earnings and Working Conditions

Trackmen are among the lowest-paid workers in the railroad industry. Section men and extra-gang men had average straight-time earnings of about $1.22 an hour in September 1949. On a yearly basis, however, extra-gang men tend to have less income than section hands, since the railroads frequently have work for them only part of the year.

Portable steam equipment operators had higher wages. Their straight-time earnings averaged about $1.57 an hour in September 1949 and their helpers’ earnings, about $1.35. Section foremen and extra-gang foremen averaged about $1.54 and $1.58, respectively.

Rates of pay vary from railroad to railroad and even from one part of a road to another. Time worked in excess of 8 hours a day or 40 a week are paid for at time and a half and time in excess of 16 hours a day at double time.

Since section men work on only a few miles of track they are usually able to live at home. Trackmen in extra gangs travel from place to place and often must live in camp cars or trailers, where they pay for their food and provide their own bedding. Men operating mechanical equipment frequently serve several divisions or an entire railroad system; they have to spend much time away from home, often living in camp cars.

Maintenance-of-way employees are highly organized. They are represented on almost every road by the Brotherhood of Maintenance of Way Employees (AFL).

Where To Apply for Jobs

Men seeking work in this occupation may apply to section foremen, track supervisors, or roadmasters.

Bridge and Building Mechanics

*(D. O. T. 5-25.849)*

Outlook Summary

Employment expected to remain at a high level in early fifties. Number of workers probably will decline over the long run.

Nature of Work

The bridge and building men are an unusually versatile group of workers. One day they may be called on to repair a bridge; the next, they may work on a tunnel; the one after that, they may repair or build a station, water tank, coal dock, ferry pier, or any one of a variety of other structures.

The largest group of bridge and building workers are the carpenters or mechanics. These men are all-round mechanics, able to do not only carpentry, but also other types of construction work. About 13,500 of them were employed on class I roads in 1949. In addition, the bridge and
building force included some 2,000 painters; a
total of about 1,900 masons, bricklayers,
plasterers, and plumbers; and 900 structural-steel
and iron workers. Helpers and apprentices num-
bered about 7,400 altogether; foremen, about 4,200.

Qualifications and Advancement

New workers start out as helpers (or appren-
tices). Generally, they serve about 3 years as
helpers before they can qualify as mechanics. As
openings occur in skilled jobs, they are filled by
promoting the qualified helpers with greatest
seniority. Journeymen with years of experience
and exceptional ability may advance to positions
as inspectors, foremen, bridge and building super-
visors, and even division engineers. The last
mentioned position frequently requires special
training.

Outlook

Employment in this occupation is expected to
remain at a high level during the early fifties.
Turn-over is likely to create many hundred vacan-
cies each year among helpers and apprentices. The
vacancies will arise as helpers are promoted, leave
for other jobs, or enter the armed services. In
1946, class I roads hired 6,400 new entrants as
helpers. In periods of declining railroad business
openings for newcomers are few since falling rail-
road traffic means heavy lay-offs of maintenance
workers and waiting lists for jobs.

Over the long run employment will tend to de-
cline slowly. A downward trend in employment
is expected for such reasons as the increasing sub-
stitution of concrete, steel, and durable, treated
lumber for untreated wood, and the greater use of
power saws, drills, and other labor-saving equip-
ment.

Earnings and Working Conditions

Bridge and building carpenters had average
straight-time earnings of about $1.53 an hour in
September 1949. Hourly earnings were slightly
higher for painters ($1.55), and still higher for
ironworkers, masons, bricklayers, plasterers, and
plumbers (about $1.68). But even these last two
groups make a little less than most groups of
skilled railroad shop workers.

 Helpers have considerably lower rates. In Sep-
tember 1949 their average hourly pay was about
$1.38.

Bridge and building men often have to be away
from home for days at a time. They generally
live in camp cars and have to provide their own
bedding and pay for their food.

The Brotherhood of Maintenance-of-Way Em-
ployees represents the bridge and building workers
on most major roads.

Where To Apply for Jobs

Job seekers may apply to bridge and building
foremen or division master carpenters.

Signalmen and Signal Maintainers

(D. O. T. 5-79.170)

Outlook Summary

One of the few railroad occupations in which
employment will probably have an upward trend
over long run. However, number of job openings
will be limited, since this is a small occupation.

Nature of Work

Signal departments have the responsibility for
maintaining, improving, and expanding signal
systems. The craftsmen who carry out this com-
licated and important assignment are signalmen
and signal maintainers. Working with them are
assistants and helpers who, in addition to doing
the less skilled work, are in training to become
full-fledged craftsmen. In 1949, class I railroads
employed about 8,400 signalmen and signal main-
tainers, 2,500 assistants, and 3,200 helpers.

Signal maintainers inspect and repair railroad
signals within a given territory. They see that
the lights, switches, other controlling devices, and
wires are in good condition and are functioning
properly. The work requires a thorough prac-
tical knowledge of electricity and considerable
mechanical skill.

The skills and knowledge required for signal-
men are much the same as for maintainers. But instead of doing maintenance repair work, signalmen are primarily concerned with installation and construction. They work in gangs and travel from one part of the road to another, wherever there is construction work to be done.

Training and Advancement

In both signalman and signal-maintainer work new employees start as helpers, doing semiskilled work. After about 6 months to 1 year of training on the job (or longer, depending upon how often vacancies occur) most helpers advance to assistants. Four years' experience as assistant generally qualifies a man for a journeyman job. As openings in skilled jobs occur they are filled by promoting qualified assistants according to seniority rules. On nearly all roads journeymen may transfer from signalman to maintainer jobs or vice versa. When lay-offs are made, workers in either type of work may bump those with less seniority in the other type.

Both signalmen and signal maintainers may be promoted to more skilled and responsible jobs, such as inspector or test man, leading signalman, or signal maintainer and foreman. A few men may advance eventually to assistant signal supervisor or engineer.

Outlook

This is one of the few types of railroad work in which employment will probably tend to increase over the long run. In 1940 about 10,300 signal workers were employed. Several thousand men left for the Armed Forces; nevertheless, employment rose to about 13,000 by 1945. Since the end of the war, employment has continued to increase (to about 13,500 in 1949). It is likely that the number employed will rise still further. The railroad will need men both to install more signal apparatus and to maintain the greatly expanded signal system.

Workers will also be needed to replace those who leave the occupation because of death or retirement, to take other jobs, or to enter the Armed Forces. Class I roads hired 2,600 new entrants as signal workers in 1946, although the net gain in employment was very small during the year.

Signal workers probably will have an especially high degree of job security. In this group as a whole, employment not only has an upward trend but is less affected by changes in the general level of business activity than employment in most other railroad occupations. When railroad business declines, most signal maintenance work must be continued, although the amount of new construction and installation work is likely to be reduced.

Earnings and Working Conditions

Signalmen and signal maintainers generally had basic hourly wage rates of $1.75 in the East and $1.73 in the South and West in late 1949. Leading signalmen and leading signal maintainers are paid an additional 6 to 10 cents an hour. Assistants' rates began at about $1.47 an hour in the East and $1.45 an hour in the South and West, and their pay rose gradually during the apprenticeship period. Signal helpers had a flat rate of $1.46 in the East and $1.43 in the South and West in late 1949.

Maintainer work is fairly steady throughout the year. Signalmen are likely to have less work in the winter than in other seasons, except in regions with mild winters. Signalmen are away from

The signal maintainer plays a key part in the safe operation of railroads.
home a large part of the time. On such occasions, the railroads provide camp cars, but the men have to pay for their food and provide their own bedding. Signal maintainers are generally able to live at home; they ride back and forth within their territory daily.

These workers are represented on practically all roads by the Brotherhood of Railroad Signalmen of America.

Where To Apply for Jobs

Job seekers may apply to signal foremen, signal supervisors, or signal engineers of any carrier.
Air transportation, the newest of the Nation's transportation industries, has had a lure for young people out of proportion to the civilian jobs available. Thousands of boys and girls aspire to careers in aviation—as pilots, airplane hostesses, aviation mechanics or airline traffic representatives, to cite but a few of the vocations found in air transportation. Despite the long-run upward trend in employment, there has been sharp competition for jobs in peacetime in most aviation occupations. Since World War II, a large number of air force veterans have sought civilian jobs as pilots or mechanics or in other work comparable to their military assignments.

Air Transportation and Related Activities

The airlines which carry passengers, mail, and cargo on a regular schedule make up the largest group of employers in the air transport field. There were 43 scheduled airlines engaged in interstate or foreign commerce at the end of 1949. Sixteen were domestic trunk lines, of which 9 flew over international as well as domestic routes. Three lines were engaged only in international operations. Two small carriers operated only in the Territories; four carriers were certificated for cargo operations only; the remaining eighteen were domestic feeder lines. Altogether, scheduled carriers operated about 1,000 planes and employed approximately 80,000 men and women in 1949. The domestic trunk lines and international lines were the largest employers; their staffs represented more than 90 percent of the total work force.

Besides the employees of the scheduled lines, many thousands work for irregular (nonscheduled) carriers and in fixed-base and industrial operations. At the end of 1949, approximately 90 active companies were registered with the Civil Aeronautics Board as Large Irregular Carriers; in addition, more than 2,000 Small Irregular Carriers were authorized to engage in air transportation.

The major functions of fixed-base operators are flight instruction, charter flying, and servicing and overhauling planes. Industrial aviation includes a great variety of activities—among them, aerial photography, sky-writing and other aerial advertising, patrolling pipe lines, seeding, crop-dusting, and other agricultural services. The aircraft manufacturing industry also employs specialized personnel of the types found in air transportation (see p. 273).

Large numbers of civilians are employed by the Air Force in ground jobs. Many of these are mechanics stationed both here and abroad. There are great numbers of military personnel in both flight and ground jobs.

The principal nonmilitary government agency which employs personnel in jobs comparable to those in civil air transportation is the Civil Aeronautics Administration, a branch of the United States Department of Commerce. This agency enforces the Civil Air Regulations which are set up by the independent Civil Aeronautics Board—for example, it certifies as to the competency of airmen and the airworthiness of aircraft and equipment and participates in accident investigations. Several hundred men with backgrounds as pilots or mechanics are employed by CAA as aviation safety agents and as airways flight inspectors. The CAA, through its Office of Federal Airways, also operates the Federal Airways System and the traffic-control towers at major civilian airports; thousands of airport and airway traffic controllers, aircraft communicators, and radio and airways technicians are employed in these operations.

The Civil Aeronautics Board employed a total of 68 aviation technicians in late 1949; these employees assist in preparing Civil Air Regulations and investigating accidents. Aviation commissions of various States also provide a small field of employment for technical aviation personnel.

Aviation Occupations

Air transportation offers employment in a wide variety of occupations. Each plane must, of course, carry at least one pilot. In addition, a flight engineer, a navigator, a flight radio operator, and one or more cabin attendants may be carried. Airline dispatchers and assistants superintend flights from ground stations. Air-route
and airport traffic controllers, most of whom are CAA employees, direct airplane movements along the airways and at airports. To handle the constant flow of communications, the airlines have radio operators and teletypists; in the CAA, aircraft communicators perform these and other functions. Planes are kept in good operating condition by ground mechanics, who are supplied with tools and other equipment by stock and stores clerks. Another occupational group are traffic agents and clerks who sell passenger tickets and handle cargo business.

Still other occupations in the air-transport field range from top executive and professional positions to porter and other unskilled jobs. Most of these occupations are found in many industries besides air transportation. The nature of the work in major aviation occupations and the qualifications needed for employment are discussed in the statements on individual occupations in this handbook.

As of early 1950, practically all flight jobs were held by white persons. On the ground, Negroes were employed mainly in unskilled maintenance, freight handling, and related occupations.

The only flight position in scheduled operations open to women is that of hostess. However, many women hold ground jobs in traffic, communication, and clerical occupations.

**Outlook**

The number of workers employed in air transportation and related activities will probably tend to increase over the long run.

Airline traffic and employment have grown rapidly during most of the industry's brief history. In 1936, when it was 10 years old, the scheduled air transport industry had about 10,000 workers. Five years later, in late 1941, employment was over 26,000; by the end of 1945, it had climbed to 68,000.

During the first postwar year, the airlines greatly expanded their equipment and facilities; late 1946 saw their employment reach a peak of 96,000. Growth in traffic was not as rapid as was expected, however, and it soon became apparent that the industry was overexpanded. The shake-down which followed in 1947 was sharpest in domestic operations, where employment dropped from 69,000 to 59,000 between late 1946 and late 1947, and then leveled off, remaining stable through 1949. In international operations, employment was 27,000 in late 1946 and only 1,000 less a year later, but it continued to decline through 1949. However, 1950 saw an improvement of the employment situation. Even before fighting broke out in Korea, the airlines had begun to increase their employment. The mobilization stimulated further expansion in the latter part of the year.

Growth of nonscheduled operations and other civilian aviation services was greatly stimulated during 1946 and 1947 by such factors as the wartime experiences of servicemen and civilians with air transportation, the large numbers of pilots trained in the Armed Forces and under the GI Bill of Rights, and the availability of Government surplus aircraft. Employment went on expanding in 1948, 1949, and 1950, in some types of operations, but contracted in others. While new operators continued to enter the field, many of the smaller ventures begun in the first postwar years encountered financial difficulties and were forced to close.

Slow growth in employment is likely during the early fifties and over the long run in air transportation and related services as a whole. The basic factors making for long-run expansion may be obscured at times by short-run influences but will persist. Air travel increases the business man's productive time and improves his competitive position—a factor that becomes more important as competition for business increases. Industry and agriculture are finding new uses for aircraft. Week-end and vacation travelers can stretch their leisure time by using flying services or their own personal planes. Air travel and other uses of aircraft will be stimulated by the improvements which are continually being made in aircraft and instruments, airway and airport facilities, and methods of operation; probably also by lower fares and other factors. Much depends upon international developments and upon how the industry, with or without government assistance, solves its many technical and economic problems.

Over the long run, expansion in traffic and in industrial and other uses of aircraft will probably...
AIR TRANSPORTATION OCCUPATIONS

...bring about increased employment in the air transport field as a whole, even though technological and other advances will tend to reduce the number of workers needed to handle given amounts of business. However, employment in some occupational groups is likely to contract while in others it will expand, as is indicated in the statements on individual aviation occupations included in this section.

Besides openings due to increased employment, vacancies will arise owing to deaths and retirements and withdrawals for other reasons. Neither in expanding nor in contracting fields, however, will the total number of opportunities for new workers be great in any one year.

**Hours of Work and Earnings**

An 8-hour day and a 40-hour week is the regular work schedule for most airline ground personnel. Flight personnel have irregular working hours. However, the Civil Air Regulations set upper limits on the flight time of pilots, navigators, flight radio operators, and flight engineers. Some union agreements set maximum limits on flying hours which are below the legal maxima or provide for overtime pay for flying hours beyond a specified number. There are no legal limits on the flight time of cabin attendants, but they generally spend about the same number of hours in the air as do other flight personnel. Besides their flying hours, pilots and other airmen may have to spend some time in ground duties. In general flight operations, hours of work tend to be much less regular than with the airlines.

Since air transportation is a 24-hour-day and 7-day-week business, many groups of workers with the airlines and other flying services may be required to work at night and on Saturdays, Sundays, and holidays. In some instances, the least desirable shifts and work days are assigned to the workers with least seniority; in other instances, a policy of rotation is applied; in still others, special compensation is given for these assignments.

Figures on earnings appear in the statements on individual occupations. Pay varies greatly both between and within occupations, depending on degree of skill, length of experience, amount of responsibility for safe and efficient operations, type of business, and many other factors.

**Where To Go To Get More Information and Apply for Jobs**

Additional information on the air transport industry and on aviation occupations is given in:


To find out about openings with a specific airline and the special qualifications required, one should write to the personnel manager of the line. Addresses are listed in part 2 of the bulletin just mentioned, or may be obtained from the Air Transport Association of America, 1107 Sixteenth St., NW., Washington 6, D. C.

Men interested in setting up their own aviation businesses should consult State aviation commissions and local chambers of commerce; also the following publication:


Inquiries regarding jobs with the Civil Aeronautics Administration should be addressed to the Regional Administrator, Civil Aeronautics Administration, at any of the following addresses:

- **Region 1. Federal Building, New York International Airport, Jamaica, Long Island, N. Y.**
- **Region 2. 84 Marietta Street, NW., Atlanta, Ga.**
- **Region 3. Chicago Orchard Airport, Park Ridge, Ill.**
- **Region 4. P. O. Box 1689, Fort Worth, Tex.**
- **Region 5. City Hall Building, Kansas City, Mo.**
- **Region 6. 5651 W. Manchester Boulevard, Los Angeles 45, Calif.**
- **Region 7. P. O. Box 3224, Seattle, Wash.**
- **Region 8. P. O. Box 440, Anchorage, Alaska.**
- **Region 9. P. O. Box 4009, Honolulu 12, T. H.**

Information on CAA-approved schools offering training for work as an aviation mechanic or pilot and in other technical fields related to aviation may be obtained from:

- **Aviation Education Division W-150,**
  Office of Aviation Development,
  Civil Aeronautics Administration,
  Washington 25, D. C.

437
Airplane Pilots
(D. O. T. 0-41.10 and .12)

Outlook Summary

Slow growth in employment expected over long run, but competition for jobs will probably continue to characterize the occupation in peacetime.

Nature of Work

Practically all civilian pilots work either for the scheduled airlines or in nonscheduled flying and related activities. Those with airlines fall into two main groups, captains and copilots.

Besides operating the controls of the plane, airline pilots have to keep close watch on a multitude of instruments, operate the voice radio, and handle other flight duties. They also have extensive ground duties—among them, studying weather reports, preparing flight plans, making preflight checks of the condition of planes, and filling out reports. The captain decides how work shall be divided between himself and the copilot, who acts as his assistant. On a small but growing number of flights, particularly on international routes, two pilots—or a pilot and flight engineer who is qualified to serve as pilot in an emergency—are carried in addition to the captain. Increasingly, pilots are also doing the navigation (see separate statement on navigators, p. 442).

Outside the airlines, pilots have a wide variety of jobs. Large numbers work for flying schools and commercial flying businesses (charter transportation, aerial photography and advertising, crop dusting and spraying, demonstration selling, and other activities). Probably 1,000 or more work for companies outside the field of aviation which use planes in connection with their business. A sizable group are in agricultural pursuits. A small number are on public pay rolls—as Civil Aeronautics Administration Aviation Safety Agents, for example. Still others are employed in aircraft manufacturing. Many operate small aviation businesses of their own, with or without paid help. The planes flown by nonairline pilots are frequently much smaller and less complex than airliners.

Airline pilots are stationed at a limited number of “division” points throughout the United States; a few are based in foreign countries. Other pilots are located in all parts of the country where there are airports. The principal areas of employment for both groups are large metropolitan districts, mainly on the East and West Coasts.

Qualifications and Advancement

To pilot a civil aircraft one must hold a valid CAA or foreign pilot certificate, attesting to technical competence, specified flight experience, and satisfactory physical condition. Every person who pilots a plane for hire or gives flight instruction for hire is legally required to hold a commercial or an airline transport license; the latter is a “must” for airline captains. In addition, pilots must hold a flight instructor rating to give flight instruction which the CAA will accept toward the requirements for a pilot rating.

Instrument flying is also restricted. It may be done by pilots holding an airline transport license. Pilots with other licenses or ratings must obtain an additional instrument rating.

To operate a voice radio transmitter, the non-Government pilot must have a Federal Communications Commission aircraft radiotelephone operator authorization. Navigation may be done only by those who can meet the separate legal requirements for this work.

Physical standards for the airline transport rating are especially high. All classes of pilots must pass physical examinations periodically, based on the same standards applied in issuing the original rating.

Entrance into the occupation with the scheduled airlines is as a copilot; this is often true in the larger nonscheduled operations as well. Beginning pilots must be young. Nevertheless, employers—especially the airlines—insist on far more flying time than is specified in the legal requirement. In addition, employers generally demand a high school education or better (heavy preference is given men with college credits). Personality, temperament, appearance, and height (tall men are preferred) are also considered. For the CAA Safety Agent positions, long and varied
flying experience, as well as specified pilot ratings, is required.

Copilots who make good are given a chance, usually on a seniority basis, to qualify for advancement to captain. At least 2 years’ experience is generally needed to be eligible for such up-grading; it may be many more years, however, before a copilot is actually reached for promotion. In nonscheduled operations promotion policies vary considerably from company to company.

A typical line of promotion in a large airline is copilot to captain to chief pilot to assistant superintendent of flight operations and other executive positions on up the ladder. But positions above the captain level are not numerous enough nor turnover in these groups great enough, to make chances for advancement particularly good; relatively few men complete their service in the industry at these higher grades.

**Outlook**

Employment of pilots is likely to rise moderately over the long run in air transport activities as a whole.

The scheduled airlines had nearly 7,000 pilots and copilots on their payrolls during most of 1948 and 1949, three times as many as in 1940. Hiring was sharp during the first postwar year, but in 1947 a shake-down occurred, particularly in domestic operations. Following the shake-down, the number of pilots employed by the airlines had fluctuated by only a few hundred until mid-1950.

The number of pilots with nonscheduled carriers and other flying services was about 10,000 in early 1948, half again as large as the number of airline pilots. In the 2½ years which followed, employment rose in some fields including crop dusting and other agricultural services, but decreased in flight instruction. In both expanding and contracting fields, a good many flying services had to close at the same time that new business ventures were started.

Pilot employment rose moderately in 1950. Further gains are anticipated during the next few years.

The really great peacetime expansion in air transportation still appears to be years ahead, awaiting further technical, operational, and other developments which will encourage large-scale travel by air. All-weather flying is one of the goals of a 15-year program to establish the so-called “RTCA, SC-31 System” (Radio Technical Commission for Aeronautics, Special Committee 31); this program was already well under way before the outbreak of hostilities in mid-1950 and will probably be accelerated by the mobilization program. Lower fares through such devices as “air coach service” may also be influential in increasing air traffic.

Expansion in activity, however, does not automatically spell expansion in employment. Larger and faster planes, which are increasingly coming into use, permit given volumes of traffic to be handled by fewer planes and pilots.

Competition for any pilot job openings that arise has generally been keen in peacetime. In the beginning of 1950, men without a flying history had practically no chance of jobs or of good business opportunities. Even highly qualified applicants were more numerous than vacancies. Trained and experienced men who failed to keep abreast of advances in piloting and related techniques were finding the advantage of their background becoming less and less important.
Under the impact of the Korean war and expanding mobilization in 1950, competition for jobs eased. By early 1951, several airlines were lowering hiring standards and making special recruiting efforts for the first time in years, in order to meet actual or anticipated shortages. In time, however, competition for pilot positions is likely to be intensified again, as many of the young men who will be trained as pilots in the Armed Forces become available for civilian jobs.

Earnings and Working Conditions

Highest-paid pilots are captains employed by the scheduled airlines. Most of these men had monthly earnings of well over $700 in 1949; many made $1,000 or more in some months. Typical earnings for the year are estimated at between $8,000 and $10,000, depending on such factors as flying time and mileage, speed of plane, length of service, and whether the flying was done in domestic or international operations. Earnings of copilots were considerably less—about $400 a month, on the average. Union agreements in effect on several lines in 1950 provided for a minimum number of flying hours, in order to establish a floor under pilot earnings.

Average flight time of airline pilots was between 75 and 80 hours a month in 1949. The permissible maximum is 85 hours a month, 255 a quarter, and 1,000 a year in both domestic and international flying. Ground duties require many additional hours of work a month.

In the past few years, pilots in nonscheduled activities have had earnings nearer to those of copilots than to those of captains, although they have often had to put in many more flight hours than pilots in scheduled operations. CAA pilots started at an annual salary of no less than $4,600 as of late 1950; their top rate of pay was $8,600, but this applied only to men who had had several promotions and many years of service. The basic CAA workweek has been 40 hours for several years; however, actual worktime has been irregular, as in private nonscheduled operations.

Airline pilots, flying on domestic routes are generally allowed a 2 weeks’ vacation with pay; those flying on international routes, a month. CAA agents, like most other Federal employees, receive 26 days of paid annual leave a year.

As a rule, airline pilots are on duty away from their base about a third or more of the time. When they are away, their living expenses are usually paid by the airline.

Most airline—but few other—pilots belong to the Air Line Pilots Association (AFL).

See also Dispatchers and Assistants, page 447; Airport and Air-Route Traffic Controllers, page 448.

Flight Engineers

(D. O. T. 5-80.100)

Outlook Summary

Opportunities will be limited both in the early fifties and over the long run in this small but slowly growing occupation. Men who qualify also as pilots or mechanics will have an advantage in competing for jobs.

Nature of Work

Flight engineers are employed mainly in scheduled international and transcontinental flying, where the Civil Aeronautics Administration has ruled that they are necessary for safety of operations. The circumstances under which they must be carried depend on such factors as the routes flown and the complexity and size of the aircraft.

Flight engineers are responsible for the proper functioning of the aircraft (and engines) in flight, permitting the captain and copilot to concentrate more fully on piloting the aircraft. In the air, their duties include watching and keeping logs on engine performance, operating certain controls under the direction of the captain, and making emergency repairs. At stops where there are no mechanics, they do needed ground maintenance work themselves; at other stops, they direct this work.

Most engineers are stationed in or near large cities on the East and West coasts, where inter-
national and transcontinental operations generally originate. Some few are stationed elsewhere in the United States and in other countries.

Qualifications

Every person serving as a flight engineer is legally required to have a Civil Aeronautics Administration Flight Engineer Certificate. This calls for a broad knowledge of such matters as flight theory, aircraft performance, fuel consumption, and aircraft loading. Written and practical tests are given to determine not only the adequacy of the engineer’s grasp of these and related subjects, but also his skill in repair work. The skills and knowledge needed are usually obtained through formal training. Such training is not often provided by airlines. Rigid physical examinations must be passed periodically.

In hiring, employers frequently emphasize personal characteristics and specified types and amounts of education. Applicants practically always need some training or experience in airline ground maintenance to qualify for flight engineer jobs. Preference is given to young men who have or can obtain an air-transport pilot certificate. Before Korea, some carriers were hiring only such men.

The line of advancement for flight engineers is to pilot or to chief engineer. Before Korea, all prospective pilots began as flight engineers on at least one line.

Outlook

Employment will rise somewhat over the years, with increased use of planes requiring flight engineers. Civil Aeronautics Administration rulings requiring that flight engineers be carried under specified circumstances have bolstered employment in this occupation since early 1948. However, the total number in the occupation has remained small. At the end of World War II, there were not more than a few hundred men working as flight engineers; the number was still only in the hundreds in late 1950. Under the most favorable circumstances likely to develop in the next several years, the number employed should continue to be of this general magnitude, probably not exceeding 1,000.

Earnings and Working Conditions

In early 1950, earnings of fully qualified flight engineers generally ranged from $350 to $600 a month, depending mainly on length of experience and amount of flight time. Under most conditions, flight time may not exceed 85 hours a month in domestic flying or 255 hours a quarter in international flying; men generally fly close to the maxima of hours indicated. Additional time is spent in ground duties. Engineers in international operations usually get a month’s paid vacation each year; those in domestic flying, 2 weeks.

As a rule, flight engineers are on duty away from base about a third or more of the time. When they are working away from home, their
living expenses are paid by the employing airline; often they are also allowed $1 or more a day for incidental expenses while on land.

In late 1949 most flight engineers were represented by the Air Line Flight Engineers Association (AFL). Another union active in the field in that year was the Flight Engineers' Officers Association, an independent union.

Navigators
(D. O. T. 0-41.60)

Outlook Summary

Few opportunities expected in any one year in this small occupation. Employment likely to decline in long run; occupation may eventually become extinct.

Nature of Work

Navigators are carried on many trans-ocean airline flights. Before each flight, the navigator prepares the flight plan for the captain's approval and sees to it that all needed navigational equipment is in good condition and aboard the plane. In the air, he is responsible for knowing at all times whether the flight is progressing according to plan, and advising the captain as to revisions in routing made necessary by changing weather conditions or other unforeseen circumstances. Navigational methods used may include dead-reckoning, celestial navigation, obtaining radio bearings, and pilotage. Another of his duties is keeping the flight log.

Navigators are stationed mainly in coastal cities, where activities employing them are commonly based.

Qualifications

Every civilian navigator is legally required to have a Civil Aeronautics Administration flight navigation certificate. Among the qualifications which one must have to obtain this certificate is a comprehensive knowledge of air navigation and related subjects. This background has been obtainable so far mainly in the military and naval air services. Employers greatly prefer men with college education; a high school education is virtually always a minimum requirement. Flight experience and personal characteristics, such as height, appearance, and personality, are emphasized in hiring. Strict physical examinations must be passed to enter and remain in the occupation.

In the summer of 1950, the Civil Aeronautics Board provided for 3-month, nonrenewable "limited flight navigator certificates" for persons unable to satisfy immediately all the requirements for regular certificates; December 31, 1951, was set as the termination date of the regulation, "unless sooner superseded or rescinded." Holders of these temporary certificates may be employed only in military contract air carrier operations.

When starting out with a given company, both newcomers and experienced men are often designated "junior navigators." Promotion to "senior navigator" is usually based on length of service with the company.

Outlook

This is a very small field; in late 1949, employment was no more than two or three hundred. In the early fifties, a number of openings may result from expanding overseas airline operations and other developments. In addition, rising military and naval needs for air navigators are leading to the withdrawal of some men from civilian positions. Employment opportunities will therefore be considerably better in the near future than in the period from 1947 to early 1950, when the airlines had many navigators on furlough, with first claim to any openings. However, it may continue to be difficult for persons without civilian or military experience in air navigation to obtain positions.

In the long run, employment of navigators will probably tend to decline. The occupation may eventually be eliminated altogether. By 1949, one or two overseas airlines had already made pilots responsible for navigation and were no longer employing navigators as flight crewmen. Technological and other factors will continue to encourage this trend over the long run. Progress is being made in developing international Airways with radio-range beams and other aids to navigation,
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although the establishment of such airways on a scale comparable with our own Federal Airways System is probably still a long way off. The increasing application of radar to civilian aviation may also be a factor in making navigators unnecessary on a growing number of flights. Even if navigators should be eliminated from flight crews, at least a few men with training and experience in navigational work will continue to be needed to teach navigation to pilots and others in civil aviation; there will also be opportunities in the armed services.

Earnings and Working Conditions

Annual pay of junior navigators averaged about $3,200 in 1949; senior navigators averaged about $6,000, with some men earning as low as $4,500 and others making as much as $7,000. Salaries are on a monthly basis. The amount received by an individual navigator depends not only on his grade but also on his length of service with the particular company and on other factors.

When navigators are away from base on duty (as they are a third or more of the time) their living expenses are paid by their employer. Often they also get $1 or more a day while on land, for incidental expenses.

Flight time is generally not more than 255 hours a quarter, more or less equally divided among the 3 months. However, a few additional hours each month must always be spent in ground duties. One month’s vacation with pay is usually given.

Navigators are covered by union contracts on almost all lines where they are employed. Most of them are represented by the Air Line Navigators Association (Transport Workers Union of America, CIO). In late 1949, the Association of Airline Navigators (Independent) represented the navigators on one line.

Flight Radio Operators

(D. O. T. 0-61.32)

Outlook Summary

Employment outlook poor in this small occupation. More than enough qualified men likely to be available for any job openings that arise. Occupation threatened with eventual extinction.

Nature of Work

In civil aviation flight radio operators (also known as flight communications or flight radio officers) are carried principally on overseas flights where safety regulations call for radiotelegraphic equipment and a qualified full-time operator. Their duties may include obtaining radio bearings, sending and receiving weather information and other messages in international code, and operating radio-navigational equipment. They may make needed adjustments and emergency repairs on the plane's radio equipment while in flight or, in some cases, on the ground. They also inspect and test the equipment between flights.

Qualifications

Every flight radio operator is legally required to have a Federal Communications Commission radiotelegraph operator license of second-class or higher and a Civil Aeronautics Administration airman certificate. To obtain the former, one must show a comprehensive technical knowledge of radio and meet other requirements. The latter certificate is issued to persons demonstrating ability to perform the duties of the occupation. As for other types of positions on flight crews, appearance and personal characteristics are emphasized in filling vacancies, and strict physical examinations must be passed to enter and stay in the occupation. Furloughed operators are usually the first to be called upon to fill vacancies. Qualified ground radio operators who are in line for promotion come next.

Flight radio operator training is obtainable in private schools and with employing airlines. However, lines require trainees to have the necessary FCC license before they are hired. When they start out with a given company, both newcomers and experienced men are often designated “junior operator.” Advancement to “senior operator” is usually based on length of service with the company.
Outlook

The employment outlook is poor in this small occupation, which employed no more than a few hundred men in late 1950. A CAA decision in August 1949 made it possible for flight radio operators to be eliminated on certain routes where their employment had previously been required by safety regulations. The CAA found that on these routes, radiotelephone facilities (which can be operated by the pilots) met safety requirements and that, consequently, planes no longer needed to carry radiotelegraph equipment and full-time operators. Immediately after the decision, flight personnel of this type were eliminated on some routes. Their continued use is likely for some time on other routes. But unless the CAA is overruled or reverses itself in this matter, flight radio operators will probably be carried on fewer and fewer routes; the occupation may eventually become extinct.

In any event, job openings will be very limited in number at best. The anticipated long-run expansion in international airline business will doubtless be moderate and gradual. Turn-over will create only occasional opportunities.

Continued, although increasingly more moderate, competition for any openings that arise is likely at least through the early fifties. Qualified men are usually available for flight radio operator positions from several sources; from among men with previous military or civilian flight experience, ground radio operators who can qualify for promotion, and veterans and nonveterans trained for other kinds of radio-operator work. However, under the impact of the Korean war and the mobilization program begun in mid-1950, these sources were being tapped to meet a variety of expanding needs; both in and outside the field of aeronautics.

Earnings and Working Conditions

Flight radio operators have higher monthly salaries than most other groups of radio operators. For the great majority, salaries were between $400 and $600 a month in late 1949, depending primarily on length of service with the given company. With work fairly steady for most men, take-home pay for the year averaged roughly $6,000. A very few men made more than $7,000 including overtime pay; a greater number made as low as $4,000.

Flight time in scheduled operations was generally between 100 and 110 hours a month in 1949. It could not legally exceed 125 hours a month, 300 hours a quarter, or 1,000 hours a year. In addition to flight time, a few hours are usually spent each month in training in the air or on the ground, in preflight testing or other duties, or in stand-by time. A month’s vacation with pay is commonly given. At least one union contract provides for severance pay which may amount to several thousand dollars for an individual employee.

As a rule, flight radio operators are on duty away from base a third or more of the time. When they are working away from home their living expenses are paid by the employing airlines.

Flight radio operators are highly organized. Several different unions were involved in early 1950—principally, the Air Line Communications Employees Association (American Radio Association, CIO), Radio Officers Union (Commercial Telegraphers Union, AFL), Flight Radio Officers Association (Independent), and Transport Workers Union of America (CIO).

See also Ground Radio Operators, page 450; Ship Radio Operators, page 105; Radio Operators (Broadcasting), page 103; Radio Operators (Telephone and Telegraph Industry), page 106.

Airplane Hostesses

(D. O. T. 2-25.37)

Outlook Summary

A good many openings for qualified applicants each year, but continuing competition for these jobs likely. Occupation will remain small for many years; slow rise in employment probable.

Duties

Hostesses (also known as flight stewardesses) are carried on most airline passenger flights within this country; also on some international flights. They are responsible for attending to
passengers’ needs and comfort while in flight—by serving meals, giving minor medical aid, helping to adjust seats, answering questions, supplying passengers with reading matter, and in other ways. They also have to keep some records. When a hostess and steward work together, as is often the case on big planes, the former tends to specialize in service to the women and children aboard.

Hostesses are stationed mainly in the few seaport cities where international and transcontinental flights originate and inland at a number of airline division points. A few are stationed in foreign countries.

Qualifications and Advancement

Entry into the occupation is usually as a “student” stewardess, for training by the employing air line. Frequently, however, girls trained in special private schools are hired through the placement facilities provided by such institutions for their own graduates. At least one airline requires training at a specified school.

Applicants must be in excellent physical condition; have a pleasing personality and appearance; be in their twenties or within even narrower age limits; and also be within specified height and weight limits. As a general rule, single women (or widowed or divorced women without children) are preferred for stewardess jobs; their continued employment may be conditioned upon their remaining unmarried. Applicants who are registered nurses are strongly preferred. Girls who have not completed nurses’ training must, as a rule, have at least 1 or 2 years of college education. For international flying, knowledge of an appropriate foreign language is frequently required and always preferred.

From the position of hostess, the line of promotion is to instructor and division chief hostess.

Outlook

Employment in this occupation will probably tend to rise slowly in the early fifties as well as over the longer run.

At the end of World War II, the airlines had about 1,000 hostesses on their payrolls. Several thousand new hostesses were hired in the next 2 years, partly to staff the many additional larger planes in service, and partly to fill vacancies owing to very heavy turn-over. Although the airlines made some nonseasonal lay-offs during 1947, employment still totaled over 3,500 at the end of that year. Thereafter, it resumed an upward trend which will be further encouraged by the mobilization program.
Earnings and Working Conditions

Base pay scales on domestic lines ranged from $175 to $260 or more a month for most stewardesses in late 1949. Additional monthly bonuses ranging from $15 to $25 or more were generally paid for overseas work.

Working time has averaged well over 100 hours a month for the past few years. Most of this time (as high as 85 hours a month) is spent in flight. Domestic lines generally give 2 weeks' vacation with pay each year; international lines, 1 month.

As a rule, airplane hostesses are on duty away from base about a third or more of the time. When they are working away from home, their living expenses are paid by the employing airline; they may also be allowed $1 or more a day while on land for incidental expenses.

Many hostesses belong to unions. Most of those organized are represented by either the Air Line Stewards and Stewardesses Association, a branch of the Air Line Pilots Association (AFL) or the Flight Purser's and Stewardesses Association (AFL).

Flight Stewards

(D. 0. T. 2-25.32)

Outlook Summary

This small occupation will provide only a very few openings, chiefly in international operations.

Duties

Stewards are carried on most international airline flights and on a moderate number of scheduled domestic operations. Their work includes serving meals while aloft, attending to the comfort of the passengers in different ways, and keeping records. With increased use of larger planes, stewards will more and more be assigned ticket-collecting and related tasks usually identified with the job designation of purser. When a steward and hostess work together, as is often the case on large planes, the former tends to handle the heavier work (such as making berths on sleeper planes); the latter, to specialize in service to the women and children aboard.

Stewards are stationed mainly in the few seaport cities where international and transcontinental flights originate, but some are located inland at a limited number of airline division points. A few are stationed in foreign countries.

Qualifications

High school education is a minimum requirement for this occupation; some college education is preferred. Knowledge of a foreign language is required for international flying. Excellent physical condition is a must, as are a pleasing personality and a good appearance. In addition, airlines may specify a maximum height and weight. Also important is experience in handling food; many of the flight stewards now employed were formerly restaurant cooks or waiters.

Standards are more rigidly applied in filling purser openings than in hiring stewards.

Outlook

Employment in this very small occupation was at about the same general level in early 1950 as in early 1948, when the number of stewards on airline payrolls was estimated at under 1,000. Even this volume of employment represented marked growth in the occupation since the end of World War II. On VJ-day, the two airlines doing overseas flying on a commercial basis together employed only a hundred or so stewards, nearly all in the occupation at that time. Heavy hiring of stewards in the first post war year was followed by some nonseasonal lay-offs in 1947. In the 2 years which followed, the number employed tended to rise slowly.

Future employment opportunities in the occupation will depend on whether airline traffic expands as anticipated, creating occasional new positions; on the rate of turn-over; and on the industry's policies with regard to employment of men and women as cabin attendants. On the basis of the hiring practices followed in early 1950, it appeared that the number of stewards would probably not rise much above the mid-1950 level.
and might even decline. The mobilization program will probably further increase the hiring of stewardesses, whether to fill new jobs or to meet replacement needs. Thus steward openings will be very scarce.

Earnings and Working Conditions

In late 1949, monthly base salaries for most stewards ranged from $175 to $260. A bonus ranging from $15 to $25 a month was generally paid for overseas work. Pursers received from $190 to $260 a month on domestic routes; their salaries ranged up to $355 in international operations.

Working time has averaged well over 100 hours a month for several years. Most of this time (as high as 85 hours a month) is spent in flight. Domestic lines generally give 2 weeks' vacation with pay each year; international lines, 1 month.

As a rule, flight stewards are on duty away from base a third or more of the time. When they are working away from home their living expenses are paid by the employing airline; they may also be allowed $1 or more a day for incidental expenses while on land.

Many stewards belong to unions. Most of those organized are represented by either the Air Line Stewards and Stewardesses Association, a branch of the Air Line Pilots Association (AFL), or the Flight Pursers and Stewardesses Association (AFL).

See also Traffic Agents and Clerks, page 435 and Railroad Clerks, page 424.

Dispatchers and Assistants

(D. O. T. 6-61.41)

Outlook Summary

Dispatcher positions practically always filled by promotions or transfers from within the company. Some job chances for outsiders as assistants.

Duties

An airline dispatcher (or flight superintendent) has control over all of his company's flights within an assigned sector. He approves flight plans, authorizes take-offs, follows the progress of flights as reported by radio, and keeps captains informed of changing weather conditions and other developments affecting their flights. In addition, the dispatcher is responsible for keeping records on the aircraft and engines available, on the amount of time logged by each plane and engine, and on the number of hours flown by flight personnel based at his station. He also sees to it that crew members are notified when to report for duty.

Assistant dispatcher and various grades of clerical employees aid in this work. Assistants assume such duties as securing weather information, helping to keep track of the progress of aircraft in the sector, and handling communications with the planes.

Where Employed

Dispatchers and assistants are employed mainly by air lines certified by the Civil Aeronautics Board for scheduled operations. A few work for the largest nonscheduled lines. The majority are stationed at large airports in different parts of the United States. However, a good many are stationed outside the country.

Qualifications

A Civil Aeronautics Administration certificate is legally required for work as an aircraft dispatcher, although not for work as an assistant. To qualify for certification, an applicant must have been employed for at least 90 days in the 6 months prior to certification in work connected with dispatching of airline planes under supervision of a certified dispatcher, and must meet other experience requirements. He has to pass a written examination on such subjects as the Civil Air Regulations, aircraft characteristics, weather data and analysis, air-navigation facilities and principles, and airport and airway traffic procedures. He also has to demonstrate his skill in weather forecasting and certain other functions involved in dispatching.
Assistant dispatchers at work in an air line dispatchers office—telephoning a CAA airways traffic-control center, entering the estimated time of arrival of a plane, and reading a teletype report on weather conditions.

It is airline policy to fill dispatcher positions by promotions or transfers from within the company. Many present dispatchers were formerly employed as station managers or meteorologists by the same line and were selected as particularly adapted to dispatching work. However, outsiders are sometimes hired as assistant dispatchers and may be promoted to regular dispatcher jobs after they have had a training period of from 1 to 3 years and have obtained their certificates.

For assistant jobs, 2 years of college is generally required by the carriers, and men who have completed a 4-year college course—including training in mathematics, physics, chemistry, meteorology, and related subjects—are strongly preferred. Experience in flying, as an airman or a meteorologist, or a background in business administration is advantageous. Personality factors also count heavily.

**Outlook**

Job opportunities for outsiders as dispatchers are almost certain to remain very limited in number indefinitely. The increase in airline traffic which is expected will not create many new dispatcher (or assistant) positions. Replacement needs will rise as the mobilization program develops, but will also not be great. The dispatcher vacancies arising out of these and other developments will generally be filled, as in the past, by promotions or transfers of personnel already with the company.

Prospects for well qualified outsiders will be more favorable for the greater number of assistant openings anticipated. Job chances will be best for highly qualified job seekers with experience as operations officers or pilots in the Armed Forces who meet the high educational and personal standards specified by the airlines.

**Earnings and Working Conditions**

For most dispatchers, monthly salaries were between $375 and $440 a month in late 1949. Assistants earned less, of course—about $250 to $350 a month in most cases. The standard workweek is usually 40 hours. Daily hours are irregular and, on occasion, very long. Two weeks’ vacation with pay is usually given to both dispatchers and assistants.

The Air Line Dispatchers’ Association (AFL) is the only labor organization with contracts covering dispatchers and related workers. It had negotiated 26 agreements with airlines by late 1949.

*See also* Meteorologists, page 100.

**Airport and Air-Route Traffic Controllers**

**(D. O. T. 0-61.60)**

**Outlook Summary**

Rising volume of air traffic control work and probably also increasing employment of controllers both in the fifties and over the long run.

**Duties**

Airport traffic controllers supervise all flights within a carefully defined flight-control area around their airport. They issue directions (by
radio or other means) to planes taking off, landing, and flying within the area, including instructions as to flying levels as well as when to take off and land. Other tasks include giving weather and position information to planes in the vicinity and keeping records of messages.

Senior controllers have responsibility for all aspects of the work. Assistant controllers, regarded as trainees for senior positions, aid them in specific duties. In their supervisory capacity, senior controllers are also responsible for seeing that defects in airport lighting, communication, and other facilities are reported, and that information regarding flights is regularly obtained from and relayed to air-route traffic-control centers in the vicinity.

Air-route traffic controllers operate air-route traffic-control centers, which regulate traffic on civil airways. As a rule, the controllers do not communicate directly with planes but constantly receive information on the progress of flights and related matters from airline dispatchers, airport traffic controllers, other control centers, and CAA communications stations. In return, instructions, advice, and information are given as to the conditions under which flights may be commenced or continued and as to the progress of flights under way. Telephone, interphone, teletype, and radio are used in transmitting these messages.

Where Employed

Most airport traffic controllers work in the towers operated by CAA’s Office of Federal Airways; the remainder in towers operated by airports. In early 1951, 170 or more CAA towers were in operation, but only 40 or so airports were operating their own. The towers, both CAA and non-Federal, are located at large fields with heavy traffic. They are in many different parts of the country, mostly near big cities; a few are outside continental United States.

The Office of Federal Airways is the only employer of air-route controllers. These workers are located at the various CAA traffic control centers scattered throughout the country.

Qualifications

Entry into either of the occupations under discussion is almost always as an assistant controller.

All permanent appointments to CAA jobs are made on the basis of competitive civil-service examinations. Such examinations have not been held for several years. In the meantime, hiring has been done directly by CAA regional offices, and successful applicants have been given only temporary status. In filling assistant positions, the CAA has adhered to the minimum standards for admission to the last civil service examination for the “trainee” classification; these standards include specified experience or education in one of several alternative fields, including meteorology, aeronautical communications, dispatching, or flying.

Positions above the level of assistant are filled mainly by promotions from within. Special CAA certificates are required for airport jobs above this level; these certificates are good for work at a specific airport only. Rigid criteria are used in determining fitness for advanced positions.

Outlook

Employment in these occupations had an upward trend during the first few years after World
War II. In the first half of 1951, CAA had an authorized staff of about 1,900 airport controllers and 1,500 air-route controllers. These numbers were substantially higher than on VJ-day.

A rising volume of air-traffic-control work is expected both in the near future and over the long run, owing to construction of additional airports and increasing airport and airway utilization. The bulk of the towers being federally owned and operated, employment in the occupation is governed largely by the size of congressional appropriations for these CAA positions. It is reasonable to expect that persistently expanding needs will be reflected in increased appropriations and in rising employment in these occupations. Additional openings will, of course, arise yearly owing to turnover. Replacement needs may increase materially in 1951 and the year or two following as a result of withdrawals for military service.

To fill these positions, the Federal Government and other employers can ordinarily draw upon a wide variety of persons with military or civilian experience: pilots and other airmen, meteorologists, communication specialists, and dispatchers. But the usually large numbers of available persons in these categories were declining under the impact of the Korean war and the partial mobilization program begun in 1950. This development sharply reduced the possibility of continued competition for trainee openings, at least in the early fifties.

Earnings and Working Conditions

Like Federal workers generally, CAA employees have a basic 40-hour week. However, air-route traffic controllers often have to work 4 or 5 hours overtime in a week, which is compensated for by time off or premium pay. Since towers must be manned 24 hours a day, night work is required; employees are assigned to night shifts on a rotating basis.

The starting salary for assistant airport controllers with CAA was $3,450 a year in late 1950; that for assistant air-route controllers, $3,825. The minimum salary for top grade of senior controllers in both airport and air-route work was $6,400. In addition, within-grade increases are given every 12 or 18 months, depending on the grade. Other benefits of these Government jobs include 26 days of paid annual leave, 15 days of sick leave, and 8 paid holidays a year.

Ground Radio Operators and Teletypists

(See D. O. T. 0-61.33 and 1-37.33)

Outlook Summary

Many radio-operator openings in early fifties; fewer teletypist opportunities. Technological developments likely to result in long-run decline in employment, especially among ground radio operators.

Nature of Work

Ground radio operators and teletypists are employed by the scheduled airlines, both domestic and international, by some of the large nonscheduled carriers, and by the Civil Aeronautics Administration. The military and naval Air Forces use civilians and also uniformed personnel in comparable work.

Radio operators working for air lines relay messages between ground personnel and between flight and ground personnel, using radiotelephone, radiotelegraph, or both. Airline ground communications are also handled by teletypists, who operate a machine with a keyboard much like that of a typewriter. The CAA employs “aircraft communicators” in its Federal Airways System to collect and relay information on weather conditions and other matters affecting flights. In the airlines as well as in CAA, some workers use both radio and teletype.

The jobs are widespread geographically, with some workers located in the Territories and foreign countries. Airline personnel work mostly at airports near metropolitan areas; CAA communicators are at stations scattered along the airways, often in remote places.

Qualifications and Advancement

For radio-operator positions with airlines, applicants must usually have at least a second-class radiotelephone or radiotelegraph license from the
Federal Communications Commission, be able to type, and have specified educational and other qualifications. Teletypists who are called on to do radio-operator work must also have an FCC license.

To qualify for positions as CAA aircraft communicators, applicants must meet requirements set by the United States Civil Service Commission. All permanent appointments are made on the basis of competitive civil service examinations. Pending the holding of new examinations (none has been given for several years), all hiring has been done directly by CAA regional offices and only temporary appointments have been made.

The airlines commonly employ women as teletypists but increasingly also as radio operators. Most CAA aircraft communicators are men.

Outlook

Radiomen and teletypists together make up a fairly large occupational group, as aviation occupations go. The number on public and private pay rolls in late 1949 was estimated at over 10,000.

Gains in airline employment were heavy during 1946 and early 1947, but there was a "shake-down" in domestic operations during the rest of the latter year. In 1948 and 1949, airline employment in these occupations showed little change. No more than a moderate rise is to be expected in the early fifties, even after allowing for the limited military and naval expansion programs set in motion in the summer of 1950. Much heavier military commitments would mean heavier job gains.

CAA communications activity has increased sharply in the postwar period, but employment among aircraft communicators has not risen proportionately and has even declined. At the end of the war, August 1945, there were about 3,700 aircraft communicators working for CAA; a year later, 4,500 or thereabouts; in early 1951, 4,000 or so. Future employment levels will depend on congressional appropriations for this activity, as they have in the past. In any event, job chances will continue to be somewhat better for persons willing to work in Alaska and other places outside continental United States.

The long-run outlook in these occupations will be greatly affected by technological developments. Much progress has been made in the substitution of teletype and other automatic equipment for radiotelegraph and radiotelephone, and efforts at technological improvement continue unabated. Radar, for example, is being increasingly used in civil aviation. The comprehensive program for all-weather flying, referred to as the "RTCA SC-31 System" (Radio Technical Commission for Aeronautics, Special Committee 31), will involve highly complex electronic installations, including items still in the developmental stage. These and other technical advances are designed primarily to promote safe, all-weather flying, reduce communication time, and speed air transport operations. But in the long run they may have the effect of reducing the number of radio operators needed, even with rising air traffic. Teletypists will probably be affected also, but not as much as radio operators.

In the early fifties, openings will arise in both types of work owing to transfers to military service, deaths, retirements, and other turn-over. These openings, plus those arising from expansion, will create a substantial number of opportunities for new entrants with public and private employers.

A surplus of qualified job applicants, especially radio operators, existed in most parts of the country from 1946 through early 1950. Persons without experience in the work, either in the Armed Forces or in civilian employment were able to obtain radio-operator jobs only in scattered instances. Under the impact of the Korean war and the mobilization program begun in mid-1950, this situation changed. Job opportunities became more widespread; the surplus of qualified job applicants was sharply reduced. This trend will continue at least through the early fifties, and the surplus of skilled and experienced radiomen seeking employment as ground radio operators (or aircraft communicators) will be wiped out as related occupations also expand both in aeronautics and in other fields.

Earnings and Working Conditions

For airline radio operators, earnings typically ranged from about $180 to $300 or more a month in late 1949; for teletypists, from about $155 to $240. CAA aircraft communicators, like Federal...
workers generally, are on annual salaries. Under the scale in effect in late 1950, these ranged from $3,100 to $5,350 a year.

Airline personnel usually get 2 weeks' paid vacation; CAA employees, 26 days of paid "annual leave." The basic workweek is 40 hours both with the air lines and with CAA.

A number of lines have union agreements covering radio operators and teletypists. Organizations involved, as of late 1950, were the Air Line Communications Employees Association (American Radio Association, CIO), and the Radio Officers Union (Commercial Telegraphers Union, AFL).

See also Flight Radio Operators, page 443; Ship Radio Operators, page 105.

Airplane Mechanics

(D. O. T. 5-80.120 and .130)

Outlook Summary

Employment prospects good for skilled mechanics in early fifties; also many openings for non-journeymen. Continued uptrend in employment over long run.

Duties

Airline mechanics are assigned either to line maintenance or to overhaul work. Line-maintenance men service and inspect aircraft, including power plants and instruments, and make minor repairs and adjustments. This work may be done at large terminals or at stops along the route. When an engine or other part has to be sent to the main overhaul base for major repairs, line mechanics remove it from the plane and install new or overhauled equipment in its place. The line-maintenance mechanic is usually an all-round "A" and "E" (aircraft and engine) man.

Mechanics at the main base usually specialize in engine or airplane overhaul or in some other division of the work, such as overhaul of electrical equipment, radio servicing, instrument work, painting, or upholstering. Generally, the larger the base, the greater is the specialization of work.

Outside the airlines, most mechanics do servicing and inspection work roughly comparable to that of the airline line-maintenance men, but some do overhaul work. The planes which these mechanics service are frequently much smaller than airliners; often they have only a few comparatively simple instruments, no radio, and no elaborate propeller mechanism. However, a single mechanic frequently has to do the entire servicing job with little supervision, and has to be able to work with many different types of planes and engines. It is estimated that one good mechanic and a helper can take care of the line-maintenance requirements of several light planes, if the work is properly organized. Overhauling, too, is a relatively simple job where light planes are involved.

Where Employed

Mechanics work principally for the scheduled airlines engaged in interstate and foreign commerce and for fixed-base operators. Some men operate their own small repair shops, with or without the help of hired mechanics. Other employers include Government agencies and private aircraft and engine factories; the Nation's military forces employ large numbers of civilians in this occupation, besides the enlisted men assigned to mechanic duty.

Mechanics are employed in more different parts of the country than most other types of aviation workers. However, large numbers of all-round mechanics, and almost all specialists in civilian activities, work at the main overhaul bases, located mainly in coastal cities. A few are on the payrolls of foreign-owned and -operated carriers with maintenance facilities in the United States.

Qualifications

To qualify as a skilled mechanic or specialist, a 4-year apprenticeship or its equivalent is often needed. For many jobs, a Civil Aeronautics Administration mechanic certificate with an aircraft mechanic ("A") or aircraft engine ("E") rating, or both, is legally required. In early 1951, establishment of special ratings for radio, propeller, instrument, and accessories mechanics, and possibly other types of specialists not then covered.
by the certificate system, was being considered. Before Korea, employers were insisting upon a certificate for many jobs for which they were not legally necessary.

In competing for jobs, applicants will find high school or trade school education—including such subjects as mathematics, physics, chemistry, and machine-shop—a great advantage, when not a definite requirement. Training as an aviation mechanic, particularly at a CAA-approved school, is valuable; persons with such training may be taken on as advanced apprentices. Experience in automotive repair or other mechanical work is also helpful. It is customary for apprentices to own a sizable kit of tools. Mechanics trained in the Armed Forces usually need additional training for licenses and for jobs above the apprentice or helper level. Most airlines require a fairly rigid pre-employment physical examination, although waivers are allowed in some instances.

The line of advancement is to such positions as lead mechanic, crew chief, shop foreman, lead inspector, and, finally, supervisory and executive positions in maintenance departments. There are a small number of advanced positions with the CAA and other non-airline employers which require mechanic experience and training. The CAA, for example, employs some former mechanics as Aviation Safety Agents, who administer the sections of the Civil Air Regulations relating to airworthiness of aircraft, participate in the investigation of accidents and CAR violations, and perform related duties.

Outlook

Employment of airplane mechanics is expected to increase both during the early fifties and over the long run. In mid-1950, more than 20,000 of these workers were employed by the airlines; the number on the payrolls of other employers, public and private, may have been still greater. Sizable gains in employment in the next few years are virtually assured by the mobilization program begun in the summer of 1950. The longer run trend will probably be upward also, owing to continued gains in the use of aircraft for an increasing variety of purposes and the growing size and complexity of planes and equipment.

Prior to the partial mobilization program begun in mid-1950, the supply of would-be civilian mechanics was ample to meet the demand for apprentices and other nonjourneymen. Some 6,000 men finished training in CAA-approved mechanic-training schools in 1950. In late 1950, about 9,000 were enrolled in these schools. Additional trainees were enrolled in nonapproved schools. There were other groups of potential job seekers.

It is expected that the total number of mechanics trained each year in mechanic schools and elsewhere will continue to be fairly large. Nevertheless, looking ahead in late 1950, continued partial mobilization appears likely to mean good employment prospects for qualified, fully trained men in the early fifties at least. Best job chances are expected, of course, for highly skilled and experienced men, but above all, for instrument mechanics and other specialists who qualify also for general “A and E” work. Improved prospects for advancement are anticipated for workers with records of long service and good work performance. Many trained but inexperienced men will obtain jobs as nonjourneymen; wholly untrained men will find entry job chances better than they have been for some years.
Earnings and Working Conditions

In late 1949, the most common starting rate for apprentices with the airlines was about 90 cents an hour; for helpers, about $1 an hour. Under pay scales then in effect, apprentices and helpers with 3 or 4 years' experience generally earned $1.50 or more an hour. Journeymen typically ranged from a beginning rate of $1.40 an hour to $2 or more for those with many years' service. Salaries of CAA agents ranged from $4,600 to $8,600 a year.

The airlines usually give their men 2 weeks' vacation with pay. CAA employees, like most other Federal personnel, receive 26 days of paid leave a year.

Mechanics are covered by union agreements on all major airlines. Several different unions were involved in late 1950—principally the International Association of Machinists (Independent), the United Automobile, Aircraft and Agricultural Implement Workers of America (CIO), and the Transport Workers Union of America (CIO).

Stock and Stores Clerks

Outlook Summary

Job chances fairly good for newcomers. Employment expected to have upward trend in early fifties and over long run.

Nature of Work

Most stock and stores clerks employed by the airlines are in the storerooms at the main overhaul bases and, to a lesser extent, at the smaller service stations where day-to-day line maintenance work is done. Duties include receiving and unpacking the tremendous number of different parts and supplies, issuing these to mechanics and other personnel, packing and shipping materials and equipment, and keeping records and inventory controls. In the larger stockrooms, different groups of clerks may specialize in different phases of the work; there may be several levels of responsibility, junior clerk being the usual entry job.

There are also a few stock clerks in the larger fixed-base operations, and on the payrolls of foreign-owned and -operated carriers with maintenance facilities in the United States. The work done by these two groups of clerks is of the same general nature as that done in the stockrooms of large American carriers. However, since the operations are on a much smaller scale, there is likely to be little if any specialization of work or distinction between grades of clerks. In many instances, only one clerk is employed, who may be required to perform some minor mechanical tasks so that he will be fully occupied.

Most jobs will be found in the areas where the main overhaul bases of the scheduled airlines are located. There were 25 or more such areas in early 1951. Some stock and stores clerks are employed at large airports in other localities.

The armed services also employ civilian stock and stores clerks, besides assigning enlisted men to this type of work.

Qualifications and Advancement

There are no legal requirements for work in this occupation, and the standards used in hiring junior clerks vary considerably from one employer to another. Ability to read and to write legibly is always essential for employment. Some airlines require a high school education, or may prefer applicants with college or business school credits. The minimum age limit is usually 18; the maximum may vary from 35 to 50. On a few airlines the passing of a physical examination is necessary. Previous clerical experience, especially in stock and stores work in aircraft manufacturing or in automotive activities, is always an asset (sometimes a prerequisite) for the job. Positions above the level of junior clerk are generally filled by promotions from within the company.

Outlook

Several thousand stock and stores clerks were employed by the airlines and in other air transportation activities in mid-1950; their number was moderately greater than at the end of World
War II. Further gains in employment are expected during the early fifties and over the long run in this as in most other occupations in aviation maintenance departments.

The pool of qualified job applicants from among persons with and without experience in the field has, in the past, been ample to meet hiring needs. Employers' hiring standards for this occupation are broad; no technical training is required. This fact, plus the fairly interesting and pleasant character of the work, has attracted many young people and others to the occupation. Competition for jobs has usually been keen. However, it may be much reduced or may even be eliminated in the early fifties as a result of the mobilization program.

Working Conditions

Typical starting rates of pay for nonsupervisory clerks with the airlines ranged from 90 cents to as high as $1.25 an hour in late 1949. Advance­ ment was possible to rates as high as $1.85.

The usual work schedule for airline stock and stores clerks is a 40-hour week and an 8-hour day. A 2-week vacation with pay is usually given.

Stock clerks are widely organized for collective bargaining. Among the unions which represent them are: Transport Workers Union of America (CIO), International Association of Machinists (Independent), and Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Agents (AFL).

Traffic Agents and Clerks

(D. O. T. 1-44.12, .27, and .32)

Outlook Summary

Chances for newcomers likely to be better in these than in many other aviation occupations. Long-run employment trend slowly upward in occupational group as a whole; rise likely to be more rapid in positions concerned with cargo traffic than in other types of work.

Nature of Work

These workers are employed mainly in airline departments handling passenger and freight traffic; a very small number work for foreign-owned and -operated carriers with offices in the United States. They include ticket agents, passenger and freight agents, and reservation and cargo clerks. Traffic representatives have a somewhat higher level of responsibility. Still farther up the ladder are city and district traffic and station managers.

Traffic staffs are located principally in downtown offices or at airports in or near large cities, where most airline passenger and cargo business originates. Some are in smaller communities where airlines have scheduled stops. A few Americans on the staffs of United States carriers are stationed in foreign countries.

Qualifications

There are strict hiring standards with respect to appearance, personality, and education—to qualify employees for the constant contact with the public which is involved in most traffic jobs. High school graduation is generally required; some college training is considered desirable. Courses in air transportation, offered by increasing numbers of colleges and universities, may improve one's chances for jobs and later advancement; these courses cover such topics as government regulations, principles of rate-making, traffic analysis, and problems of aviation management. Experience in connection with freight or express traffic in other branches of transportation will be increasingly valuable. Aviation background and sales experience are helpful for higher-grade jobs. Women are often employed as reservation and ticket agents; some few are passenger agents.

The occupations covered in this statement are among the best in the industry from the point of view of advancement.

Outlook

Employment in these traffic jobs is expected to increase both in the near future and over the long
run. In early 1950 considerably more than 10,000 people were in such work in air transportation. By 1955, the number should be substantially greater. The expected rise in employment will be slowed, however, by measures designed to increase efficiency and reduce costs in traffic departments.

The largest number of openings will probably be for ticket and reservation clerks, but the most rapid gains will be in employment connected with cargo traffic. The air-transport industry has been placing increasing emphasis on air-freight business, and such traffic has been expanding faster than any other class of transportation, passenger or freight, in the last year or two. This trend will continue. But passenger work will remain the more important field of employment indefinitely.

Job chances for persons without experience in the aviation field appear to be somewhat better in these traffic positions than for many other occupations in air transportation. Competition for traffic jobs has generally been considerable in the past—partly because the requirements for employment are broad and nontechnical, and many people can qualify. The mobilization program will probably lessen competition in the early fifties; it will probably improve job chances for women.

**Earnings and Unionization**

Earnings vary widely, depending on the degree of responsibility of the job. In late summer of 1949, the bulk of agents and clerks had monthly salaries ranging from $175 to $325; a few made as much as $350 or more a month. Station managers and district traffic managers in large cities had monthly salaries of $400 or better.

Reservations and transportation agents are covered by union contracts on several lines. They are represented chiefly by the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Agents (AFL).
ELECTRIC LIGHT AND POWER OCCUPATIONS

Electric utility systems, both privately and publicly owned, furnished employment to 335,000 men and women at the beginning of 1950. Utility systems service 40 million homes, stores, and factories, and electric power jobs are found in all sections of the country. Many different types of technical and skilled workers are needed to ensure the dependable electrical service that utility systems endeavor to render. These include such workers as electrical engineers, power plant operators, linemen and troublemen, meter readers and repairmen, and workers in every major office occupation. In many communities the local utility is one of the best sources of interesting and steady jobs.

Electric Utility Jobs

Privately owned utility systems have about four-fifths of the total generating capacity and employ the great bulk of the workers in electric light and power occupations. Employment in the private electric light and power companies was about 284,000 in June 1949. The remainder of the 335,000 utility employees were divided among municipal systems, State power districts, rural cooperatives, and federally operated facilities, with the municipal systems having the biggest share.

The relative importance of the major job groups included in the labor force of the privately owned electric light and power industry is shown in chart 79. First, there are the basic jobs in the generation of electricity, those of the power plant workers. These include boiler operators, turbine operators, auxiliary equipment operators, and switchboard operators, who watch over and check the equipment which produces the power, and the watch engineers who supervise them. These and the related workers needed for the actual generation of the electricity amount to only 15 percent of the private electric utility employees. Estimates of the number employed in the individual power plant occupations and also of some of the more important jobs in other departments are given in the following list.

<table>
<thead>
<tr>
<th>Selected occupations</th>
<th>Estimated employment, June 1949</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical engineers</td>
<td>16,000</td>
</tr>
<tr>
<td>Power plant occupations:</td>
<td></td>
</tr>
<tr>
<td>Auxiliary equipment operators</td>
<td>5,000</td>
</tr>
<tr>
<td>Boiler operators</td>
<td>5,700</td>
</tr>
<tr>
<td>Switchboard operators</td>
<td>5,200</td>
</tr>
<tr>
<td>Turbine operators</td>
<td>4,000</td>
</tr>
<tr>
<td>Watch engineers</td>
<td>2,200</td>
</tr>
<tr>
<td>Transmission and distribution occupations:</td>
<td></td>
</tr>
<tr>
<td>Cable splicers</td>
<td>1,400</td>
</tr>
<tr>
<td>Groundmen</td>
<td>12,000</td>
</tr>
<tr>
<td>Linemen and troublemen</td>
<td>23,000</td>
</tr>
<tr>
<td>Load dispatchers</td>
<td>1,500</td>
</tr>
<tr>
<td>Substation operators</td>
<td>8,000</td>
</tr>
<tr>
<td>Customer servicing occupations:</td>
<td></td>
</tr>
<tr>
<td>District representatives</td>
<td>3,000</td>
</tr>
<tr>
<td>Metermen</td>
<td>5,500</td>
</tr>
<tr>
<td>Meter readers</td>
<td>6,600</td>
</tr>
</tbody>
</table>

A somewhat larger number of employees are engaged in the next stage of getting electric power to the users—the transmission lines and the distribution networks. These two departments employ about 23 percent of the private utility workers, including substation operators, linemen, cable splicers, and load dispatchers. Others in this department include groundmen, laborers, and patrolmen.

In the actual operation of electric utilities customer servicing jobs, including metermen and meter readers, account for about 10 percent of utility employment.

In order to keep the equipment running efficiently, a large force of maintenance workers is required. Maintenance and custodial employees, excluding those who work on the lines, cables, and meters, comprise about 14 percent of private electric utility employment. Among the more important workers in the maintenance shops are electricians, machinists, mechanics, boilermakers, painters, carpenters, and welders.

Because of the nature of its services and the way its production is carried on, the electric light and power industry employs a higher proportion of administrative, technical, and commercial employees than do most other industries. In the industry as a whole, almost 40 percent of the workers
were in such jobs. In many companies there were as many of these office employees as there were of the production and maintenance workers combined. For this reason, power companies are one of the most important sources of jobs for accounting, clerical, and other office employees in many localities. The relative importance of office employees in the industry is accounted for partly by work involved in billing and collecting from the multitude of individual customers; and also by the fact that a large number of workers are not needed in the actual generation of electric power. In addition to preparing bills and keeping records of customers' accounts, clerical workers are also used to maintain the general financial records of the company, to purchase new supplies and equipment, and to maintain extensive inventory records.

Electric utility systems employ staffs of technical workers whose duties are not closely connected with day-to-day operations but whose function it is to plan for generating plant additions and installations of new transmission and distribution equipment, supervise or inspect the actual construction and installation, develop improved operating methods, and test the efficiency of the many types of electrical equipment. Electrical engineers are the key members of the technical staffs, and some mechanical and civil engineers are employed for special phases of the work. Large numbers of draftsmen are also employed. In most electric utilities, electrical engineers hold a large proportion of the top supervisory and administrative jobs. These men generally work their way up through the technical and operating divisions of the companies. Private utilities usually employ a number of engineers in sales development work, to aid industrial and commercial customers in their utilization of electrical equipment and lighting. They stimulate greater consumption of electricity by demonstrating the advantages of electrical equipment and suggesting places where more electricity can be effectively used.

Workers in electric light and power operations fall into two general classes—those whose jobs are distinctively electrical, in that they are found mainly in electric utilities, such as the power plant workers and the linemen; and those whose jobs are commonly found in other industries, such as the maintenance, commercial, and administrative employees.

### Opportunities for Women

Only a few women are employed in the operating or maintenance departments of electric utilities, and these are mostly in clerical jobs connected with operations. A large proportion of the office employees in the administrative and commercial departments are women, holding such jobs as bookkeeper, cashier, typist, and clerk.

A special type of job opportunity for women is provided by some utility systems, which employ women to visit homes and advise on the use of electrical appliances, and to give lectures to clubs and other groups on the use of appliances, cooking, planning of menus, and similar subjects.

### Where the Jobs Are Found

Electric utility service now reaches into almost every locality. Although employment is widely scattered, most of the jobs are still in the more heavily populated areas, especially where industrialization is extensive. Large cities also have a disproportionately large share, not only because they contain many

**CHART 79**

**Administrative, Technical, and Commercial Activities Employ Almost 40 Percent of the Workers**

<table>
<thead>
<tr>
<th>Administrative &amp; Commercial</th>
<th>Transmission &amp; Distribution</th>
<th>Generating</th>
<th>Maintenance &amp; Custodial</th>
<th>Customer Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>23</td>
<td>15</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>

**Percent of Total Employment**

- Administrative & Commercial: 38%
- Transmission & Distribution: 23%
- Generating: 15%
- Maintenance & Custodial: 14%
- Customer Service: 10%

*United States Department of Labor, Bureau of Labor Statistics*
customers, including large industrial users, but because the headquarters of most of the large systems are in the cities. Recently, the rapid extension of electric service into rural areas has brought more jobs into the smaller towns in farming sections, and Federal hydroelectric projects have opened up some new jobs in relatively isolated areas.

**Working Conditions and Hazards**

What a worker's job is like depends to a great extent on what part of the system he is in. The office jobs are similar to office work in other fields, as far as the work surroundings go. It is mainly in the generating plants and in the transmission and distribution departments that we find the distinctively electrical jobs. Differences in the working conditions among the various types of jobs are described in the reports on individual electric utility occupations beginning on page 462.

In certain occupations in the power and light industry the danger of accident resulting in injury or death is always present. Yet the frequency of accidents per man-hour worked is lower than in most manufacturing industries. In 1948, there were about 15 disabling injuries among the employees of electric utility systems for each million man-hours worked, while the average rate in manufacturing industries was about 17 injuries. Though the injury rate is not high, when injuries do occur they may be serious. Fatalities are not frequent, but a larger percentage of the injuries result in death than in most other industries.

Accidents are most frequent among line crews and cable splicing crews. Among the more frequent causes of these injuries are falls from poles and towers, blows from falling or flying objects, electrical shock and electrocution, accidents caused by tools, and motor-vehicle accidents. Around the generating plant and substations failure to observe safety regulations while around high voltage lines and equipment may result in death. These accidents, however, are not common. Because of the dangers of electrocution and other hazards, the electric companies have made intensive efforts to enforce safety regulations. Accidents are usually due to carelessness rather than to defective equipment. Workers may lose their jobs for not following safety regulations.

Few industries offer the worker as much security of employment as does the power and light industry. Electric utility companies are not as likely to slash payrolls in business depressions as most industries, because the demands for power hold up fairly well in such periods. There is little variation in employment throughout the year. Most utility workers are covered by pension systems. A large number of the companies also provide sickness and accident benefits and insurance. Over half of the utility systems have paid sick leave plans covering both plant and office workers.

The 40-hour workweek and a 2 weeks' vacation with pay are general practice throughout the industry. The steadiness of utility employment is shown by the large numbers of workers who have been with the same company for more than 20 or 30 years.

**Earnings and Unionization**

Hourly earnings in this industry are higher than in most other public utility and manufacturing industries, but they are considerably lower than earnings in such high-paying industries as automobile manufacturing and petroleum refining. In May 1949, employees of the privately owned electric utility companies averaged $1.54 an hour. This average included premium pay for work in excess of 40 hours a week, and any pay differentials for night shifts. In comparison, the 1939 average was 86.9 cents an hour, while the highest peak reached during the war years was $1.15 an hour in July 1945.

Several factors, such as the size of the system and its geographic location, influence wage rates paid by individual companies. According to a special wage survey made by the Bureau of Labor Statistics in March and April 1948, the larger systems generally paid higher wages than smaller companies. Geographically, the highest wage rates were found in the Pacific Coast States, and the second best pay area in the Great Lakes region. In general, the lowest wage scales were in the southeastern section of the country.

There were also wage differences between individual occupations. Load dispatchers earned the most, with an average of $1.94 an hour. Watch engineers with $1.81 an hour were the next highest paid, followed by the electricians engaged in
A large majority of the workers in the privately owned electric light and power industry in 1949 were covered by union contracts. Over 75 percent of the unionized workers were members of International Brotherhood of Electrical Workers (AFL). The Utility Workers Union of America (CIO) and a number of independent, unaffiliated unions also represented a large number of workers. The larger electric utility companies are generally organized to a greater extent than the smaller companies.

Employment Outlook

Future Levels of Capacity and Output. Rising demands for electric power should result in substantial increases in power production during the 1950 decade. For many years the total generation of electricity has been growing rapidly. As chart 80 shows, production of electric power in 1949 was more than twice the amount generated in 1939, even though the 1939 total was far above that of 1929. Generating capacity has also been steadily expanded, although the gains have not kept pace with the rising output. Total generating capacity in privately and publicly owned systems stood at about 63 million kilowatts at the end of 1949, an increase of more than 55 percent since 1939.

Total annual production of electric power is expected to rise to almost 400 billion kilowatt hours by 1955 according to estimates published in the January 1950, Electrical World magazine. This would represent an increase of about 36 percent over the 1949 output of 291 billion kilowatt hours. To meet the increased demands for power and to provide for more reserve capacity, it was expected that utility systems would expand the total generating capacity to 92 million kilowatts, which would make it about 45 percent greater than in 1949.

In line with these forecasts, utility companies have substantial expansion programs under way. Large additions to capacity have been made since the end of World War II, and further expansion is in progress or has been planned. In June 1950, class I utility systems (those which produce more than 50 million kilowatt-hours a year) reported to the Federal Power Commission that they had scheduled capacity additions amounting to over 15 million kilowatts to be installed between July 1950 and the end of 1953. If the smaller systems increase their capacity at the same rate, total utility capacity will amount to about 82 million kilowatts by the end of 1953. The expanded defense production program begun in the fall of 1950 will further increase the requirements for electric power. As a result, indications are that large amounts of new capacity will also be added in the years following 1953.

Effects of Technological Changes in Labor Requirements. Throughout most of its history the growth of the electrical utility field has been accompanied by marked increases in efficiency as measured by output per worker. (See chart 81.) During the next 10 years the utility systems should again be able to expand output with a relatively smaller increase in employment. The prospective use of atomic energy for power generation will have a far-reaching influence on the design and location of power plants and on the utilization of
fuel by the electric utilities. It is likely, however, to have relatively little effect on the number and kinds of jobs in the industry. The main effect of the use of the uranium or other fissionable material would be its substitution for coal or oil. From the production of the steam on through the rest of the operations, the process would be the same as that now carried on by utility systems.

Estimates vary as to how soon generating plants powered by atomic energy will be in regular commercial use. The Atomic Energy Commission in its Fourth Semianual Report, issued in July 1948, indicated that it does not look forward to large-scale operation of atomic power plants before 20 years. Experimental power plants sponsored by the Atomic Energy Commission will be in operation within a few years, but many years of research and experimentation will be required to make feasible atomic power production in connection with regular utility operations.

**Future Trend of Employment.** If the utility systems expand their capacity and output as much as expected, a large number of additional workers will be required. However, the gain in employment will be relatively less than the gain in output. All these factors considered, it seems reasonable to conclude that by 1960 total utility employment will exceed 374,000. This would mean an increase of about 40 thousand—or 12 percent—over the 335,000 workers employed in June 1949. Most of this increase is expected in the privately owned systems.

**Where to Get Additional Information**


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**Power Plant Jobs**

*Nature of Work*

The most numerous and important of the generating plant workers are the four classes of power plant operators—the boiler operators, turbine operators, auxiliary equipment operators, and switchboard operators. They are the core of the power plant staff. Supervision of the operations is handled by the chief engineer in charge of the plant and by the watch engineers under him. At the other end of the scale are the laborers and helpers who assist the power plant operators.

In June 1949, utility systems (including both private and publicly owned) employed about 5,700 boiler operators, 4,000 turbine operators, 5,000 auxiliary equipment operators, 5,200 switchboard operators, and 2,200 watch engineers. A substantial number of power plant workers are employed outside the utility systems, mainly in industrial plants which generate their own power. In all except the largest of these plants, the various operating jobs may be combined. Switchboard operators especially are found much less frequently in the industrial plants than in utility systems.

The duties of the various power plant operators are usually distinct. In some small plants, tur-
bine and switchboard operators may be combined into a single job. In others there may be no auxiliary equipment operators as such, this work being divided between the boiler operators and turbine operators. All the power plant operators’ jobs are similar in that they are responsible for watching, checking, and controlling the operation of the various kinds of equipment. They must see that the equipment is functioning efficiently and detect instantly any trouble which may arise.

The **boiler operator** (D. O. T. 5–72.930), sometimes called a fireman, regulates the fuel, air, and water supply used in the boilers and maintains proper steam pressure to turn the turbines. This is done by means of control valves, meters, and other instruments mounted on panel boards. One man may operate one or more boilers. Boilers vary greatly in size and capacity, some producing as much as 500,000 or more pounds of steam an hour at 925 degrees Fahrenheit. In modern power plants the coal is usually fed to the boilers mechanically by coal stokers. In many plants pulverized coal, oil, or gas is piped to the boiler. The boiler operators usually supervise the ash disposal if coal is the fuel. Other workers—coal and ash handlers, cleaners, and helpers—assist them. Boiler operators are employed only in steam generating plants, none being needed in hydro or Diesel plants.

**Turbine operators** (D. O. T. 5–51.120), in some plants called running engineers, are responsible for the control and operation of the turbines and generators. In small plants they frequently may also operate auxiliary equipment or a switchboard. Modern steam turbines and generators operate at extremely high speeds, pressures, and temperatures. In a large modern plant, steam enters the turbine at a pressure of up to 1,200 pounds per square inch and at temperatures as high as 900°F. The steam hits the turbine blades at velocities up to 1,200 miles an hour, a force which makes a hurricane tame in comparison. Hence close attention must be given the instruments which show the operations of the turbogenerator unit.

The turbine operator watches pressure gages and thermometers to see that the proper pressures and temperatures are maintained, and records the readings of these instruments. He also checks other instruments which indicate the oil pressure at bearings, the speed of the turbines, and the circulation and amount of cooling water in the condensers which change the steam back into water. The turbine operators are responsible for starting and shutting down the turbines and generators as directed by the switchboard operators in the control room. Other workers, such as helpers, cleaners, and oilers, assist the turbine operator in his duties, and auxiliary equipment operators are sometimes under his supervision.

**Auxiliary equipment operators** (D. O. T. 5–51.115) regulate and tend such equipment as pumps, fans and blowers, condensers, evaporators, water conditioners, compressors, and coal pulverizers. They check and record readings on the instruments which show how their equipment is functioning. The operators must be able to detect trouble quickly, make accurate judgments, and sometimes make repairs. As power plants become larger the auxiliary equipment increases in complexity and size, and more of it is necessary to operate the plant.

In some of the smaller plants there are no separate auxiliary equipment operators, the turbine operators handling this work along with their other duties. In the larger plants, however, auxiliary equipment operators often outnumber the turbine operators. The auxiliary equipment operated by these workers is used only in steam generating plants, and no operators are needed by hydro plants.

**Switchboard operators** (D. O. T. 5–51.130) control the flow of electric current from the generators to the outgoing power lines. They usually work in a control room which is separated from the generating room and which has switchboards and instrument panels. The switches control the movement of the current through the generating station circuits and on to the transmission lines carrying the current away from the station to the users.

The instruments show such things as the total power requirements on the station at any instant, the power load on each line leaving the station, the amount of current being produced by each generator, and the voltage of the current. The operator uses the switches to distribute the power demands among the generators in the station, to combine the generated current in the bus system, and to regulate the passage of the current onto the various power lines in accordance with the demands of the users served by each line.
changing power requirements on the station make it necessary, he orders generators started up or stopped and at the proper time connects them to the power circuits in the station or disconnects them. For most of these operations he receives telephoned orders from the load dispatchers in the system headquarters, who control the flow of current throughout the system. Among his other duties, the switchboard operator keeps a log of all switching operations and of load conditions on the generators, lines, and transformer banks. He obtains this information by making regular meter readings. In hydrogenerating plants the duties of the switchboard operator may be combined with other plant operations—usually generator operating. In such cases, he may be called either a hydrostation operator or a generator-switchboard operator.

The principal supervisory workers in a power plant are the watch engineers (D. O. T. 5-93.320). They supervise the employees responsible for the operation and maintenance of boilers, turbines, generators, auxiliary equipment, switchboards, transformers, and other machinery and equipment. Directly over the watch engineers may be a plant superintendent, who is in general charge of the entire plant. In small plants the watch engineer may be the top supervisory employee.

Also found in power plants are coal and ash handlers, who may include crane and conveying equipment operators as well as manual workers; oilers, who oil the machinery and equipment; cleaners; helpers; and learners and apprentices. Custodial, clerical, maintenance, and other workers may in some cases be considered a part of a plant's personnel; for example, guards, watchmen, janitors, cashiers and paymasters, and mechanics.

**Working Conditions**

A generating station is typically well lighted and ventilated and its interior presents a very orderly appearance. Even the steam plants are
quite clean, since the coal is handled by mechanical equipment separated from the principal work areas. In the boiler room the workers watch the control instruments mounted on large panel boards. Large pipes feeding pulverized coal to the boilers or carrying steam to the turbines may pass through the boiler room. The boiler room is often rather warm.

The turbine room (where the current is generated) is a long rectangular chamber with rows of turbines in operation, the number and size of the turbogenerator units varying with the size of the power station. The turbine room is airy and clean but there is usually considerable noise from the whirring turbines.

The main feature of the power plant's control room is the battery of elaborate switchboards with their numerous switches, clocklike recording instruments, and other controlling and testing apparatus.

Switchboard operators in the control room often sit at the panel boards, whereas boiler and turbine room operators are almost constantly on their feet. Not much strenuous activity is required of the power plant operators and rarely any heavy lifting. Since generating stations usually operate 24 hours a day, power plant employees frequently rotate shifts.

Training, Qualifications, and Advancement

Anyone who wants to get a power plant job will find that most utilities expect new workers to begin at the bottom of the ladder. The methods of training men for power plant jobs vary somewhat among systems, but usually the new employee puts some time in as a laborer or cleaner and then gradually advances to more responsible jobs as he learns more about operating the equipment and as openings occur. Formal apprenticeships are rare. How rapidly one advances from job to job depends to a considerable extent on how often vacancies occur.

Typically, after starting as a laborer or helper it takes from 1 to 3 years to become a fully qualified auxiliary equipment operator, and from 3 to 5 years to become a boiler operator, turbine operator, or switchboard operator. A person learning to be a boiler operator might spend 3 to 6 months as a laborer, then be promoted first to the job of oiler, next to helper or assistant boiler operator, and finally, when there is an opening, to a boiler operating position.

In many plants turbine operators are selected from among the auxiliary equipment operators. The line of advancement in other companies is from laborer to helper to assistant operator to operator. Where a system has a number of generating plants of different size, operators get experience first in the smaller stations and then are promoted to the larger stations to fill vacancies.

Switchboard operators work as helpers, then as junior operators, and then as senior operators. They also may be advanced from smaller stations to the larger ones, because operating conditions in the larger stations are usually much more complex. Some utilities take men from among the substation operators and transfer them to switchboard operating jobs. The duties of both classes of operators have much in common. In the larger plants switchboard operators can advance to the job of chief switchboard operator.

Watch engineers are selected from the experienced power plant operators. At least 5 and sometimes 10 years of experience as a first-class operator is usually required to qualify a worker for a watch engineer's job.

Outlook

Increased numbers of power plant workers will be needed to staff the expected additions to generating capacity. The rise in employment is likely, however, to be considerably less than the growth in plant facilities would indicate. The new plants installed and the replacements for worn out and obsolete equipment will have many operating features not possessed by many of the older units. This will reduce greatly the number of employees per unit of capacity and output. The number of workers in a plant is to a considerable extent related to the number of producing units—boilers and turbogenerators. Usually an operator can handle a large turbogenerator unit as well as he can a smaller one which turns out much less current. Modern large generating plants typically have bigger units of equipment than were built in the twenties, and they have been designed to use as few workers as possible.

Many of the opportunities in power plant jobs will come about because of the death, retirement, or promotion of the experienced workers. A
large proportion of electric utility employees have been with their companies for many years, and are nearing the ages when drop-outs due to death or retirement are more numerous.

**Earnings**

Of the five principal power plant occupations, watch engineers receive the highest earnings, followed by class A switchboard operators. The lowest salaries are received by auxiliary equipment operators and class B switchboard operators.  

Average straight-time hourly earnings in privately owned utilities in March and April 1948 were $1.60 for class A switchboard operators, $1.49 for turbine operators, $1.48 for boiler operators, $1.37 for class B switchboard operators, and $1.35 for auxiliary equipment operators. In all of these occupations the highest average hourly earnings were in the Pacific Coast States, where boiler operators made $1.60; turbine operators $1.68; and class A switchboard operators, $1.76. The lowest earnings were in the Southeast region except for turbine operators, whose average earnings were lowest in the Border States, and boiler operators, whose average earnings were lowest in the Middle West. Average hourly earnings for watch engineers were $1.81. Their hourly earnings varied from a low of $1.57 in the Southeast to $1.96 in the Border States and $1.93 in the Great Lakes region.

**Transmission and Distribution Jobs**

Almost a fourth of the workers employed by electric light and power companies are in transmission and distribution jobs. The transmission system of an electric utility consists chiefly of high voltage transmission lines which are supported by steel towers or poles, except in cities where they are usually in underground cables. The transmission system begins with the step-up substations, which are either in the generating plants or located adjacent to them and which raise the voltage of the generated current to a voltage suitable for transmission.

The principal workers of the transmission and distribution systems are the men who control the flow of electricity—load dispatchers and substation operators; and the men who construct and maintain power lines—linemen, cable splicers, troubleshooters, patrolmen, groundmen, truck drivers, helpers, and their foremen. Linemen constitute the largest single occupation in the industry.

**Load Dispatchers**

**(D. O. T. 5-51.520)**

**Nature of Work**

Load dispatchers are the key operating workers of the transmission and distribution departments. There were about 1,500 of these workers in mid-1949.  
The load dispatcher’s room is the nerve center of the entire utility system. From this location the dispatcher controls the plant equipment used to generate electricity and directs its flow throughout the system. He gives telephone orders to the generating station switchboard operators and to the substation operators, directing how the power is to be routed and when additional boilers and generators are to be started or shut down in line with the total needs of the system. The load dispatcher must anticipate demands for electric power before they occur so that the system will be prepared to meet them. Power demands on utility systems are not constant; they change from hour to hour. A sudden afternoon rainstorm can cause a million lights to be switched on in a matter of minutes, while boilers often must be heated for as long as 2 hours before they are ready to produce sufficient steam for generating. The load dispatcher must therefore keep in touch with weather reports from hour to hour. He must also be able to direct the handling of any emergency situation such as a transformer or transmission line failure, and to route current around the affected area. Load dispatchers are also in charge of the interconnections with other systems and direct the
transfers of current between systems as the need arises.

The load dispatcher's source of information centers in the pilot board, which dominates the dispatcher's room. It is virtually a complete map of the utility system that enables the dispatcher to determine at a glance the conditions that exist at any point. Meters show the output of individual power stations, the total amount of power being produced, and the amount of current flowing through the important transmission lines. Red and green lights may show the positions of switches which control generating equipment and transmission and distribution circuits, as well as high voltage connections with substations and sometimes large customers. The board may also have several recording instruments which make a graphic record of operations for future analysis and study.

Training and Qualifications

Load dispatchers are selected from among the experienced switchboard operators and operators of the larger substations. Usually, at least 7 to 10 years' experience as a senior switchboard or substation operator is required for promotion to load dispatcher. To fill an opening for this job an applicant must show that he has knowledge of the entire utility system.

Outlook

The prospective expansion of utility capacity will create a need for some additional load dispatchers, but most of the openings will occur because of the death, retirement, or promotion of those now holding these positions. Only the largest systems employ more than a few load dispatchers. The increase in their number will not be proportionate to the increase in generating capacity.

Earnings

Wage rates for load dispatchers are higher than those paid to any other operating or maintenance occupation in the industry. In March and April 1948 the average straight-time hourly earnings for load dispatchers in private utilities were $1.94. The highest average hourly pay, $2.16, was in the New England region and in the Pacific region, while the lowest, $1.68, was in the Southwest region. Wage rates for load dispatchers usually depend in part on the complexity of the utility system for which the dispatcher works.

Substation Operators

(D. O. T. 5-51.210)

Nature of Work

Substation operators, of whom there were about 8,000 employed in mid-1949, rank third in number after linemen and groundmen among the operating and maintenance workers.

The substation operator is generally in charge of a substation. He is responsible for its efficient operation and maintenance of equipment. He carries out the switching orders issued him by the load dispatcher. He supervises the activities of the other substation employees on his shift, and assigns tasks and directs their work. In small substations, however, he may be the only employee.

A step-up substation is usually located adjacent to the power plant, to raise the voltage of the electricity so that it can be sent out over long distances. The step-up substation is chiefly a bank of transformers and oil switches. Step-down substations are at the other end of the transmission lines, in the areas in which the customers are located. There the power is reduced to a lower voltage by another bank of transformers before being sent out through the distribution network. In the distribution substation the current is divided and sent out to the individual customers. The substation operator directs the flow of current out of the station by means of a switchboard.

The switchboard in the substation is similar in purpose to the switchyard on a railroad. The substation operator controls the flow of electricity by means of circuit breakers. Ammeters, volt meters, and other types of instruments located on the switchboard, register the amount of electric power flowing through each line. In some substations where alternating current is changed to direct current to meet the needs of special users, the operator controls the synchronous converters which perform the change.
Training and Qualifications

Substation operators usually begin as assistant or junior operators. It usually takes 3 or 4 years of such on-the-job training to become an operator in a large substation. Often workers begin in small substations and are promoted to larger stations as they become more experienced.

Outlook

The employment outlook for substation operators is affected by the growing use of unattended stations in residential and rural areas where consumption of current is light. Adoption of the underground low-voltage distribution network, with transformers placed along the cables at frequent intervals to cut down the voltage has reduced the need for substation operators. Most utility systems are, however, continuing to use attended substations with operators in areas where electric requirements are heavy and complex. Expansion of facilities will involve the construction and staffing of many new substations. The capacity of existing stations can often be increased considerably, however, without a comparable increase in operating personnel. Because of this factor and the trend toward more automatic operations, there will not be a large number of new substation operator jobs. There will be more openings to replace workers who die, retire, or are promoted—probably altogether not more than 200 a year—than openings resulting from system expansion.

Earnings

Hourly wage rates for substation operators in privately owned systems in March and April 1948 averaged $1.53. The average hourly rate varied from a high of $1.69 in the Pacific Coast States to a low of $1.19 in the Southeastern States.

Linemen and Troubemen

(D. O. T. 5-53.420 and .422)

Nature of Work

Most people have never seen a turbine operator or a substation operator at his job, but the power lineman at work high on a pole is a familiar figure. To construct and maintain the millions of miles of power lines more than 23 thousand journeymen linemen and troublemen were employed in June 1949, making this the largest electric utility occupation. Most of them worked for privately owned utility companies, but a fairly large number were employed by municipally owned systems and by rural cooperatives. Federal power agencies and local power districts employed smaller numbers. Many worked for construction contractors who install lines for private systems or government agencies.

The lineman’s job is strenuous, and involves a great deal of climbing on poles and on steel transmission line towers. On new construction, linemen customarily erect the steel towers for transmission lines. The digging of holes and raising of wooden poles is largely done by the groundmen under the supervision of the linemen. The linemen bolt or screw cross arms to the poles or towers and nail or clamp insulators in place on the cross arms. With the assistance of the groundmen they raise the wires and cables and install them on the poles or towers by attaching them to the insulators. In addition, they attach a wide variety of equipment to the poles and towers, such as lightning arrestors, transformers, and switches.

Although installation of new lines and equipment is important, much of the lineman’s work consists of repairs or routine maintenance. When wires or cables break or a pole is blown down, it means a hurry call for a line crew. Linemen splice broken wires and cables, replace broken insulators and bad wires, and replace or repair equipment such as transformers, switches, and lightning arrestors.

Some power companies have several classes of linemen. Those in one crew may work only on new construction. Other crews do repair work on live wires. In some cases linemen specialize on high voltage lines using special “hot line” tools.

Troubemen are journeymen linemen with at least several years of experience who are assigned to special crews which handle emergency calls for service. They move from one special job to
another, as ordered by a central service office which receives reports of line trouble. Often the troublemen receive their orders and communicate with the office by radio. Troublemen must have a thorough knowledge of the company's transmission and distribution systems and be familiar with all the circuits and switching points. They first locate and report the source of trouble and then attempt to restore service or set up emergency service until the necessary repairs can be made.

Training and Qualifications

It usually takes about 4 years of on-the-job training to qualify as a journeyman lineman. In some companies this training is given through a formal apprenticeship, but in most systems there is no definite training program. Under a formal apprenticeship there is a written agreement, usually worked out with the union, which covers the content of the training and the length of time the apprentice works in each stage of his training. A principal feature of apprenticeship as compared with informal training is that the person entering the apprenticeship is definitely assured of becoming a journeyman lineman if he completes his training satisfactorily. Also, when conforming to the standards of the Bureau of Apprenticeship, United States Department of Labor, the apprenticeship provides at least 144 hours of classroom instruction a year. The courses include study of electrical codes, blueprint reading, elementary electrical theory, and methods of transmitting electrical currents.

The apprentice usually spends his first 6 months in training as a groundman, assisting the linemen by helping set poles in place and by passing tools and equipment up to them. Then he does simple line work on “dead lines” or lines of low voltage under the direction of a journeyman lineman or the line foreman. After about a year at this stage he is assigned more difficult work but is still under close supervision. During the last part of his apprenticeship the trainee does about the same kind of work as the journeymen but has more supervision and works on the more routine jobs. During the apprenticeship the new worker learns such things as setting poles in place; attaching cross arms, insulators, circuit breakers, and transformers; and stringing and splicing (joining) the wires or cables.

The training under the informal method is very similar to the apprenticeship and usually takes about the same length of time. The worker also begins as a groundman and progresses through increasingly difficult stages of line work before becoming a journeyman. In both types of training the new workers sometimes start by working on the lines without first getting experience as groundmen.

Linemen mainly work at installing new lines and doing routine maintenance on existing lines. Repairing damage from storms is a smaller part of the job and is often done by special crews.

Some companies, since the end of World War II, have set up special training programs for linemen under which the prospective linemen are given a short but intensive training course in actual line practice and in theory. Companies which have conducted these courses have felt they reduce the total training time required by as much as 2 years.

It is obvious that candidates for line work should be strong and in good enough physical condition to carry on the strenuous work of climbing poles and lifting lines and equipment. They must also have steady nerves and good balance to avoid the hazards of live wires and falls.
During the early fifties, utility systems are expected to hire over 1,000 new workers to train for linemen or troublemen jobs. The large expansion in generating capacity will make necessary a considerable volume of work on transmission and distribution lines. For example, hydroelectric plants planned for relatively isolated areas will need transmission lines to connect with the distant distribution areas to which they will supply power. The extension of rural electrification will mean many thousands of miles of new lines in certain farm regions. Lines must be run through the new subdivisions springing up around most large cities. In general when the output of a system is stepped up, even if many new customers are not served, the increased load requires substantial alterations in the power lines and other distribution facilities. Not only are linemen needed to construct new lines, but the new lines will add to the volume of maintenance work in future years.

In many of the largest cities a good share of the power lines run underground in cables and are not serviced by linemen. Utility systems can be expected to add gradually to the underground facilities to take care of situations where underground cables would be more practical than overhead wires. Underground installations are very costly, however, and for this reason are not likely to replace overhead lines on any large scale except in the heavily built-up sections of cities.

Training of linemen was largely suspended during World War II, but since the end of the war utility companies have added many trainees to their line crews. Only a part of this increase has been to provide for the extension of power lines. Most of the new workers have been hired to build the line crews to prewar size.

Over the longer run most of the new openings will be to replace workers who die or retire from line work. Because of the strenuous nature of the work, many linemen become unable to continue in the occupation after the age of 50 or 55 and are transferred to some less physically demanding job. Because a good share of the experienced linemen are over 40 years old, by 1960 the drop-outs from the occupation should become fairly numerous. This means that those who get into line work now are assured of steady employment for many years, and that there will be some openings each year for trainees to replace men leaving the occupation.

Earnings and Working Conditions

Linemen and troublemen are among the highest paid of the nonsalaried operating employees of electric companies. The average straight-time hourly earnings in private utilities in March-April 1948 were $1.61 for linemen and $1.63 for troublemen. Their earnings were highest in the Pacific Coast States, where both were receiving an average of $1.87 an hour, while the lowest hourly earnings were $1.49 in the Southwest for troublemen and $1.47 in the Southeast for linemen.

Working conditions are often hazardous or unpleasant because of the extensive amount of climbing involved, outdoor work in all weather, and the danger of electrocution and shock. Linemen may occasionally work long and irregular hours during storms, floods, and other emergencies to repair damage and restore service. They may work under a blazing summer sun or in subzero weather. Troublemen regularly work on night as well as day shifts and must be ready to answer emergency calls when off duty.

See also Telephone Installation and Maintenance Craftsmen, page 175.

Cable Splicers

Nature of Work

In some of the largest cities much of the transmission and distribution systems is carried in underground cables rather than on poles. The extent of underground wiring varies among cities.
They perform the same service as the linemen do on the overhead lines. Because cable splicers are needed mainly in a few large cities this is a small occupation, with fewer than 1,500 persons in June 1949.

Underground wires are carried in lead-sheathed cables which run in conduits beneath the streets. When the cables are installed the cable splicers supervise the laying of the conduit and the pulling of the cable through it. The splicers then join the cables at connecting points in the transmission and distribution systems. At each connection or break in the cable they wrap insulation around the wiring and seal the cable with lead joints much the same as a plumber closes a pipe joint. Most of the actual physical work in the placing of new cables is done by the helpers and laborers who belong to the cable laying crew.

It is extremely important that each splice be properly made. Care must be taken that the wires do not get mixed up and that the continuity of each line is maintained from the substation to the customer's premises. Failure of an incorrectly spliced cable can lead to serious breakdowns in the transmission or distribution system. The cable splicers usually work in small rooms under the streets, which are reached through manholes. Considerable stooping and working in cramped positions is involved.

**Training and Advancement**

Cable splicers get their training on the job and it usually takes about 4 years to become fully qualified. Workers usually begin as helpers and then are promoted to be assistant or junior splicers. In these jobs they are gradually assigned more difficult tasks as their knowledge of the work increases.

**Outlook**

Only a few additional cable splicers will be hired by utility systems during the fifties. In view of the high cost of underground construction, no large scale replacement of overhead lines by underground cables is expected. Underground cables will be extended gradually to take care of situations where density of power load or difficulties in using overhead wires justify their installation. There will be a few openings for new workers to replace those who leave the occupation because of death or retirement, but the opportunities created in this way will not be more than a few dozen a year since the occupation is so small.

**Customer Servicing Jobs**

**Nature of Work**

Workers in customer servicing jobs include those who read, install, test, and repair meters so that the utility companies can accurately charge each customer for his consumption of current. Also included in this group are men who act as company agents in rural areas and appliance servicemen working in company operated shops which repair electrical equipment owned by the customers.

**Metermen** (D. O. T. 5–83.456) are the most skilled workers in this group. About 5,500 were employed by electric utilities in June 1949. They sometimes install meters, and frequently they test them, but their main job is to repair meters, both those on company-owned property such as in power plants and substations and those on the customers' premises. Some metermen can handle all types of meters, including the more complicated ones used...
in the control operations of the utility system and in industrial plants and in other places where large quantities of electric power are used. Others specialize in repairing the simpler kinds, like those used to record consumption in homes. About 4 years of on-the-job training is required to become a fully qualified meterman. New workers usually begin as testers or as helpers.

Meter readers (D. O. T. 1–49.94) are the men who go into the homes, stores, and factories to read the consumption of current registered on the meter. They record the amount used in a certain period so that each customer can be billed for it. While the job is not physically hard in other respects, the meter reader must walk all day long and there is usually a great deal of stair climbing. Meter readers watch for and report any tampering with the meter or power diversion and other conditions affecting the meters. Over 6,000 men were employed as meter readers in June 1949.

Meter readers are chosen partly for their ability to get along with people, since they are the company’s main contact with its customers.

The district representative usually serves as a company agent in outlying districts, in localities where the utility does not have an office and where the small number of customers does not justify the use of more specialized workers. His work includes reading meters, collecting overdue bills, connecting and disconnecting meters, and making minor repairs on them. He also receives complaints about service and reports of line trouble and transmits them to a central office for handling. In June 1949, there were about 3,000 district representatives working for electric utilities.

Some companies employ appliance servicemen (see p. 171), who install, repair, and service electrical appliances either in a shop belonging to the company or on the customer’s premises. In June 1949, the electric utility systems employed over 3,000 of these servicemen. Meter installers (D. O. T. 5–83.450, .451) are specialists who install or remove meters. Similarly, meter testers (D. O. T. 5–83.452) specialize in testing meters.

Outlook

No significant increase in the employment for metermen is expected. The new customers that will be served by utilities and the expansion of generating and substation facilities means that many more meters will be in use. However, the meters installed in recent years are better constructed and require much less maintenance than meters produced 10 or 20 years ago. This improvement in meter performance tends to reduce the needs for metermen.

The number of meter readers employed at any one time depends upon how many meters are in use. Since the millions of new customers that utility systems expect to add will place more meters in service, additional meter readers will be hired. Similarly, expansion of service in rural areas may require more district representatives. However, if the companies open additional offices in some of their outlying territories it will cut down their needs for the district representatives.

Earnings

Class A metermen employed by private utilities in March and April 1948 averaged $1.59 an hour straight time. Appliance servicemen earned $1.45 an hour; district representatives made $1.37; class B metermen, $1.36; and meter readers, $1.18.

In all of these occupations the highest hourly earnings were in the Pacific Coast States. In some areas in the West, district representatives are the most highly paid of the service workers. Generally, the lowest hourly earnings were found in the Southeast, the Border States, and the Southwest.
INSURANCE OCCUPATIONS

More than 600,000 persons earn their living in the life insurance industry. This vast, complicated business requires the services of hundreds of different kinds of workers, some of whom are in specialized insurance occupations, while others are in types of jobs found in most industries. Among the most important groups of workers unique to the insurance field are actuaries, claims adjusters, home office underwriters, insurance agents, and brokers. Actuaries are the technicians who determine what risks should be accepted and what premiums should be paid for insurance of various kinds. To do this they gather, assemble, and interpret statistical data relating to their companies' business, such as information on births, deaths, and accidents. Ordinarily, actuaries have college degrees in mathematics. Claims adjusters determine whether their companies are liable for losses under the terms of the insurance contracts. Some adjusters are college graduates, including many lawyers, while others have no college training.

Home-office underwriters, insurance agents, and brokers are discussed in the statements on pages 473, 474, and 475.

Besides the workers who are found only in the insurance business, the industry hires a wide variety of workers in occupational groups that are also employed in many other industries or in private professional practice. Among these are large numbers of clerks, typists, accountants, auditors, and business machine operators. There are also many lawyers, engineers, and doctors. All of the types of workers mentioned and many others play important parts in the insurance industry.

Insurance company home offices are located mostly in big cities. New York City and Hartford, Conn. have the heaviest concentrations of insurance company workers. Many thousand insurance agents and employees of branch agencies, on the other hand, are widely scattered throughout the United States.

Home-Office Insurance Underwriters

Outlook Summary

Openings in this small occupation almost always filled by promotion of experienced clerical personnel. Opportunities for such advancement somewhat limited.

Nature of Work

Underwriters decide on the insurability of applicants and property for life or other insurance, in line with company policy. They usually specialize in life insurance, in some other branch of insurance such as fire, casualty, marine, or surety, or in a subdivision of one of these branches. Duties include analyzing applications for insurance, doctors' reports on applications, reports made by insurance investigators, and other types of information relating to the advisability of underwriting risks. The work often involves considerable responsibility and judgment. Heads of underwriting departments are major executives in insurance companies. Underwriters are employed in the home offices of insurance companies.

How to Enter

The usual way of entering the occupation is through promotion from clerical jobs in underwriting departments. Even college-educated people must obtain their skills largely through several years of practical experience in clerical positions.

Outlook

This small occupation is likely to expand slightly over the long run as the volume of insurance business increases. In 1949, there were a few thousand home office underwriters, a large majority of them men. Because the number employed will at best grow slowly, most openings will arise through turn-over. Only small numbers of persons are expected to die, retire, or leave the occupation for...
other reasons, so that there will be only a limited number of replacements made each year. Competition for the underwriter positions will be keen.

A large proportion of home office underwriters are employed in the New York City and Hartford, Conn. areas, where the home offices of many major insurance companies are located.

Home office underwriters, like other insurance company employees, have excellent chances of steady employment even during periods of poor general business conditions.

Earnings

Underwriters are paid regular salaries. In general, earnings are highest in the Middle Atlantic and Pacific regions. Men’s earnings tend to be considerably higher than women’s. In January 1947, male underwriters in home offices of life-insurance companies had average straight-time weekly earnings of about $72, as compared with $49 for female underwriters. Underwriter clerks, of course, had considerably lower earnings—about $41 a week for men with $33 for women.

Where to Get More Information

Questions of employment opportunities, how to prepare for underwriting work, earnings, and other matters may be addressed to home offices of the big insurance companies or trade associations in the insurance industry, including the following:

Life Office Management Association,
110 E. 42d St.,
New York 17, N. Y.

See also Life Insurance Agents, page 474; Property, Casualty and Surety Insurance Agents and Brokers, page 475.

Life Insurance Agents

(See D. O. T. 1-57.10)

Outlook Summary

Several thousand openings each year for inexperienced men; some opportunities for women.

Nature of Work

Life insurance agents, also called life underwriters or field representatives, usually specialize in one of the three main types of life insurance—ordinary, industrial, or group. Ordinary insurance refers to policies with face values of $1,000 or more and with premiums payable to the company’s branch, agency, or home office. Industrial insurance is usually sold in amounts ranging from $100 to $1,000, and the agent himself collects the premiums. In group insurance, a single policy covers a number of people, such as the employees of a particular company. Premium payments are made to the insurance company by an individual representing a group, such as an employer who deducts each employee’s share of the premium payment from his pay check.

Life insurance agents generally represent only one insurance company. The earnings of ordinary and group agents consist of commissions on the insurance they sell. Industrial agents generally have a fixed income based on the number of policy holders in their assigned areas, plus commissions on any additional policies they sell.

How to Enter

To become an agent, one must first obtain a contract with a company, and a license from each State in which he is to operate. In many States, about all that is necessary is to apply for a license and pay a nominal fee. In some States, however, written examinations are given covering life insurance principles, State laws, and other matters relating to the business.

An expert knowledge of the field is necessary for success. Therefore, to prepare for work as an agent, one should take courses in insurance and related subjects in a college, evening high school, correspondence school, or with a trade association or insurance company. In any event, the agent goes through a period of on-the-job training when he starts out with a company and works under close supervision for a fairly long time. All else being equal, the greatest success comes to men who like people and find it easy to deal with them.
INSURANCE OCCUPATIONS

Outlook

Many thousand beginners will be taken on in this large occupation in the early fifties. Most of these openings will be to replace agents who change to other types of work or who die or retire. In 1949, there were about 180,000 agents and agency managers, over half of whom specialized in selling industrial life insurance. Employment has increased considerably since the end of the war, but is not much above the prewar total.

Competition for sales is stiff. Beginners must compete with experienced agents, and they frequently find it hard to earn a satisfactory income for the first few years. Many of the new agents become discouraged and take other jobs. More and more companies, however, are financing beginning agents to carry them through the initial period when they are learning the business and getting established. Industrial agents have a guaranteed income from the start.

Over the long run there will be a tendency for life insurance companies to have fewer agents, although the volume of insurance sold is expected to increase as the population grows and national income rises. Improved methods of selection and training and financial assistance to new agents will probably result in an increasing number of successful agents while the total number of agents employed drops off. Insurance companies are raising hiring standards and frequently give preference to college graduates. Many companies give tests which help determine an applicant’s chance of success.

Opportunities for life insurance agents will be found throughout the country. The best place to start is generally in one’s own community, where one has the most friends and acquaintances. Places which have had recent increases in population and income are likely to offer more favorable opportunities than other localities, but there may be offsetting factors. California, for example, has had very great population and income growth, but it already has many more agents than ever before.

Earnings

Earnings of experienced life insurance agents vary widely. A great majority have moderate incomes, but a small number of the most successful agents have earnings ranging up to $100,000 or more a year.

In addition to the commission an agent receives when he sells a policy, he gets a commission on the premiums paid for several years thereafter, the number of years depending on the company. These renewal commissions enable an agent to increase his income over a period of years, even though he sells about the same amount of insurance each year. Moreover, some companies pay an agent a service fee as long as a policy remains in force.

Where To Go for More Information

General agents or managers of life insurance company branch offices can supply information not only on employment opportunities in the particular locality but on their companies’ methods of selecting, training, and compensating agents. Other questions, including how to prepare for life insurance work, may be addressed to the following organizations:

Institute of Life Insurance,
488 Madison Ave.,
New York 22, N. Y.

Life Insurance Agency Management Association,
115 Broad St.,
Hartford 5, Conn.

For information about securing a license, write to the department of insurance at any State capital.

See also Home-Office Underwriters, page 473, and Property, Casualty, and Surety Insurance Agents and Brokers, page 475.

Property, Casualty, and Surety Insurance Agents and Brokers

(D. O. T. 1-57.10)

Outlook Summary

Many openings each year in this large occupation. Long-run trend in employment upward.

Nature of Work

Broadly, there are two groups of insurance agents—those who sell life insurance (see p. 474)
and those who specialize in insurance of other types. The latter group, plus insurance brokers, are the ones covered by this statement. They sell policies covering accidents and sickness, loss or damage to property, and liability for financial or bodily damage to a third person. They also sell surety bonds which protect the holder against loss resulting from his failure to complete a contract or fulfill an obligation, fidelity bonds which guarantee against loss resulting from the dishonesty of employees in positions of trust, and transportation, inland marine, and marine policies.

Brokers do not directly represent, and are not under contract to any particular insurance company. They select policies from whichever copy best meets their client’s needs. The broker orders the policy he wants, while the agent writes the policies for the companies he represents. Brokers, like agents, may operate as individuals, although a few brokerage firms are very large and have offices throughout the country.

How to Enter

To become an agent or broker, one must first meet the licensing requirements of the State where he expects to operate. The States generally require licenses for insurance agents and brokers, and in many of the States those who wish to take out a license must pass written examinations. Agents must have contracts with the insurance companies whose policies they sell. Agents and brokers can start selling with little capital but those in the business full-time usually have the cost of maintaining offices.

An expert knowledge of the chosen branch of insurance is necessary for the newcomer’s success. Therefore, to prepare for work as an agent or broker, one should take courses in insurance and related subjects in a college, evening high school, or correspondence school, or with a trade association or insurance company. New agents sometimes have periods of on-the-job training when they are first hired and, in any event, usually work under close company supervision for a fairly long time. Since the broker is on his own once he starts in business, it is particularly important for men planning to enter this type of work to have good education and training. Experience as an agent is helpful background for those who want to set up brokerage offices.

Outlook

There will be many opportunities for men to become agents or brokers in the fifties. Although it is relatively easy to enter this field, men who do not know the business thoroughly may find it hard to make a living. Competition for business is keen, and established agents and brokers have a great advantage over beginners in making sales. It generally takes several years for an agent or broker to earn a satisfactory income from insurance sales alone. Earnings of experienced agents and brokers vary greatly.

The number of successful agents has had an upward trend in the past and probably will continue to increase. An increasing volume of insurance probably will be sold because of such factors as increasing property values, States requiring compulsory automobile insurance, and growing interest in health, accident, and group retirement insurance. While the number of agents will not grow proportionately with a rise in the volume of insurance sold, an increasing number of persons probably will be able to achieve success in this field. Moreover, as older agents and brokers die or retire there will be opportunities for younger men to take over their business.

Openings for agents will be found throughout the country. Brokerage opportunities, however, will be mainly in large cities, such as New York, Philadelphia, Chicago, San Francisco, and Los Angeles. In general, the best place to start is in one’s own community, where one has the widest contacts. Places which have had recent increases in population and income will offer more favorable opportunities than other localities, but there may be offsetting factors. California, for example, has had very great population and income growth, but it already has many more agents and brokers than ever before.

Where to Go for More Information

General agents or managers of insurance company branch offices can supply information not only on employment opportunities in the partic-
ular locality, but on their companies' methods of selecting, training, and compensating agents. Questions on how to prepare for general insurance work may be addressed to the National Association of Insurance Agents, 80 Maiden Lane, New York 7, N. Y., or to State or local associations of insurance agents. Information on training courses is available from NAIA educational division at the above address.

For information about securing a license, one may write to the Department of Insurance at any State capital.

See also Home-Office Insurance Underwriters, page 473; and Life Insurance Agents, page 474.
RESTAURANT OCCUPATIONS

The custom of “eating out” has created one of this country’s largest industries. During 1948, people spent more than 12 billion dollars for meals and beverages in about 350,000 places specializing in serving foods and beverages and in hotels, clubs, and a great variety of other eating and drinking places. This was about a third of the amount spent for food consumption at home.

To serve these meals and beverages requires a great army of workers, more than 1.3 million in 1948. In restaurant dining rooms are waiters and waitresses, head waiters, hostesses, bus boys, and cashiers. The kitchens have not only cooks and chefs, but vegetable cleaners, dishwashers, and a variety of other kitchen helpers. Also employed in the industry are restaurant and cafeteria managers, dietitians, stewards, bartenders, countermen, and many others.

For several decades the tendency to eat meals outside one’s home has been growing, and this has been reflected in an upward trend in restaurant employment. The increase in restaurant sales was greatly accelerated during the war, by rationing and food shortages and the fact that many workers who had migrated to other cities for war jobs were without cooking facilities. Restaurant sales continued to increase moderately during the postwar years, but employment and the number of firms in operation began to decrease in 1948, and continued to decline in 1949. Increased defense preparations, however, probably will stimulate the restaurant business. Over the long run employment will tend to increase slowly.

An increasing number of colleges are offering courses in various phases of restaurant operation. In addition, there are many vocational schools throughout the country where training in institutional cooking and other restaurant operations is available.

The following reports describe employment opportunities in four of the industry’s largest occupations: Restaurant and cafeteria managers, cooks and chefs, waiters and waitresses, and beverage-service workers.

Additional information on training, employment opportunities, earnings, and other subjects may be obtained from large hotel and restaurant chains, local superintendents of schools or boards of education, State hotel associations, State restaurant associations, and:

Educational Director,
National Restaurant Association,
8 S. Michigan Ave.,
Chicago, Ill.

Hotel and Restaurant Employees and Bartenders
International Union, AFL,
528-30 Walnut St.,
Cincinnati 2, Ohio

The Official Hotel Red Book and Directory, which is available at most hotels and libraries, gives addresses of the secretaries of State hotel associations and of all hotels and hotel chains.

People interested in opening their own restaurants will find useful information in:


Restaurant and Cafeteria Managers
(D. O. T. 0-71.21 and .23)

Outlook Summary

Employment of restaurant managers in the early fifties will remain about the same as in 1949. Some experienced restaurant workers will be able to advance to managerial positions to replace men who die or retire. Long-run upward trend in employment.

Duties

Managers have over-all responsibility for the operation of restaurants and cafeterias, including dining rooms and cafeterias operated by hotels, schools, factories, clubs, and public institutions. Their duties include hiring personnel, supervising and assigning duties to employees, esti-
mating amounts of food needed, keeping records on inventories, cooperating with the cook or chef in planning menus, handling customers' complaints, and buying food and equipment. In the largest eating places, some of these duties are delegated to one or more assistant managers. Many restaurants are managed by their owners.

This report covers only persons who spend most of their working time on managerial duties. Small eating places seldom have full-time managers.

Qualifications and Training

Several years of experience in restaurant work are needed to qualify as a manager. Larger restaurants usually require at least a year's experience as an assistant manager. Some establishments hire prospective managers and assign them for brief periods to a series of different jobs, to give them a chance to learn all aspects of the business.

It is usually necessary to have a high school education, and a 2- to 4-year college course in foods and restaurant management is often required. An increasing number of colleges are offering such courses. College-trained persons often start as assistant managers or supervisors in the larger eating places. Managers should have a thorough knowledge of food buying and storing, food preparation, menu making, and cost accounting. The ability to organize and supervise a large staff of workers is essential. In addition, managers must understand sanitation and be qualified to make daily sanitary inspections and to fill out the required reports.

Outlook

There will be little expansion in employment during the early fifties. Most of the employment opportunities will arise as restaurant and cafeteria managers die, retire, or leave the occupation for other reasons. Persons with experience in the trade—waiters, cooks, and others—have frequently been promoted to managerial positions and given on-the-job training, but there is a trend toward hiring and promoting those with specialized schooling in restaurant management. Hotels which operate large restaurants are among the employers giving preference to persons with college degrees who have specialized in restaurant work. Many restaurant and cafeteria managers are women.

There will be a long-run upward trend in the employment of managers. Such factors as rising per capita income and the shift of population to metropolitan areas where “eating out” is more common will bring about a gradual increase in restaurant business. There will also be a larger number of schools, factories, and other institutions which operate restaurants and cafeterias.

Cooks and Chefs

(D. O. T. 2-26)

Outlook Summary

Numerous openings annually as replacements for those who leave the occupation. Long-run upward trend in employment.

Nature of Work

Cooks and chefs are employed not only in about 350,000 places specializing in serving foods and beverages but in hotels, boarding houses, railroad dining cars, ships, hospitals, clubs, and many other places. Those who work in private homes or who prepare only a limited number of short-order dishes in very small eating places are not covered by this report. A great many of the 336,000 cooks reported in the 1940 Census were of the latter type. Of all cooks, chefs, and assistants employed in 1940, three-fifths were men, two-fifths women. Men hold most of the top jobs, however.

In eating places with large staffs, cooks usually specialize in preparing different types of food. In smaller establishments, on the other hand, each cook may handle many different types of work. In some places, one cook does all the work, assisted by one or two kitchen helpers. Cooks frequently cannot transfer from one sort of eating place to another without additional training because of the wide variations in the way foods are prepared and because restaurants specialize in different types of dishes.
How To Enter

An apprenticeship or equivalent on-the-job training lasting at least 3 years is generally needed to become a skilled, versatile cook. As a rule, it takes a number of additional years of training and experience to become a chef or head cook, especially in the larger and higher-grade places. The training period for the various cook specialty jobs is usually 1 to 2 years. Many people enter the trade after serving for varying lengths of time in other kitchen jobs, such as vegetable cleaner, pot washer, and dish washer.

Preparatory training in one of the large number of vocational schools which give courses in this work is helpful to those seeking beginning jobs.

Outlook

Each year thousands of openings arise through turn-over in low-price restaurants. As a rule, the jobs go to persons with experience in restaurant kitchen work. Inexperienced workers will almost always have to start as kitchen helpers. Because of high turn-over, there will be thousands of openings in kitchen helper jobs each year in the early fifties.

It will continue to be very difficult to get the best positions in this occupation—those in the kitchens of big hotels and high-price restaurants. Chefs and cooks who occupy these spots usually have a special talent for their work in addition to years of cooking and other restaurant experience. There are few such jobs, and the competition for vacancies is very keen.

Over the long run, employment of chefs and cooks probably will increase as more and more people eat some of their meals in restaurants.

Earnings and Working Conditions

There are wide differences in earnings, depending upon such factors as the worker’s skill, the type of eating place, and the part of the country in which it is located. Union wage rates for station cooks in many large cities in late 1949 ranged from about $12 to $15 a day. A typical workweek for cooks is 48 hours. In some eating places, employees are on a split shift. Unionization of cooks varies throughout the country and within a community. The major union in this field is the Hotel and Restaurant Employees’ and Bartenders’ International Union, AFL.

See also Restaurant and Cafeteria Managers, page 478.

Waiters and Waitresses

Outlook Summary

Turn-over will create many thousands of openings yearly in this large occupation. Long-run employment trend upward.

Nature of Work

Waiters and waitresses are employed in many different types of eating places, including restaurants, hotels, bars, night clubs, boarding
houses, passenger ships, and railroad dining cars. In addition to taking guests' orders and serving food and beverages, they set tables, make out checks, sometimes collect payments, and handle other duties. In many eating places which do not have bus boys they also clean off the tables. Generally, higher grade establishments employ the more skilled and experienced workers. Many restaurants employ captains or hostesses, head waiters or head waitresses, who supervise the other dining room employees and conduct guests to tables.

**How To Enter**

One way to enter the occupation is to start as a bus boy or bus girl. Some restaurants fill waiter and waitresses jobs only by promoting people from these beginning positions or hiring workers with experience in waiting on tables. Other places may require that inexperienced applicants have vocational school training for the job. Some places will take on workers without any restaurant experience, give them a few weeks' training, and then start them out waiting on a small number of guests. Still other restaurants, usually the expensive places, prefer to hire only waiters and waitresses with at least a year's experience.

Vacancies in supervisory jobs are usually filled by promoting or hiring experienced waiters or waitresses. Supervisory workers may sometimes advance to managerial positions.

Two-thirds of the 525,000 workers in the occupation in 1940 were women. In the more exclusive eating places, however, men outnumber women workers.

**Outlook**

Thousands of women and some men will be hired each year to fill jobs in low-price restaurants. This type of establishment, which usually employs mostly women, typically has high turn-over. Moreover, turn-over is likely to increase in the early fifties as it becomes easier to shift to other types of jobs.

Positions in higher-price restaurants, which employ mostly men, will be much harder to get. Because men predominate in these places and because they usually earn much more than waiters and waitresses in the low-price restaurants, turn-over is comparatively small. Moreover, the better restaurants have much higher job standards than low-price establishments. Newly hired waiters are expected to have considerable experience, skill in pleasing customers, and a knowledge of how to serve fine foods.

Over the long run, employment in both types of eating places will increase as the population grows and per capita income rises.

**Earnings and Working Conditions**

Earnings in this occupation depend not only on the wages received, but also on tips, which vary considerably, depending on such factors as the skill of the worker and the type and location of the restaurant. Generally, union wage rates in late 1949 were $4 to $5 a day, exclusive of tips. Bus boys and girls, who ordinarily do not receive tips, are often paid slightly higher wages than the waiters and waitresses they assist. Both groups of workers receive one or more free meals a day in many cases.

Many of these employees work 48 hours a week, though some have shorter hours and others much longer ones. Split shifts are fairly common. The work requires employees to be constantly on their feet.

Many waiters and waitresses, especially in large cities and the Far West, East, and Middle-West, are union members. The principal union in the field is the Hotel and Restaurant Employees' and Bartenders' International Union, AFL.
Beverage-Service Workers

(D.O.T. 2-21.10)

Outlook Summary

Several thousand job openings each year in early fifties, owing to deaths, retirements, and other turn-over.

Nature of Work

These workers are employed in hotels, restaurants, and other places, such as bars, taverns, night clubs, taprooms, and cabarets, which sell alcoholic beverages. The group includes bartenders, bar boys, wine stewards, and bar waiters and waitresses.

Bartenders mix and serve many types of alcoholic beverages to order. In service bars, drinks prepared by the bartender are served by waiters. In public bars, bartenders serve as well as mix drinks and collect payment. Bar boys perform such duties as carrying in supplies, taking out empty bottles and trash, chipping ice, washing and drying glasses, and sometimes mixing simple drinks. Wine stewards—employed only in large or high-grade establishments—are in charge of the ordering, storing, and issuing of wines and liquors.

How to Enter

Most bartenders learn the trade through on-the-job experience. Bar boy is a beginning job, which after 6 or more months may lead to promotion to bartender work as helper or assistant to an experienced man; then, after perhaps another 6 months, to a regular bartender job. Sometimes a bar boy may be promoted to bar waiter and thereafter to bartender. Schools give courses in this work, usually of 3 or 4 weeks’ duration, which are sometimes helpful in qualifying for assistant bartender positions.

In some of the larger establishments, a bartender may advance to head bartender and to wine steward.

Outlook

It is estimated that there will be about 3,000 openings each year owing to deaths and retirements among the estimated 150,000 workers in this occupation. Replacements will also be needed for the bartenders who leave their jobs for other reasons. Turn-over is likely to be greater in the early fifties, than in 1948 and 1949, because it will be easier to shift to other types of work and because younger bartenders will be entering military service.

Generally, the best chance of jobs for beginners will be as bar boys in service bars, where they can work with experienced men. Some experienced bartenders will be able to establish their own businesses. There will be few opportunities to be promoted to wine steward, since this is a very small occupation.

Earnings and Working Conditions

Typical wages of bartenders were about $50 to $70 a week in some large cities in late 1949; those of assistant bartenders about $35 to $50; and those of bar boys around $25 to $30. Salaries vary, however, from one locality to another. Meals and uniforms are furnished by the employer in many establishments. The usual work schedule is 8 hours a day, 6 days a week.

Unionization is fairly common in cities except in the South. The major union organizing these workers is the Hotel and Restaurant Employees’ and Bartenders’ International Union, AFL.

See also Waiters and Waitresses, page 480.
HOTEL OCCUPATIONS

The typical modern hotel in this country is not simply a lodging place but a complex organization offering many kinds of service to its guests—from providing them with food and doing their laundry to helping them get theater tickets and make travel arrangements.

To furnish these many different services, year-round hotels employed about 360,000 workers in 1949. A great many different kinds of workers are employed, such as managers, clerks, skilled maintenance men, restaurant and kitchen workers, housekeepers, maids, and bellmen. The qualifications for these jobs are so varied that men and women with very different educational backgrounds, personalities, and skills can find jobs in the hotel industry.

The Hotel Industry

A large majority of the workers in this industry are employed by a relatively small number of hotels. Of the 28,000 hotels in 1939, 3,000 large ones—ranging in size from 100 to more than 1,000 rooms—had about three-fourths of the employees. (See chart 82.) In 1948 there were 29,000 hotels.

Small hotels are located in a great many communities throughout the United States, but the big hotels are found mostly in the larger cities. In 1939, 10 cities had over a third of all the hotel workers in the Nation. These were New York, Chicago, San Francisco, Washington, Boston, Atlantic City, Los Angeles, Detroit, St. Louis, and Philadelphia. As would be expected, New York had far more hotel workers than any other city—about an eighth of the workers in the whole industry.

The location of resort hotels depends on many factors, including climate, scenery, nearness to cities, and availability of recreation facilities and entertainment. In 1939, three-fifths of the resort hotel employment was concentrated in only five States—Florida, New York, New Jersey, Maine, and California.

Of the three types of hotels—commercial, residential, and resort—commercial hotels are the most numerous and employ by far the greatest number of workers. Residential hotels, which let most of their rooms for relatively long periods, and resort hotels, which cater to vacationers, are fewer and employ a small proportion of the hotel industry.

CHART 82

Most of the Hotel Workers Are in the Few Large Hotels

Percent Distribution, 1939

<table>
<thead>
<tr>
<th>Number of Rooms</th>
<th>Percent of Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 25</td>
<td>40</td>
</tr>
<tr>
<td>25-49</td>
<td>30</td>
</tr>
<tr>
<td>50-99</td>
<td>20</td>
</tr>
<tr>
<td>100-299</td>
<td>10</td>
</tr>
<tr>
<td>300 or more</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Census of Business
workers. Many resort hotels, especially those in the North, are open for business only part of the year. A number of resort hotel owners have hotels in both the North and South. These hotels often transfer parts of their staffs, especially the supervisory workers back and forth from season to season. Much of the remaining staff is made up of temporary workers hired locally and college students.

**Hotel Occupations**

A great variety of jobs are to be found in large hotels. In the executive department of a big hotel, there is likely to be a general manager, a personnel director, a publicity director, sales and advertising managers, and other executive and junior executive workers. The front-office employs such workers as mail clerks, room clerks, reservation clerks, and the front-office manager. In the accounting department are auditors, bookkeepers, office-machine operators, cashiers, and other clerical workers. The housekeeping department includes not only the housekeeper and her assistants and the chambermaids, but also housemen to do heavy cleaning, furniture polishers, seamstresses, decorators, upholsterers, and others. Headed by the superintendent of service, the service department employs such workers as bellmen, elevator starters and operators, and doormen.

The restaurant department, which usually has the greatest number of workers (see chart 83) includes chefs, cooks, and kitchen helpers, and occasionally dietitians or food purchasing and control men; the steward and his staff—pantrymen, storeroom employees, dishwashers; and waiters, bartenders, and other food and beverage service workers. In the maintenance department one finds such workers as stationary engineers, electricians, plumbers, carpenters, and painters. In addition, there may be laundry workers, barbers, valets, and tailors.

Although small hotels do not have nearly as many different occupations as this, practically all of them employ front-office, housekeeping, and maintenance workers, and some have restaurant workers and service employees such as bellmen.

A number of occupations—including front-office clerk and bellman—exist only in hotels. However, many of the occupations in hotels—for example, accountant, carpenter, cook, waiter—are found also in other industries. In these occupations, the work performed and the training required are much the same in hotels as in other fields, and hotel employees make up only a small proportion of all employed workers. The employment opportunities for these occupational groups are affected by general conditions in their trades.

Young people interested in a career in hotel work usually have to begin at the bottom of the ladder—in jobs such as bellman, elevator operator, clerk, or maid. From these entry jobs, they may be promoted to supervisory positions, if they have the needed personality and ability. Exceptionally able and well-qualified men may advance eventually to managerial jobs, but more and more of these jobs are going to men with college backgrounds, including specialized training in hotel work. Courses leading to a degree in hotel management have been offered by several universities for a number of years. This field attracted hundreds of students after the end of the war. In addition, there are numerous summer, evening, and extension courses being offered by these universities which are suitable for people without a college education. Such short courses may be very helpful to people already employed in the hotel field in advancing to more responsible positions.

**Employment Outlook**

Employment in year-round hotels is likely to remain near the 1949 level of about 360,000 through the early fifties, at least. It is unlikely that many new hotels will be built, since the present number of hotel rooms is considered adequate to meet any ordinary demand for accommodations that can be foreseen for some years ahead. Whenever the work force in a hotel is cut sharply, employment in some occupations such as maids and kitchen helpers is greatly affected, but employment in others, such as supervisory jobs, tends to hold up better.

Over the longer run, the number of hotel workers is likely to rise slowly. Our population is growing, per capita income is rising, and more and more workers are getting paid vacations. These factors make for a greater amount of traveling about the country and increase the demand for
places to sleep and eat. Some of this growing demand will be taken care of by tourist cabins and other lodging places, but hotels will also benefit.

Although hotel employment is not expected to increase for the next several years at least, there will be thousands of openings each year as workers die, retire, or leave their jobs for other reasons. Turn-over will vary widely from one hotel occupation to another. In general, openings in the higher paid positions which require considerable training and experience will be few compared to the number of openings in such beginning jobs as maid, kitchen helper, or elevator operator, which usually require no training or experience and pay low wages. Not only are there fewer workers in such groups as chefs, superintendents of service, housekeepers, and auditors than in beginning jobs, but turn-over in the more responsible positions is usually much lower than in the beginning jobs.

For some of the better paying hotel occupations, opportunities will be relatively better than in others. In the food and restaurant end of the hotel business, for example, there is a demand for trained managers to work on food production, control, and purchasing. Graduates from college courses in foods, restaurant administration, or institutional management should therefore have good chances to find jobs in the hotel field in the early 1950's. Men are much in demand in this field, but well-trained women also have good prospects.

Most of the vacancies which will arise in hotel jobs will continue to be filled by promoting workers from lower ranks. Increasingly, however, promotions to top positions will require formal training in addition to hotel experience. More and more of the executive positions, for example, will be filled by men who, in addition to experience in the field, have had hotel or other specialized training in colleges. Even persons who have college training must start near the bottom of the job ladder.

Front-Office Clerks
(D. O. T. 1-07)

Outlook Summary

Limited numbers of applicants will be hired in the early fifties, to fill vacancies created by turn-over. Experienced hotel workers will get preference over inexperienced outsiders. Some growth in employment expected in long run.

Duties

The duties of front-office clerks in hotels include renting rooms to incoming guests; acknowledging room reservations received by telephone or mail and filing reservation cards; handling guests' complaints; issuing and receiving room keys; supplying information about arrivals and departures of guests and about local points of interest; delivering messages; and taking care of incoming mail.

In small hotels with few employees, one clerk may do all this work by himself or with the help of one or two assistants. Where there is a large staff, however, employees usually specialize in different types of work. In such cases, beginners are assigned routine jobs such as those of key clerk, information clerk, or mail clerk, and there are also higher-grade clerks with such titles as room clerk, desk clerk, or front-office manager, who supervise other clerical workers in addition to handling the more difficult and responsible work.

How to Enter

Men are generally preferred for front-office clerical jobs. Openings in beginning jobs are filled sometimes by hiring inexperienced outsiders, sometimes by promoting bellmen, switchboard operators, or other workers already employed in the hotel. Positions of higher grade are usually filled by promotion from within but, in some instances, by hiring experienced clerks from other hotels. A supervisory clerk may be promoted to assistant manager, and, after becoming familiar with the operation of other departments of the hotel, may possibly become general manager.

As a rule, applicants should have at least a high school education. Increasingly, preference is being given to those who have completed a 2- or 4-year college course in hotel management. Men without college training may find vocational school courses in hotel work an advantage in getting a job. No matter how much formal education a person may have, however, he must start...
out at an ordinary beginner's job. However, those with a good educational background are more likely to progress to managerial positions.

**Outlook**

Several hundred vacancies will arise each year as a result of turnover, including men entering the armed services during the early fifties. Preference in filling these vacancies in the front-office will be given to workers with hotel experience. However, an increasing number of jobs will go to graduates of college courses in hotel training. Over the long run, employment in this and other hotel occupations probably will rise slowly, owing to such factors as the increasing demand for hotel rooms and the trend toward a shorter workweek for hotel employees. Front-office clerks usually have steady employment over a long period of time.

**Earnings and Working Conditions**

According to a survey of year-round hotels in 18 large cities, straight-time average hourly earnings of male room clerks in July 1948, ranged from 86 cents to $1.29, with the majority of cities paying $1 or more; desk clerks earned from 73 cents to $1.23 an hour. Wages for women desk clerks in the 8 cities for which information was available, were somewhat lower, ranging from 72 to 89 cents an hour. Pay is highest in the large hotels in metropolitan centers.

The typical workweek was 48 hours for front-office clerks in the majority of hotels in mid-1948. Since hotels provide 24-hour service, some employees must work at night. Practically all hotels covered in the survey gave paid vacations, usually 1 week after the first year and 2 weeks' vacation after 2 to 5 years' service. There is some unionization among front-office clerks in the big hotels in a number of large cities.

*See also* Hotel Managers, page 491; Bellmen, page 487; Bell Captains, page 488; and Superintendents of Service, page 488.
Bellmen
(D. O. T. 2-22.11)

Outlook Summary

Turn-over in this occupation likely to be higher in the early fifties than in 1948 and 1949. Employment expected to rise somewhat over long run.

Duties

Bellmen’s work includes ushering guests to their rooms and carrying their baggage in and out of the hotel, running errands, delivering messages and packages, and supplying various types of information to guests. They also help to set up sample rooms for salesmen, buy transportation tickets, and arrange for shipment of express articles. In some instances, bellmen act as relief men in such jobs as elevator operator and switchboard operator.

How to Enter

The way of entering these occupations differs from one hotel to another. Some hotels fill openings only by promoting workers already employed by the hotel—most often elevator operators and starters—whereas, some hire workers with experience in other hotels. A good many hotels, especially the smaller ones, hire outsiders without previous hotel experience. In a few localities training courses for bellman jobs are given by the public schools; completion of such a course is generally helpful in obtaining work.

Lines of Promotion

A man who wishes to advance from the job of bellman may aspire to be bell captain. The second step up is to become superintendent of service. Some workers have a chance to transfer to front-office clerical jobs, which may enable them to advance eventually to managerial positions. Moreover, bellmen sometimes increase their earnings by moving to jobs of the same kind in better-grade hotels.

Outlook

There will be many openings arising through turn-over in the early fifties. The occupation is made up mainly of young men, few of whom plan to be bellmen over a long period of time. For this reason turn-over is typically high and probably will tend to increase in the early fifties. Many bellmen will enter the armed services and many will be able to shift to better paying jobs because of the generally favorable job market. Over the long run employment of bellmen is likely to grow slowly as demand for hotel accommodations increases and the workweek is shortened.

Earnings and Working Conditions

Bellmen are paid a low basic wage by the hotel, and depend on tips for the major part of their income. Union wage rates in large cities in late 1949 were about $3.50 a day, exclusive of tips, for bellmen on a 6-day week, and more for those on a 5-day week. Tips vary greatly from one hotel to another and at the same hotels, and amounts received also vary among individual bellmen. Earnings are usually highest in the big hotels.

The usual work schedule is 8 hours a day, 6 days a week, although some recent union contracts call for a 5-day week. Some men are on duty at night, since hotels provide service 24 hours a day. Paid vacations, consisting usually of 1 week after a year’s service, and 2 weeks after 2 to 5 years’ service, are common. Some hotels also give their employees insurance policies for accidents, sickness, death, and hospitalization.

Most bellmen in the large hotels outside the South are represented by the Hotel and Restaurant Employees’ and Bartenders’ International Union, AFL, and in a few places by the Building Service Employees’ International Union, AFL.

See also Hotel Managers, page 491; Bell Captains, page 488; Superintendents of Service, page 488; and Front-Office Clerks, page 485.
Bell Captains

*(D. O. T. 2-22.01)*

**Outlook Summary**

Positions nearly always filled by promoting experienced bellmen. Opportunities for such promotions will be limited during the early fifties. Gradual increase in employment over the long run.

**Duties**

These supervisory employees are to be found in almost all medium-sized and large hotels, though seldom in small hotels that have only a few service workers. It is the bell captain's job to assign work in rotation to bellmen and to keep time records. He is responsible for instructing new employees, interviewing job applicants, investigating and adjusting guests' complaints relating to the work of his department, and deciding what action should be taken on unusual requests for service. He usually has an expert knowledge of train and airplane schedules. The bell captain, in addition to his duties, may occasionally perform bellman's work.

**How to Enter**

Bell-captain positions are usually filled by promoting one of the bellmen employed by the hotel.

From the job of bell-captain, a man may advance to the position of superintendent of service.

**Outlook**

Only a small number of bellmen will be promoted to bell-captain positions in the early fifties to fill the few vacancies that arise from turn-over. Competition for these jobs will therefore be very keen. Employment in this small occupation will tend to be stable over the long run, since big hotels have bell captains in both good and bad times.

**Earnings and Hours of Work**

Basic weekly wages have risen somewhat since 1946, when they were roughly $35 to $45 a week, according to scattered data from a few large cities. Total earnings were much higher, however, because of tips. The amount earned in tips varies from one hotel to another, depending on such factors as the type of hotel or the kind of clientele it caters to. The usual work schedule is 8 hours a day, 6 days a week.

See also Hotel Managers, page 491; Bellmen, page 487; Superintendents of Service, page 488; and Front-Office Clerks, page 485.

Superintendents of Service

*(D. O. T. 2-25.11)*

**Outlook Summary**

Positions in this small occupation usually are filled by promotion. Such openings will be limited in the early fifties and also over the long run.

**Nature of Work**

Hotel service departments include such employees as bellmen, elevator operators and starters, doormen, and washroom attendants. At the head of the service department in some large hotels is the superintendent of service. He hires, instructs, disciplines, and discharges employees in his department. In addition, he confers and cooperates with the people in charge of other departments—for example, the chief clerk and the housekeeper—and he may also make out the payroll for his department. In smaller hotels, these duties are performed, as a rule, by the assistant or general manager, the room clerk, or the bell captain (who may be called working superintendent of service).

**How To Enter**

Most superintendents of service have been promoted from the job of bell captain. To become a superintendent of service usually requires many years of hotel experience. Occasionally, men transfer from this position to a front-office clerical job, with the aim of advancing eventually to a managerial position. Sometimes superintendents of service move to better-paying positions of the same type with larger hotels.
HOTEL OCCUPATIONS

Outlook

Very few job opportunities are expected in the early fifties in this small occupation, numbering only in the hundreds. The openings which will arise as men die, retire, or leave their jobs for other reasons, will be filled in most instances by promotions of men already working in hotels. There will be little or no expansion in employment. This occupation is little affected by declines in general business activity. The small group of men who succeed in obtaining positions in year-round hotels can expect steady employment for many years.

Earnings and Hours of Work

There has been a considerable increase in wages since 1946, when typical weekly pay ranged from $40 to $60, according to scattered data from some large cities. A few men who worked in very large hotels earned more. Tips are seldom received, but meals may be provided by the hotel. The number of hours of work per day and per week vary greatly, depending upon the pressure of work.

See also Hotel Managers, page 491; Bellmen, page 487; Front-Office Clerks, page 485; and Bell Captains, page 488.

Hotel Housekeepers and Assistants

(D. O. T. 2-25.21)

Outlook Summary

Housekeeper positions filled by promoting hotel workers with years of experience. Small number of vacancies arising from turnover in the early fifties. A few women with no experience in hotel work will be hired as inspectors or assistant housekeepers. Some expansion in employment over long run.

Nature of Work

The hotel housekeeper is responsible for keeping the furnishings, rooms and halls clean and attractive. She supervises the work of room maids, linen maids, wall and window washers, furniture polishers, housemen (who do heavy cleaning), and seamstresses. Generally, she hires and discharges employees in her department. In addition, she buys or assists in the buying of supplies, reports expenditures to the manager, prepares a summary of the time worked by employees in her department, takes periodic inventories of supplies, and trains new employees.

Large hotels have an executive or head housekeeper and also one or more assistant housekeepers and floor housekeepers or inspectresses. In small hotels, on the other hand, there is only one housekeeper (often called a working housekeeper) who not only handles all the supervisory duties by herself but may, in addition, do some of the work of a maid.

How To Enter

Openings for housekeepers are usually filled by promotions from within the hotel, or by hiring women who have performed similar work in another hotel. Women who have been doing housekeeping in private homes do not have the type of experience which qualifies them for supervisory positions in hotels. Mature women, usually over 35 years of age, are preferred for this work. Positions as inspectors or assistant housekeepers in large hotels are filled sometimes by hiring inexperienced women and giving them on-the-job training; sometimes by promoting linen maids, seamstresses, and occasionally chambermaids. From assistant supervisory jobs, promotion to the position of housekeeper is possible. Training courses for housekeeping jobs are given by the public schools in some localities which may be helpful to women wishing to enter the occupation.

Outlook

Only a small number of vacancies are likely to arise in housekeeping positions over the next several years. These openings will be the result of deaths, retirements, and other turnover, and will be filled mostly by women with years of hotel experience. However, there will be a somewhat larger number of openings at lower supervisory levels, such as inspectors or assistant housekeepers, some of which will be filled by women with no ex-
RESTAURANT AND HOUSEKEEPING EMPLOYEES ARE LARGEST GROUPS OF HOTEL WORKERS

PERCENT DISTRIBUTION OF EMPLOYEES IN YEAR-ROUND HOTELS, BY MAJOR OCCUPATIONAL GROUPS, 1939

1. RESTAURANT - 36.7%
2. HOUSEKEEPING - 26.5%
3. SERVICE - 12.9%
4. OFFICE AND CLERICAL - 11.0%
5. ENGINEERING AND MAINTENANCE - 4.7%
6. EXECUTIVE AND SALARIED OFFICERS - 2.0%
7. ALL OTHER - 6.2%

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Sources: CENSUS OF BUSINESS, SERVICE ESTABLISHMENTS, VOLUME III, 1939
"HOTEL BUSINESS" - BY R T HUNTINGTON, 1940
Employment in housekeeping occupations is not likely to increase much during the early fifties. Over the longer run, such factors as a possible expansion in hotel business and reduction in hours of work probably will create a need for a slowly increasing work force.

Earnings and Working Conditions

Earnings of housekeepers, according to limited data for large cities, were about $150 to $350 a month in large hotels and $75 to $100 in small hotels in early 1946. By late 1949, the rates were considerably higher. Assistant housekeepers and inspectors earn somewhat less. Besides their cash pay, housekeepers are usually given their meals and lodging. Assistant housekeepers are usually given free meals.

Maids were paid from 29 to 88 cents an hour in July 1948, according to a survey of year-round hotels in 18 large cities. Occasional tips may add a little to their earnings. In many States the minimum hourly rates which hotel housekeeping employees must be paid are established by law. Some employers provide insurance policies for accidents, sickness, death, and hospitalization. This occupation is fairly well organized in the larger hotels outside the South, by the Hotel and Restaurant Employees and Bartenders International Union.

Hotel Managers and Assistants

(D. O. T. 1-71.13)

Outlook Summary

Vacancies filled by promoting or hiring persons with years of experience in hotel work. Little expansion in employment during the early fifties and only slight growth over long run.

Nature of Work

Over-all responsibility for the operation of a hotel rests with the manager. It is his job to see that the different departments function efficiently, so that the guests are satisfied and the greatest possible profit is made. The manager has many duties to perform, such as hiring personnel, buying or supervising the purchase of supplies, directing publicity, introducing improvements in service, and determining rates and credit policies. In large hotels, some of these duties are assigned to assistant managers. In small hotels, on the other hand, the manager—who is frequently the owner—may also do front-office clerical work.

There were about 29,000 hotels in the country in 1948. Each of these has one manager; the big hotels also have one or more assistant managers.

How to Enter

Advancement to the position of manager is possible from many hotel jobs, including bellman, bookkeeper, and cook, but the most common line of promotion is from the front office. To qualify for promotion to manager, it is usually necessary to have a high school education and it is increas-
ingly helpful to have college training in hotel management. College-trained persons often start in such positions as room clerk, salesman, accounting clerk, storeroom clerk, or, in a small hotel, assistant or night manager. It is possible for high school and college-trained people to start in kitchen jobs; experience in the kitchen and steward's department is extremely valuable in qualifying for future managerial positions.

Persons need many years of well-rounded experience in hotel management and also a very considerable amount of capital to go into business for themselves as owner-operators of small hotels.

**Outlook**

Employment of hotel managers and assistants will expand very little in the future. Almost all of the vacancies which arise will be a result of deaths, retirements, and other types of turn-over.

The positions of hotel manager or assistant manager are almost always filled by promoting employees of the hotel or by hiring outsiders with a good deal of experience in hotel work. For such jobs, larger hotels select only men with exceptional ability and many years of experience. Competition for managerial jobs is always very keen. Small hotels are frequently managed by their owners.

In recent years, more and more manager and assistant manager positions have been filled by men with college training in hotel management. This trend will continue, and it will become increasingly difficult for men to rise through the ranks unless they have had special training. Even men with college training, however, will have to start near the bottom of the hotel's occupational ladder and work their way up by demonstrating their ability and capacity for work.

Most managers and assistant managers may look forward to continued employment over a long period of time. The long-run trend of employment will be slightly upward in these occupations.

**Earnings and Working Conditions**

Earnings of managers have an extremely wide range and largely depend upon the size of the hotel. In addition to a fixed salary, many managers receive a percentage of the profits. However, since hotel profits are sensitive to business fluctuations, that part of their income based on a percentage of the profits may vary considerably from year to year. Frequently managers are also provided with living accommodations and meals for themselves and their families.

*See also* Bellmen, page 487; Superintendents of Service, page 488; Front-Office Clerks, page 485; and Bell Captains, page 488.
Agricultural Occupations

GENERAL OUTLOOK FOR FARMING

Farming is not an easy occupation. Many kinds require long days of hard work, especially during the growing and harvesting seasons. Investment and operating costs for adequate size units are high and, in many cases, risks are great. If these cautions are observed, farming offers an excellent opportunity for vigorous, intelligent operators. Farming is not just one occupation. There are many types of farms requiring different qualifications and presenting varied opportunities in different parts of the United States.

The following descriptive material is arranged by groups of States to enable some geographical distinction among types of farms. This arrangement is unjust to the more commonly used generalized type-of-farming areas, such as the Corn Belt which stretches into parts of the Great Plains States and Lake States. However, it does allow more attention to the wide variety of farms appearing in all regions of the country and was selected largely for that reason.

Farming an Essential Industry

Food production is an essential in our national economy and, today, is fairly well protected by the Nation in the interests of conservation and...
adequate supplies of food. However, there is a substantial turn-over in farm operators. As in any business, hundreds of farmers go broke each year. Many thousands are relatively inefficient, which is not amazing in view of the fact that 10 percent of our farmers produce over half our food.

In 1950-51, in contrast to 1940 and the thirties the reserve labor force on farms is relatively small. Thousands of men are needed each year to replace the aged, the physically disabled (farm accident rates are high), and the economic casualties of bad financing or inefficient operation. In addition, there are thousands of farms that are too small or too poor in resources to offer an adequate living wage. However, these units may provide additional income to those receiving pensions or annuities. Though cash income from these “part-time” units is small, they do offer low living costs in inexpensive residences and food products for family consumption. It should be noted that residences in some areas are quite expensive in comparison with total farm investment. This is particularly true in the Northeast and in suburban areas of all regions.

Among widely varying factors to be considered in farm location are community facilities, including churches, schools, stores, transportation, recreation, entertainment, hospitals, and medical care. To some extent, facilities vary with the population; that is, more of them are available in the heavily populated areas. However, existence alone must be tempered by quality. Age, local customs, wealth, industry, kind of people, geography, and many other factors affect the acceptability of these facilities which, even in our great country, vary from excellent to very poor. Their impor-
When choosing a farm, the family must be kept in mind. Schools, churches, and other community facilities are important in the choice.

Farm Finances

The price of farms and the amount of money needed to start farming varies greatly. Potential farmers should not be discouraged by the high cost of certain types of farms, particularly in the Midwest. Many financial aids are available. More important is the fact that these costs represent owner-operated units of fairly well established farmers. In contrast, a large proportion of all farms are operated by tenants who lease land and buildings and use their capital for equipment and operating costs, including livestock. On this basis, a fairly large unit can be operated with a limited amount of capital. Many tenant farmers prefer such an arrangement and continue to lease although they could easily own their properties. Location during inflation is not impossible, but is likely to favor renting more than buying. Any assumed debt should be considered in relation to long-time earning capacity of the farm.

Some idea of the opportunities in farming in different regions of the country can be obtained by examining farmers' reports of their incomes and investment in 1945. Farms are grouped in table 1 by economic classes, as determined largely by the value of what farmers sold or used in their own living. Every region has some large-scale and many very small farms in each. This is the basis for saying that there is a greater variation of opportunity within each region than there is among regions; or, perhaps, that a man with determination can pick any area of the country he likes and make a good living on the right farm in that area. However, it may be a little easier where reports show that there is a larger number of fairly prosperous farms.

Some idea of changes in net income from year to year can be gained by looking at those of farms.
selected from various parts of the country (table 3). These net incomes differ widely by type; but the changes from the prewar years to 1948 are more significant because they show what can happen to income on just one farm. Winter-wheat farms had the greatest fluctuation in income while dairy units tended to be most stable.

Study of the information in tables 1 and 2 gives some idea of the amount of money needed to run farms of different sizes in different parts of the country. This information also indicates the limited incomes that can be expected and the difficulties to be faced if farming is started on a shoestring. These difficulties are not so much a barrier to prospective farm operators, as they are a warning that unusual care should be used in selecting the right farm. Any individual judgment should be aided by consulting all local sources of advice in respect to proper size, type of farming, location, and prospective return. In most cases, this will be necessary to obtain the loan to start farming. In any case, such consultation will be important if the prospect hopes to become a prosperous member of the farming community.

Farm Training

Much depends on the training the individual receives for farming. Obviously, there are excellent and poor schools, with many in between. Also, a good school may not be available in the area or for the type of farming selected. The choice of a school should be very carefully discussed by the counselor and, if crowded conditions prevent free selection, it may be desirable to do some apprentice training in the chosen area before going to school. Owing to the very general nature of the advice presented here, purchase of an actual farm before schooling is not recommended.

Type of Farm

The use of the word “type” in the discussion of farming may be confusing. Type, in this context, denotes the major source of income. Thus, by definition, a dairy farm obtains over 40 percent of its gross income from dairy product sales and no other source approaches 40 percent. More detailed analysis would point out that very few farms receive all their income from only one source; thus, we have dairy-poultry, dairy-hog, corn-hog-beef cattle, cotton-peanuts, cattle-potato, and literally hundreds of similar combinations. Also, very few areas are completely dominated by

Table 1.—Number and average size of farms by economic class, United States, 1945 1

<table>
<thead>
<tr>
<th>Economic class</th>
<th>U.S.</th>
<th>North</th>
<th>South</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of farms (in thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large-scale units</td>
<td>102.1</td>
<td>10.6</td>
<td>31.9</td>
<td>60.6</td>
</tr>
<tr>
<td>Large family farms</td>
<td>4068.9</td>
<td>10.6</td>
<td>31.9</td>
<td>60.6</td>
</tr>
<tr>
<td>Medium family farms</td>
<td>1,173.0</td>
<td>236</td>
<td>104</td>
<td>1135.0</td>
</tr>
<tr>
<td>Small family farms</td>
<td>1,601.9</td>
<td>657.5</td>
<td>923.6</td>
<td>1602.6</td>
</tr>
<tr>
<td>Small holdings</td>
<td>923.5</td>
<td>217.1</td>
<td>674.2</td>
<td>332.2</td>
</tr>
<tr>
<td>Part-time farms</td>
<td>602.2</td>
<td>218.4</td>
<td>323.1</td>
<td>507.0</td>
</tr>
<tr>
<td>Nominal units</td>
<td>997.3</td>
<td>333.4</td>
<td>546.4</td>
<td>857.5</td>
</tr>
<tr>
<td>Total</td>
<td>5,858.9</td>
<td>2,453.4</td>
<td>2,890.9</td>
<td>491.6</td>
</tr>
</tbody>
</table>

Table 2.—Number of farms and average value of land, buildings, and machinery, by economic class and by major region in the U. S., 1945 1

<table>
<thead>
<tr>
<th>Economic class</th>
<th>U.S.</th>
<th>North</th>
<th>South</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of farms (in thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large-scale units</td>
<td>372.42</td>
<td>306.017</td>
<td>857.108</td>
<td>893.509</td>
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<tr>
<td>Large family farms</td>
<td>20.067</td>
<td>26.825</td>
<td>25.306</td>
<td>26.999</td>
</tr>
<tr>
<td>Medium family farms</td>
<td>11.135</td>
<td>12.191</td>
<td>6.367</td>
<td>12.999</td>
</tr>
<tr>
<td>Small family farms</td>
<td>5.117</td>
<td>6.608</td>
<td>5.791</td>
<td>7.813</td>
</tr>
<tr>
<td>Small holdings</td>
<td>3.935</td>
<td>3.260</td>
<td>3.381</td>
<td>5.600</td>
</tr>
<tr>
<td>Part-time farms</td>
<td>2.885</td>
<td>3.065</td>
<td>2.052</td>
<td>3.067</td>
</tr>
<tr>
<td>Nominal units</td>
<td>3.585</td>
<td>4.635</td>
<td>2.444</td>
<td>6.468</td>
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<tr>
<td>Average for all farms</td>
<td>8,100</td>
<td>10,394</td>
<td>4,644</td>
<td>16,706</td>
</tr>
</tbody>
</table>

Average value of implements and machinery

<table>
<thead>
<tr>
<th>Economic class</th>
<th>Total at 1940 (in thousands)</th>
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</thead>
<tbody>
<tr>
<td>Large-scale units</td>
<td>6,452</td>
</tr>
<tr>
<td>Large family farms</td>
<td>3,021</td>
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<tr>
<td>Medium family farms</td>
<td>1,616</td>
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<tr>
<td>Small family farms</td>
<td>565</td>
</tr>
<tr>
<td>Small holdings</td>
<td>294</td>
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<tr>
<td>Part-time farms</td>
<td>209</td>
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<tr>
<td>Nominal units</td>
<td>176</td>
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<tr>
<td>Average for all farms</td>
<td>899</td>
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<tr>
<td>Item</td>
<td>1937-41</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>Dairy farm—Central New York</td>
<td></td>
</tr>
<tr>
<td>Investment in:</td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>$5,495</td>
</tr>
<tr>
<td>Machinery and livestock</td>
<td>3,129</td>
</tr>
<tr>
<td>Return from farming:</td>
<td></td>
</tr>
<tr>
<td>Total income</td>
<td>3,207</td>
</tr>
<tr>
<td>Total expense</td>
<td>1,810</td>
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<tr>
<td>Net farm income</td>
<td>1,397</td>
</tr>
<tr>
<td>Dairy farm—Southern Wisconsin</td>
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<tr>
<td>Investment in:</td>
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<tr>
<td>Land and buildings</td>
<td>8,933</td>
</tr>
<tr>
<td>Machinery and livestock</td>
<td>3,067</td>
</tr>
<tr>
<td>Return from farming:</td>
<td></td>
</tr>
<tr>
<td>Total income</td>
<td>3,000</td>
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<tr>
<td>Total expense</td>
<td>1,411</td>
</tr>
<tr>
<td>Net farm income</td>
<td>1,589</td>
</tr>
<tr>
<td>Hog and dairy farm—Corn Belt</td>
<td></td>
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<tr>
<td>Investment in:</td>
<td></td>
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<tr>
<td>Land and buildings</td>
<td>9,624</td>
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<tr>
<td>Machinery and livestock</td>
<td>2,816</td>
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<td>Return from farming:</td>
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<tr>
<td>Total income</td>
<td>2,901</td>
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<tr>
<td>Total expense</td>
<td>1,290</td>
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<tr>
<td>Net farm income</td>
<td>1,602</td>
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<tr>
<td>Hog and beef fattening farm—Corn Belt</td>
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<tr>
<td>Investment in:</td>
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<tr>
<td>Land and buildings</td>
<td>15,767</td>
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<tr>
<td>Machinery and livestock</td>
<td>3,703</td>
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<td>Return from farming:</td>
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<tr>
<td>Total income</td>
<td>3,931</td>
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<tr>
<td>Total expense</td>
<td>1,737</td>
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<tr>
<td>Net farm income</td>
<td>2,194</td>
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<tr>
<td>Cash grain farm—Corn Belt</td>
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one type, so that a corn-hog area has corn-hog farms neighbored by poultry and dairy. These details will become much clearer during the education of those who select farming on the basis of these statements.

In summary, farming is not an also-ran occupation. On the contrary, it is a highly skilled industry that offers as good opportunities as any in the country. It has its trade arrangements that make entry difficult in some instances, such as acreage allotments, restricted markets, established areas covered with no-sale signs and closed associations. So has every occupation. An intelligent person with adequate financing, who is willing to obtain or has already received adequate education and experience, can find excellent opportunities in agriculture.

For Further Information

Among the many publications of the United States Department of Agriculture, the following are especially recommended. They may be obtained free by writing to the Department, Washington 25, D. C.

- Suggestions to Prospective Farmers and Sources of Information, February 1945.

Reports of interest to the prospective farmer also may be obtained from State departments of agriculture and agricultural experiment stations. One publication especially recommended is the following:

- Capital Needed To Farm in the Midwest, University of Minnesota Agricultural Experiment Station, North Central Regional Publication No. 5. Reprinted August 1947. May be obtained from the United States Department of Agriculture.

NOTE

The following descriptions give a few of the variations in farming by types and regions. For each is presented a general description of relative opportunities. The field of farming as an occupation is barely opened up. In the selection of any farm, the need for sound local advice cannot be overemphasized. This need also exists for those planning farm-service jobs on a custom basis. Particularly should advice be sought from agricultural colleges, county agents, successful farmers, and farm associations.
NORTHEAST STATES

Northeast States—Dairy Farms

Dairying is by far the most important type of farming in the Northeast. The degree of specialization, the size, the productivity, the location with regard to market, and other factors all affect the income possibilities of the farm. Dairying is often combined with poultry or cash crops, and many so-called general farms could better be called diversified dairy farms.

Most Northeast dairy farms produce their own roughage (hay, silage, pasture, etc.), but very few produce all of their feed concentrates. The proportion of concentrates produced varies widely between areas and between farms, but Northeast dairymen generally have found that it pays to keep enough cows to utilize fully the labor supply and roughage capacity of their farms, even if this means purchasing all the concentrates.

The Job

A dairy farmer with a herd of suitable size has productive full-time employment for himself and family. Some seasonal help may be needed for haying and other harvesting. Feeding, milking, and other chores must be done every day and at
fairly definite hours. This means that the operator and his family are tied down more than in some other types of farming.

Mechanical aptitude is necessary because a milking machine, farm truck, tractor, mower, rake, sprayer, and other field equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock characteristics and disease control is essential.

**Outlook**

There is every indication that dairy farming will continue as the most important type in this region. It is more stable than most other types, ties in well with conservation programs, provides good distribution of employment and income during the year, and has a favorable long-time outlook.

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**Northeast States—Fruit and Berry Farms**

This is a risky and difficult business as a commercial enterprise. A typical Northeast family fruit farm would have from 40 to 100 acres, with from 60 to 95 percent planted in fruit trees. Not all acreage will be of bearing age, as rotation to maintain production is necessary. Commercial tree-fruit farms are concentrated in areas where soil and air drainage have proved favorable, such as the lower Hudson Valley of New York, central Massachusetts, south-central Pennsylvania, the lake areas of western New York, and parts of New Jersey.

Apples, peaches, cherries, grapes, cranberries, blueberries, strawberries, and raspberries are among the fruits grown commercially in the Northeast. Acreage of berry farms is smaller than for fruits grown on trees, and work is much more intensive. Favorable areas for grapes are concentrated along the lakes in New York; for cranberries, in the Massachusetts and New Jersey bogs; for blueberries, the rolling land of New England, particularly Maine; for other small fruits, somewhat wide possibilities. Many of these farms also grow vegetables or have a dairy or poultry enterprise. Also, many dairy and poultry farms have a minor fruit enterprise.

**The Job**

Skill and experience are required to bring somewhat delicate crops through the year. Disease and weather must be constantly battled. Harvest and marketing must be timed to maximize returns. Fruit growers are less tied down to the farm, except for spraying and harvesting, than are other farmers, but the work is hard and good supervisory ability is essential. Daily work requires considerable mechanical aptitude for equipment used and good judgment in timing seasonal operations. Bad investments are exceedingly dangerous in tree-fruit farms, because the cycle of growth covers such a long time and there is such wide variation in farm productivity. Because of soil and topographical limits in the Northeast, the purchase should be most cautiously made.

**Outlook**

Especially favorable areas offer good opportunities for the well-grounded, well-financed operator. Outside of these areas, many unfavorable production and marketing conditions are likely to force continuation of recent declines in commercial fruit farming.

*See Part-Time and Resort Farms, pp. 504, 508.*
Northeast States—Poultry Farms

Unusually risky business for inexperienced operators. A fairly typical general poultry farm raises about 2,500 sexed to 5,000 mixed chicks and keeps 1,500–2,500 laying hens on a small acreage. Few, if any, crops are grown. There are countless variations of this scheme. Perhaps the most profitable with a small investment, although it demands high skills, is the keeping of fewer birds and doing door-to-door selling of chickens and eggs. A higher price for eggs can also be obtained by selling them to hatcheries. Some egg producers buy full-grown pullets and concentrate on egg production only. In the late thirties, commercial broiler production became very popular. Broiler (young chickens for meat) production is fairly simple, except for disease problems, and can be profitable. However, a careful study of possible markets should precede any investment in broiler production. Poultry is often one of several enterprises on diversified farms.

Many substantial poultry farmers have cows, field crops, and some fruits or vegetables. This adds to work and total investment, particularly in land, but it allows diversification as a protection against bad years in the poultry enterprise and, also, increases products received from the farm by the family. Small flocks are common on part-time farms and as backyard flocks in suburban or town areas.

The Job

The work is more specialized than dairy or general farming. As in most farming, certain chores, such as picking up and delivering eggs, feeding, watering, and cleaning, must be done every day. Seasonally, houses must be cleaned and repaired and birds prepared for market. Some of this is hard physically, and it is monotonous. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Cleanliness is unusually important in poultry farming. High mortality can very quickly wipe out a year’s profits. Among the best protections against disease are cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Poultry farming has less seasonal or exceedingly heavy work than many other farm enterprises. The operator and his family can and should plan to do practically all their own work.

Outlook

Dense population of the Northeast requires large quantities of poultry products. Poultry farming is well suited and highly important to the agriculture of the area, but competition is exceedingly stiff. Ease of production and shipping from surplus feed-producing areas, short-time and relatively small investment required to establish poultry enterprises, and disease dangers inherent in poultry make it a somewhat risky farm venture. Efficient, well-located, well-financed poultrymen do have a place, but this is a type of farming in which investments should be made with caution, particularly so in broiler production.
Other Types

Poultry includes chickens, turkeys, ducks, geese, guineas, and pigeons. Variations in investment, marketing, and care occur among these fowl, but the comments above apply to all.

See Part-Time and Resort Farms, pp. 504, 503.

Northeast States—Tobacco Farms

Tobacco may be grown alone, but some farms combine it with other crops and livestock. Areas are very limited and little tobacco is now grown outside the Connecticut Valley and the Lancaster-York district of Pennsylvania. Farms for family operation vary from 25 to 200 acres; the smaller units all in crops, mostly tobacco, the larger with considerable livestock. Good tobacco land is expensive, and high investment is necessary, largely in land but also in equipment. In some parts of the Connecticut Valley, a few acres of tobacco are combined with onions, potatoes, poultry, and truck crops. In Pennsylvania, tobacco is one enterprise on farms growing truck crops and field crops for a dairy enterprise.

Both areas grow cigar tobacco; valley types for wrappers and binders and Pennsylvania for filler. Some valley acreage is shade-grown, a type for which marketing is very closely controlled. All is grown under a Federal allotment program, and the farm’s allotment history should be considered before purchase is made.

The Job

Tobacco culture is difficult and risky. It should not be undertaken without some experience and education. Income from an acre of tobacco is unusually large. So is amount of toil per acre. Work is hard, quite seasonal and demands skill and knowledge of a special kind. Combination of enterprises in which tobacco is usually found includes dairy, poultry, and truck crops. Work and management on such farms require a vigorous, resourceful operator with mechanical aptitude and experience in planning and carrying out field operations of considerable complexity.

Outlook

The cigar-tobacco industry has decreased considerably in the past 20 years. It is very doubtful that this trend will change, although it was reversed somewhat by World War II. As part of a combined farm operation, tobacco will continue to be grown on land suited for it. Purchase of farms at prices built up from tobacco land only should be made with extreme caution, particularly at present levels.

Northeast States—Vegetable Farms

A difficult business with a premium on successful marketing and handling of labor; high cash expenses, and much tedious work. A fairly common vegetable farm has about 30 acres of cropland devoted to crops such as carrots, peas, lettuce, spinach, beets, cauliflower, cabbage, radishes, squash, and celery. Kinds of vegetables raised and number of replantings of the same land depend on the market, available labor, soil, and the operator. In some areas, potatoes are the major or only crop.

Market-garden operators sell from roadside stands, to stores, and to wholesale producemen. Market gardening is characterized by large proportion of retail sales and wide variety of crops. Intensity of operation is dictated by high value of land, usually situated in or near a large city. Many cities still have farmers operating small acreages and running huckster routes.

Operators of larger acreages farther from the cities may concentrate on fewer varieties and quality produce, selling in several cities and through...
outlets such as chain stores that take full loads. Soil types also may limit the vegetables grown and the advisability of intensive production. Some areas are particularly well adapted to certain crops, sold both for fresh market and for processing. Typical of these specialties are the peas, beans, and sweet corn of New Jersey and the cabbage area of northern New York. Among specialized potato areas, Aroostook County, Maine, is outstanding. Long Island, N. Y., also has many potato farms.

The Job

Vegetable production is concentrated in the summer months and requires long hours of hard physical work in the field, in the packing house, and in the street or market. Modern machinery eases some of this work. The family works, but the operator must also be a good hirer and supervisor of seasonal help, mostly “stoop” laborers.

Planning lay-out for the year, to prevent impossible seasonal labor peaks at harvest and to maximize returns by “hitting the market,” pays high dividends. Picking at the right time or, occasionally, plowing a crop under and replanting require good judgment and managing ability.

Outlook

Dense population of the Northeast offers many opportunities for well-financed, intelligently operated, and purchased market gardens. Vegetable growing for processing or distant shipment also is advantageous in those regions of good soils and topography that favor vegetables, particularly the muck areas. While processing may expand more rapidly in other regions, the Northeast will at least hold its established acreage which is devoted to this purpose.

See Part-Time and Resort Farms, pp. 504, 503.

Northeast States—Resort Farms

A sound way of making the best of some bad farm locations. Resort farms can produce income ranging from hundreds of dollars to several thousands on a correspondingly wide range of investment. Ideal resort locations are fairly numerous and may even be good farms of more common types, usually dairy or general. Success depends on farming ability, plus the knack of promotion and meeting the public.

Primary factor for success is location. Recreational opportunities for winter and summer sports, such as swimming, hiking, skiing, golf, or just resting, are essential. Cabin or house sleeping accommodations and a large dining room must be furnished. On the farm side, as much food as possible must be home-grown; on most successful resort farms (as distinguished from resorts), reputation depends on production and good home cooking of farm food.

They vary from small shore poultry farms to hilly general farms having rambling homes in the mountains. Upland dairy farms, whose meadows lead to steeply pitched hills and mountains, are excellently located for resort farming. Some farmers act as caretakers for cabins, summer homes, or residential estates, and sell products seasonally to the owners.

The Job

The resort farm is a logical extension of the summer-boarder enterprise, which has long been common in the Northeast. As such, its success depends more on the farm wife and her kitchen than on the husband’s barns and crops, because she meets the guests more often and, in the summer especially, he is busy on farm chores.

Aside from guest attention, the job calls for farming skills to fit the type. For example, dairy work on a resort farm is just as hard and demanding as on a dairy farm, and the operator should have learned his trade before he started.

Resort farms are more likely to be in poorer agricultural areas where farming as such is a part-time occupation, and guest time is supplemental work for the farmer. However, the operator should have a garden, poultry, dairy, and other small enterprises that will interest his guests and, also, reduce the cash costs of keeping them. These
varied enterprises will tax his ingenuity and, occasionally, his physical strength.

Outlook

While not a commodity type, this kind of farm was steadily increasing in number before World War II and in the long run will further increase as the large population exploits recreational advantages of shorter workweeks. Ideal locations (mountain, shore, lake, river) and good management can be combined to make this a fairly stable kind of farming. Competition from roadside and “airside” cabins and highly commercialized resorts will remain strong. The greatest present draw-back is the seasonality of such trade, limiting the profit to a few weeks in summer.

Northeast States—Part-Time Farms

Very common and usually quite successful. They usually have from 3 to 100 acres with a garden, small pasture, a cow and pig or two, and a small flock of chickens. None of them offers either large cash results or the often advertised “5-acres-and-independence.” Variations in part-time farming usually reflect resources of the farm and work schedule of the operator and his family. In contrast to the residential farm, these produce for sale and aim for some net cash farm income.

The Job

Fairly light work of a wide variety is customary on a part-time unit. Some of this is burdensome on the operator, even though his main work is off the farm. His purpose is to add to his real income by well-directed use of spare time.

Outlook

In the long run more part-time units will develop as workweeks are reduced, as submarginal farms fail as commercial units, as farmers get part-time jobs off the farm, as pensioners find suitable locations, and as urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Families which buy within the limits of their resources and operate within their physical and financial limitations will be successful.
CORN BELT STATES

Corn Belt States—Corn-Livestock Farms

This type includes many of the best farms in the country. The livestock enterprises combined with corn and other feed grains include the hogs, hog-dairy, hogs-beef fattening, and hogs-beef raising. Acreage ranges from 60 to 440 with the more common size from 135 to 320 acres depending on type of operation. The corn-hog unit is typical but not exclusively so, of any large area. Actually, it is a general term used to describe the Corn Belt where corn is a highly important crop and hogs are the major vehicle for selling the corn.

The combination of hogs and dairy cattle is found in areas having good corn-small grain land and also land whose soil and topography favor hay and pasture. It is most common in northeastern Iowa and Indiana and northwestern Illinois and Ohio. Oats, wheat, barley, and soybeans are found to some extent on these farms. Major source of income lies in 10 to 15 cows and sales of around 12,000 pounds of hogs.

Hog-beef fattening combinations are favored by operators with considerable corn and some roughage which they think can be sold best through raising hogs and some cattle and fattening both. In addition, they buy feeder cattle for fattening and often purchase additional grain for this fattening. Areas prominent in this type are in western and east central Iowa, in west north-central Illinois, and in northwestern Missouri.

Hog-beef raising operators, on the other hand, place less emphasis on fattening their own cattle; they sell some stocker and feeder cattle, milk a few cows and are much like general farmers in their diversity. Ordinarily, these farms are not large in either acreage or volume of business and are typical in northeastern Missouri and the Iowa and Illinois areas adjacent to it, and southeastern Ohio.

The Job

Corn-livestock operators must have a high degree of skill in the handling of animals and in field work. Long, hard days are common, except for a few weeks in late winter. Versatility is essential, and supervisory ability is very helpful at peak labor seasons. Experience, adequate capital, and good marketing sense have important effects on income.

Outlook

These farms are in our major farming region, and prospects are bright. Adequately sized, well financed, and well-operated units in this group have as good a future as farms anywhere else in the country.

Corn Belt States—Cash Grain Farms

These units are among the largest in acreage in the Corn Belt. They are most common in west north central Iowa and in east central Illinois. Corn, soybeans, and oats are their major crops; hogs and beef cattle their major livestock. Their operators, compared with livestock farmers, usually plan to sell a larger share of their grains and to market somewhat less grain through livestock. They have increased their acreages of soybeans faster than most other farmers in the region and now have 10 to 35 percent of their cropland in beans. Mechanical harvesting and favorable soils have favored this development.

The Job

Cash grains require large amounts of labor during the growing seasons. Much of the work is
done by the operator and his family. It is very desirable that the operator have good knowledge and working experience in field crops. Planting, growing, and harvesting are highly mechanized, and equipment use and care are very important. But some labor must be hired and supervised.

Outlook

The productivity of these units and the need for feed to meet expected national increases in livestock products denote a bright future. Recent trends toward more livestock and more soybeans than before World War II, but less oats, probably will continue.

Corn Belt States—Dairy Farms

This is an important dairy region. Commercial dairy farms are found around all urban areas. In addition, there are numerous areas where roughage-consuming livestock and feed-grain production give operators their best income; in many cases, where this is true, dairy becomes the best livestock enterprise. Among these are northeastern Iowa, southwestern Missouri, parts of northern Indiana, northern Illinois, and much of eastern and southern Ohio. Variations in soil and topography are great enough to make any generalization about the location of “dairy” areas hazardous; thus, in most of the above areas hogs, poultry, small grain, or other enterprises are also of major
importance on many farms. Also, some dairy farms will be found in all parts of this region.

The Job

Requires an active, resourceful man who can do a variety of jobs with considerable skill and, also, paper and book work necessary for good farm planning. Mechanical aptitude is necessary because a milking machine, farm truck, tractor, mower, rake, and other field equipment must be kept in operating condition and buildings kept in repair. An understanding of livestock characteristics is essential.

Outlook

Good opportunities in this region. In the well-established areas, much of the land is well suited to dairy farming and developed markets are available, although better markets are needed particularly in the sour-cream areas. Experienced operators on the better dairy farms can find profitable year-round employment with less fluctuation of income than on more specialized farms.

Corn Belt States—Fruit and Vegetable Farms

Not primarily a fruit or vegetable region, although considerable quantities of both are grown in certain areas.

Various fruits are widely but sparsely grown. Commercial units are limited by better alternatives. They are located mostly in southwestern, east central, and other hill areas of Missouri; southern Illinois, south central Indiana; northeastern and, to some extent, eastern Ohio. Apples are the largest enterprise, but peaches, cherries, and berry crops are heavy contributions to commercial fruit production.

Fruit farms are concentrated around urban districts in the northern areas of States bordering on the Great Lakes, and in a few areas where one or two crops are heavily grown. Sweet corn and canning peas are widely grown as one enterprise on general or livestock farms, although peas are heavily concentrated in northern Illinois; melons are centered around St. Louis and in the bootheel of Missouri, in southwestern Indiana, and at the western end of Lake Erie; tomatoes in Indiana and northwestern Ohio. Many other vegetables are grown commercially in the northern areas of Ohio, Indiana, and Illinois, and in alluvial soils particularly along the Wabash, Illinois, and Mississippi Rivers.

Large centers of population in this region have resulted in a considerable number of market garden units, similar to those in the Northeast. These are typified by small acreages and intensive production on suburban land.

The Job

Production is concentrated in the summer months and requires long hours of hard physical work in the field, in the packing house, and in the street or market. Operators must also be good hirers and supervisors of seasonal help, mostly "stoop" laborers. Planning lay-out for the year, to prevent unmanageable seasonal labor peaks at harvest and to maximize returns by "hitting the market," pays high dividends.

The job requires skill and experience to bring somewhat delicate crops through the year. Disease and weather must be constantly battled. Fruit growers are somewhat less tied down, except at harvest time, than are other farmers. Danger of bad investments is exceedingly great, because the cycle of growth of tree fruits covers such a long period.

Outlook

Good opportunities in market gardening for energetic operators. The remainder of commercial vegetable farming on a family scale does not offer very good prospects, other than a living to the small operator. New processing and production methods favor continued increases in units larger and more expensive than those discussed here. Fruit farms are not likely to increase, and competition for land in the few favored areas is likely to require heavier investments than long-time market prospects can justify.
Corn Belt States—Poultry Farms

Although this is the largest poultry producing region, there are relatively few commercial poultry farms. The large production of this region comes from 50–300 hen flocks which are found on nearly all farms. Either as scavengers or as well-fed family flocks, these hens add to family living and farm cash income. On many farms, turkeys are raised in the same minor enterprise manner. Commercial poultry farms have increased in number in the past 30 years. Operators of farms that are too small for successful grain-livestock farming often have found poultry a profitable major enterprise. A commercial unit houses from 1,000 to 2,000 laying hens, selling cockerels and culls for meat. Broilers, sold for meat at 3 to 5 months, are raised in annual units of from 10,000 to 25,000. Turkeys are sold for meat at 5 to 7 months, usually in the fall, from flocks of 500 to 5,000.

The Job

Work is more specialized than dairy or general farming. Certain chores, such as picking up and delivering eggs, feeding, watering, and cleaning, must be done every day. Seasonally, houses must be disinfected, repairs made, and birds marketed. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Control of disease is unusually important in poultry farming. High mortality can very quickly wipe out a year’s profits. Among the best protections against disease are cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Outlook

This area, compared with the period before World War II, should be good for increases in commercial poultry production. Poultrymen are in feed-grain areas and usually can grow much of their own feed or buy easily. Also, large urban populations offer good local markets, as low-cost poultry meat has a definite place in the protein diets of our steadily increasing population. Probable increases in breeding and hatching for sale in the region offer profitable investment for operators skilled in this work.

Corn Belt States—General Farms

General farms include a few of the best and many of the average to poorer farms in this region. Their income is from a wide variety of crops and livestock with no outstanding contributor. Some general farms are found all over the region, but they are most numerous in Missouri, west-central and southern Illinois, northeastern and southern Indiana, northwestern and southeastern Ohio. Most general farmers use fairly level land for feed and cash crops, rolling land for hay, and rough land for pasture and woods.

Among enterpises found on general farms are dairy, poultry, cattle, hogs, sheep, feed grains, wheat, potatoes, fruit, vegetables, and forest products. The actual combination is determined by the resources, available markets, and the operator. They are relatively small in both acreage and cash receipts. The smaller units are likely to be self-sufficing with little commercial production.

The Job

Operators must be vigorous, resourceful, well-trained and skilled in management. A wide variety of jobs must be well done or well supervised. Some knowledge of production methods and operating problems, such as disease control in cattle, hogs, sheep, vegetables, and field crops is necessary. General farms offer good opportunities to plan operations to get the most from family labor.
Outlook

Good opportunity for profitable farm operations, on a smaller scale and with less investment than other types in this region. The better located units offer an adequate living to the operator and his family. Planned to give employment all year and to take advantage of soil and climatic resources, these farms, if well managed, should be successful. Year-to-year variations in income are exceptionally small compared with other types, although income average is lower.

Corn Belt States—Part-Time Farms

Part-time units are common around urban areas which have much seasonal work. They have from 1 to 20 acres with a garden, small pasture, a cow and pig or two, small flock of chickens and maybe a few fruit trees. None of this offers large cash returns nor the often advertised “5-acres-and-independence.”

Variations usually reflect soil resources of the farm and the whims of the operator. Some dislike livestock and have none. Some have seasonal jobs, which allow time for a small market garden. Others have large units, with poor soil, and several dairy cows that are pastured on the farm, but which must be fed on feed and hay brought from the outside. In southern areas of Illinois, Ohio, and Missouri especially, there are numerous hilly areas where part-time units have developed, although off-farm employment is very irregular.

The Job

Fairly light work of a wide variety is customary. None of this is too demanding on the operator, whose main purpose is to add to his income by well-directed use of spare time. Perhaps the greatest asset is the lower cost of living that comes from substituting rural for urban modes of living.

Outlook

In the long run more such units can be expected as workweeks are reduced, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Successful ones will be operated by families which buy within the limits of their resources and operate within the limits of their ability, both physical and financial. Number of markets in this area tend to make it a good prospect for commercial part-time operation. Cow-chicken-hog-garden units for family use only will continue to be numerous as enterprising families try to stretch meager off-farm incomes to meet family needs.
LAKE STATES

Lake States—Dairy Farms

This is one of the principal dairy regions of the country. Soils, climate, topography, and experience in dairying in this region are a combination that has made it one of the greatest dairy areas in the world. In size, farms vary from 60 to several hundred acres. Products vary from fluid milk to rare cheese.

Dairy farms are in most parts of this region although fewer in the most northern areas. In southwestern Minnesota and also, along the southern border of the region, farming tends more toward Corn Belt agriculture with emphasis on corn-oats-livestock. While incomes are much lower in the northern areas, dairying still is the most important source of revenue. It is accompanied by hay, pasture, and sometimes small grains. Potatoes, cabbage, rutabagas, and cucumbers are common cash crops.

Fluid milk marketing and specialization in milk production is typical of areas adjacent to urban markets, particularly around Chicago, Detroit, Twin Cities, and other large centers, which are most numerous in the southern half of the region. Milk in excess of fluid needs goes into evaporated and dried milk, butter, cheese, and other manufactured products. Some areas also ship large quantities of cream to other regions.

The Job

An active, resourceful man who can do a variety of jobs with at least average skill is required. Mechanical aptitude is necessary because a milking machine, farm truck, tractor, mower, sprayer, and other field equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock is essential.

Outlook

Excellent opportunities in this region, as much of the land is well suited to dairy-farm needs and developed markets are available, although better markets are needed in sour-cream areas. Experienced operators can find profitable year-round employment with good prospects.

Lake States—Crop Specialty Farms

Specialties in this region include potatoes, sugar beets, beans, and tobacco. Potatoes are the most widely grown of crop specialties, for they are well adapted to the cool climate of this region. Although grown to some extent in all areas, they are of major importance only in a few counties; the Red River Valley of Minnesota, the sandy lands of central Wisconsin, and the central-Thumb and northwestern quarter of the lower peninsula of Michigan. Acreages vary widely, but from 75 to 125 acres are needed as an adequate unit in most areas. A few growers use overhead irrigation. Field crops and livestock enterprises are of considerable importance on most potato farms, even in the heavy potato areas.

Sugar beets and beans are not widely grown. The former are concentrated around Saginaw Bay in Michigan, in eastern Wisconsin, and the Red River Valley, and south-central Minnesota. In the Saginaw Valley and the Thumb, beans and sugar beets are grown on farms that are quite specialized in their production. Beans are rarely grown outside this area.

Tobacco is a minor crop. A few counties in southern Wisconsin and a few farms in southern
Minnesota have tobacco as an enterprise in areas that are primarily grain-livestock.

**The Job**

Crop specialty farms have their own requirements for equipment and production skills. Hard work in the fields is necessary during the growing season and it must be skillfully performed because of the price-for-quality nature of the crops.

**Outlook**

This region has considerable land that is well suited to potatoes and sugar beets. Beans are much more limited in area but they will likely have a continuing place in the cropping systems of many farms in the areas adapted to them. This is not a major tobacco area. Also, both tobacco and sugar beets have been allotment crops and cannot be freely produced.

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**Lake States—Fruit Farms**

In only a few areas of the region are found the fruit farms, which range from 20 to 120 acres. With the exception of apples, which are fairly widely grown in home orchards in the southern half of the region, fruit farming is largely concentrated in Berrien and Kent Counties of Michigan. Fruit farms are also quite common along the western lake strip of southern Michigan. Cranberries are limited to the peat bogs of central Wisconsin. Raspberries are found in the Michigan areas and around the Twin Cities of Minnesota. Cherries are centered in the northern part of the Michigan lake strip and in Door County, Wis. Strawberries, pears, peaches, grapes, and dewberries are heavily concentrated in and near Berrien County, Mich.

In spite of heavy fruit production, most of these areas have feed grain and livestock of all kinds. Substantial acreages of fruit are grown by farmers who spend the majority of their time on field crops and livestock. This is particularly true of units having 80 or more acres.

**The Job**

A high degree of skill and experience is required to bring somewhat delicate crops through the year. Disease and weather must be constantly battled. Harvest and marketing must be timed to maximum returns. Fruit growers are less tied down, except in harvest, than are other farmers, but their work is quite hard, sometimes disagreeable, and good supervisory ability is essential. Daily work requires considerable mechanical aptitude for equipment used and, also, good judgment in timing seasonal operations. Danger of bad investments is exceedingly great, because the cycle of growth covers such a long time. Due to this danger and because of soil and topographical limits of fruit farming, purchase should be most cautiously made.

**Outlook**

Good opportunities, in areas having favorable soil and climate, for well-grounded, well-financed operators. Outside of the better areas, production and marketing situations are likely to force continual declines in fruit enterprises. Extremely limited production areas in this region make establishment of new farms or purchase of old ones quite difficult and expensive.

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**Lake States—Livestock Cash Grain Farms**

Fairly common type in some parts of this region. Units range from 80 to 400 acres depending on the area and kind of farming. Corn, wheat, oats, barley, flax, and potatoes are the most common crops. Hogs, beef and dairy cattle, sheep, and poultry are the livestock. In southern areas, most grain is marketed through livestock, especially hogs and beef cattle in southwestern Minnesota. Farther north, corn is usually for silage, more wheat and barley are grown, and more small grain is sold.

In the grain-corn southern areas, intensive live-
stock-grain units of from 80 to 160 acres are quite common, but at least 160 acres should be operated to obtain an adequate income. Usual combinations with grains include hogs, dairy-hogs, hogs-beef raising, and hogs-beef fattening. These units are extremely flexible and can shift their enterprises within a year or two. New soybean varieties have in recent years become part of these organizations.

The Job

Livestock-cash grain farms require a high degree of management skill and year-round work.

Mechanical skills are necessary for operating combines, tractors, and a variety of field equipment. Knowledge of livestock management is essential.

Outlook

A well-bought unit of this type offers good opportunity to an industrious, intelligent, and thoroughly trained operator for profitable employment. Continued increases in demand for meat and other livestock products are expected, and units of this type are an essential part of the meat production picture.

Lake States—Poultry Farms

Units on which poultry is a major enterprise are not numerous but have steadily increased in recent years so that a substantial amount of commercial poultry is now produced in this region. From 1,500 to 2,500 laying hens are housed each fall, and cockerels and culls are marketed for meat. Broiler farms concentrate on meat rather than on egg production, selling somewhat heavily fed young birds at 3 to 5 months. One family can handle up to 25,000 broilers. Turkeys in flocks of 200 and up are raised for meat. They are kept longer (about 5 to 7 months) and have a shorter marketing season than broilers. Hatcheries are intensively commercial, require higher skills, and are far less common.

In this region, the majority of poultry products comes from farms of from 60 to 280 acres. These flocks have from 50 to 300 laying hens or about the same number of turkeys, and are definitely minor enterprises although they contribute a significant proportion of the farm cash income. Commercial poultry is most common in the southern areas, particularly around large cities with well-established poultry markets.

The Job

The work is more specialized and less heavy than dairy or general farming. As in most farming, certain chores, such as picking up and delivering eggs, feeding, watering, and cleaning, must be done every day. Seasonally, houses must be disinfected, repairs made, and birds marketed. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Control of disease is unusually important in poultry farming, as high mortality can very quickly wipe out a year’s profits. Among the best protections against disease are cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Outlook

This area, with markets in the heavily populated urban localities of the Midwest and Northeast, offers good opportunities to efficient, well-located poultrymen. Broiler production may expand. Poultrymen who grow much of their feed and have other farm enterprises are in a good competitive position.
Lake States—Vegetable Farms

Commercial units are limited to a small portion of this region. There are both market garden and wholesale vegetable farms scattered through southern Michigan and southeastern Wisconsin and Minnesota. However, a majority of vegetables, particularly canning peas, are grown in combination with livestock and, in Michigan, with fruit.

Commercial units range from 40 to 120 acres and have wide annual fluctuations in income. Short growing seasons are characteristic. Canning peas and sweet corn are heavily produced in the vegetable areas, usually as a supplementary cash crop on livestock farms of Wisconsin and Minnesota. Cucumber pickles are raised in central and southern Michigan. Celery is definitely concentrated in the muck areas of southwestern Michigan, onions in the southern muck areas. Nearly all truck crops are grown commercially to some extent.

The Job

Vegetable production is concentrated in the summer months and requires long hours of hard physical work in the field, in the packing house, and in the street or market. The family works, and the operator must also be a good hirer and supervisor of seasonal help, mostly “stoop” laborers. Planning lay-out for the year to prevent impossible seasonal labor peaks at harvest and to maximize returns by “hitting the market,” pays high dividends. Picking at the right time or, occasionally, plowing a crop under and replanting, require good judgment and managing ability.

Outlook

Skillfully managed market gardens offer good opportunities for energetic operators. The remainder of vegetable farming on a commercial scale does not extend very good prospects and is more likely to remain as another important cash enterprise on livestock and general farms. New processing and production methods favor continued increases in units larger and more expensive than those discussed here.

Lake States—General Farms

The better general farms of from 160 to 320 acres are found in the southern areas of the region, the Saginaw Valley of Michigan and the Red River Valley of Minnesota. Ordinarily, they reflect the farmers’ attempts to maximize income by utilizing all resources available to his farm.

Income is received from some combination of cash grain, beans, sugar beets, potatoes, vegetable, dairy, beef cattle, hogs, sheep, and poultry. No one source of income is continuously dominant. Southern areas have productive prairie soils and, therefore, can ripen corn more easily. Corn-hog-beef cash-crop units are common in these areas. Farther north, less productive soils and shorter growing seasons tend to limit the number of cash crops, to increase acreages of small grains and hay, to force production of corn for silage rather than grain, and to encourage roughage-consuming rather than grain-consuming livestock.

The poorer general farms produce a little of several products and suffer from having no production advantages. These are found most often in the sandy and cut-over areas, where poor soils and low cash receipts are prevalent.

The Job

Operators must be vigorous, resourceful, well-trained and skilled in management. A wide variety of jobs must be well done or well supervised. Knowledge of production methods and operating problems, such as disease control in cattle, poultry, sheep, fruit, vegetables, and fields crops, is necessary. General farms often offer good opportunities for realizing the most from family labor.
Outlook

If planned to give full employment all year and to take advantage of their resources, these farms should be successful, but at a relatively lower level compared with more specialized units. Year-to-year variations in income are small compared with other types.

Lake States—Part-Time Farms

In the cut-over areas, many farms are part-time in the sense that they do not offer full employment to the operator. They are found most frequently in the suburban and northern areas of this region and are scattered around manufacturing districts, particularly in the southeastern area. Southern units are largely residential and have very small off-farm sales.

The usual part-time farm has from 3 to 50 acres with garden, small pasture, a cow and pig or two, a small flock of chickens, and a few fruit trees. None of this offers large cash rewards or the often advertised “5-acres-and-independence.” Whenever lay-out calls for full-time work by the operator and family or large cash expenses, the farm is no longer part-time. Increase in size of business, off-farm employment, or purchase by people with outside income seems the likely result, if these units are to remain in production.

The Job

Fairly light work of a wide variety is customary. None of this is too demanding on the operator, whose main purpose is to add to his income by well-directed use of spare time. The operator and his family must be willing to accept the manner of living associated with part-time units: outside work, few luxuries, slower living.

Outlook

In the long run an increase in number may be expected as workweeks are shortened, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Units operated by families which buy within their resources and operate within the limits of their physical and financial ability will be successful. Cow-chicken-hog-garden units for family use only, will continue to be numerous as enterprising families try to stretch meager incomes to meet family needs. In addition, there are numerous desirable locations with good recreational opportunities for pensioners and retired workers, particularly in the better developed northern areas.
APPALACHIAN STATES

Appalachian States—Tobacco Farms

This area is the primary tobacco land of the country. Farms range from 50 to 200 acres in size with wide variations in productivity. Some dairy cattle, poultry, and hogs are found on most of the farms in the area and provide a considerable portion of the family living and some income. Widest variations are in cash crops other than tobacco. In North Carolina, Tennessee, and to a lesser extent Virginia, small acreages of cotton are quite often grown. Fruit and vegetables are more common in southern Maryland and on the Eastern Shore. Peanuts have become much more important recently, especially in Virginia and North Carolina. Many farms raise grain (wheat and corn), and some of this is sold. Livestock as a cash enterprise is more common on the larger units, and hay and pasture become important. These units are most often found on the lower slopes of mountain areas.

Many different kinds of tobacco are grown in the area. Of these, burley and flue-cured for cigarettes are the most important. Dark tobaccos have become steadily less popular since World War I, but are still grown on many farms, particularly in Virginia.

The Job

It is hard. Much field work is necessary in raising and harvesting and is followed by curing and handling after harvest. Some knowledge of tobacco culture and curing is essential, because quality has a substantial effect on the price. The level of family living is greatly influenced by adequate production of milk, eggs, and vegetables, which require versatile skills on the part of the operator.

Outlook

This area is the best suited in the country for this crop and will maintain its leadership in tobacco production. Production of cigarette tobaccos has good prospects, especially when some diversification and raising of home-used foods supplement the family income. In contrast, dark-tobacco demand has been decreasing for 25 years and only the most favorable lay-outs have even fair future prospects.

Appalachian States—Fruit Farms

This region is one of the more important fruit areas of the country. Apples, peaches, and strawberries are major fruit crops, with apple farms predominant. Farms range from 50 to over 500 acres with a majority of acreage in fruit, especially on the smaller farms. Apples are widely grown, but are most common in the Shenandoah and Tennessee Valleys, western Maryland, and western North Carolina. Fewer peaches are grown, and are best in about the same areas as apples. Strawberries are concentrated in selected areas of eastern North Carolina, western Tennessee and Kentucky, and the Norfolk-Eastern Shore area of Virginia and Maryland. Strawberries often are one of several enterprises on truck-fruit farms, especially on the Eastern Shore. As in the Northeast, apples and peaches combine well with dairy, livestock, or poultry. Fruit of some variety is often found on the general farms of this region.

The Job

It requires skill and experience to bring somewhat delicate crops through the year. Disease and weather must be constantly battled. Harvest and marketing must be timed to maximize returns. Fruit growers are less tied down, except in harvest, than are other farmers, but labor is quite hard and good supervisory ability is essential. Daily work requires considerable mechanical aptitude for equipment used and good judgment in timing seasonal operations. Bad investments are exceedingly dangerous because the cycle of growth covers such a long period. Due to this danger and because of soil and topographical limits of fruit
farming, the purchase should be most cautiously made.

**Outlook**

Areas having favorable soil and climate offer good opportunities for well-informed, well-financed operators. Outside of the better areas, unfavorable production and marketing conditions are likely to force the continuation of recent declines in fruit enterprises.

**Appalachian States—Poultry Farms**

This region includes the Delmarva broiler area. Broiler production is a highly specialized business with considerable risk. Family broiler enterprises involve raising from 5,000 to 25,000 chicks to about 3 months of age. Started at different times of the year, such enterprises are full-time jobs. Farms of this type are concentrated in the Delmarva or Eastern Shore area and, also, are scattered through the region. Larger investment is required but more stable incomes are received from a broiler-layer combination in which 1,500 to 2,500 birds are housed for egg production. Many different kinds of poultry farms are found in this region. A big share of the poultry, much of which is consumed on the farm, is produced as but one of several enterprises on a general or livestock farm; turkeys are widely raised on general farms.

**The Job**

The work is more specialized than dairy or general farming. As in most farming, certain chores, such as picking up and delivering eggs, feeding, watering, and cleaning, must be done every day. Seasonally, houses must be disinfected, repairs made, birds killed and marketed. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are essential.

Cleanliness is unusually important. High mortality, particularly among grown birds, can very quickly wipe out a year's profits. Cleanliness, a knowledge of diseases and their remedies, and establishment of disease-free stock are necessary to prevent high mortality.

**Outlook**

This area sells in the heavily populated Northeast and offers good opportunities to efficient, well-located poultrymen. Competition from surplus-feed areas will make "factory" broiler production less profitable but will have less effect on the poultrymen who grow some of their feed and have other farm enterprises. Further increases in breeding and hatching for sale offer profitable investment for operators skilled in this work.

**Appalachian States—Livestock Farms**

Many kinds of livestock farms are found in this region. Most common sources of income on livestock farms are cattle, hogs, poultry, sheep, and horses. Many livestock farms in Maryland, Virginia, Kentucky, and Tennessee also sell some wheat. Beef cattle and hogs do very well so far as grazing and roughages are concerned, but there are few areas in this region where they can be fattened as cheaply as in the Corn Belt. Horses are an important side line as a hobby; horses and mules are a business in Kentucky, Tennessee, and northern Virginia. Sheep have been diminishing as an enterprise in this region. A few dairy cattle and poultry are kept on nearly all livestock farms. The better livestock units are found in approximately the same areas as the better general farms—Virginia valleys and their Maryland extension, central basin and river valleys of Tennessee, and the bluegrass country of Kentucky.

**The Job**

Active resourceful management and a considerable amount of hard physical work is required. Roughage crops must be grown and harvested,
AGRICULTURAL OCCUPATIONS—APPALACHIAN STATES

and livestock must be very carefully managed. Good knowledge of livestock care, breeding, and disease control is necessary. Very important is experience and market sense, for much of the profit in livestock farming results from good marketing.

Outlook

Livestock farms on the better rolling lands of this region offer good opportunities to good operators. Mild climate, good grassland, and fair markets are conducive to successful operation. Relatively high feed-growing costs prevail in the rougher lands, and fattening operations are risky, depending on bumper crops in surplus-feed producing areas. In the better situated sections, well-managed livestock units can offer good and fairly stable returns to operators.

Appalachian States—Cotton Farms

It is a difficult business to grow cotton in most parts of this region. Most of it is grown in North Carolina and Tennessee, and a little is found in Virginia. From 5 to 15 acres of cotton is usually the major source of income. Other cash crops include peanuts, tobacco, vegetables, small grains, or seeds. Corn and hay are grown and fed to working livestock and to a few cows or chickens.

Additional enterprises have been typical of cotton farms during recent years because of reduced cotton acreage and a desire to operate better balanced farms. Recent trends in mechanization are accelerating these shifts.

Cotton-dairy combinations of from 100 to 200 acres are found in most cotton areas of the region. Cotton, tobacco, and peanuts are found in various combinations in some parts of North Carolina and Virginia, while cotton-livestock cultivation is more common in Tennessee.

The Job

Cotton and other enterprises that may be combined with it require exceptionally long days of work during the growing season. It is one of the hardest kinds of farming. Good knowledge of current methods is very desirable because of quality price premiums that accompany improved practices.

Outlook

This is one of the oldest cotton regions and for quality production it is one of the best. Some cotton will probably always be grown and may be more profitable than before World War II, if mechanization is reflected in cheaper production. Cotton on 150- to 250-acre farms, balanced with other crop or livestock enterprises, offers fairly good possibilities to good operators.

Appalachian States—Peanut Farms

Not a fully established type, for peanuts are usually grown in combination with cotton and tobacco, both high value crops. Peanut acreage expanded during the war, but less so in this area than farther south. Peanut farms in the area are concentrated in a relatively small section around the eastern end of the border between Virginia and North Carolina. Farm experience and possible quotas for cotton and tobacco will limit the quantity grown. Peanuts are sold as nuts if possible; but, in off years, it may be advantageous to graze hogs over part of the peanut crops. Nearly all farms have some livestock; largely for home use. With a growing demand for livestock products and the need to rest peanut land, farmers will tend to sell more dairy and poultry products.

The Job

Peanuts, cotton, and tobacco require unusually large amounts of hand labor during the growing seasons. Much of this must be done by the operator and his family. Planting, growing, and harvesting these crops is tiresome and often very hard work. Some labor must be hired and supervised. Future prospects are for more mechanical aids, but these will require larger acreages and will bring more management problems. High value and price-for-quality characteristics of these crops
make it very desirable that the operator have good knowledge and working experience in their culture.

Outlook

The diversified nature of the peanut farm and importance attached to it during the war make it a fair prospect for potential farmers. At present, there is some doubt as to the best peanut areas and best combination of enterprises which include peanuts. Mechanization and other technological developments should be carefully considered.

Appalachian States—Vegetable Farms

The Norfolk-Eastern Shore area of this region is one of the major truck areas of the country, but high incomes are unusual. Metropolitan market gardening is not so common as in the Northeast.

Commercial units range from 50 to 150 acres with 150-acre units most common. Many kinds of vegetables are favored by climate in this region and are found to some extent on most farms. Vegetable areas are concentrated in the Norfolk-Eastern Shore of Virginia and Maryland, northeastern Maryland, tidewater North Carolina, and the plateau of western Tennessee. Among vegetables commonly grown are tomatoes, peas, sweet corn, snapbeans, lima beans, melons, potatoes, spinach, and cucumbers. A family farm on the Eastern Shore may have 20 acres of potatoes, 5 of snapbeans, 6 of tomatoes, and 3 of strawberries.

A wider variety of vegetables and an increased proportion of retail sales are found on market garden farms surrounding Baltimore, Louisville, Memphis, Norfolk, Washington, and other urban districts. Larger farms, with fewer vegetables and more livestock (particularly dairy and poultry), are more common in the rolling lands of the higher Appalachian areas.

The Job

Vegetable production is concentrated in the summer months and requires long hours of hard physical work in the field, in the packing house, and in the street or market. The family works, but the operator must also be a good hirer and supervisor of seasonal help, mostly “stoop” laborers. Planning a combination of enterprises for the year, to prevent impossible seasonal labor peaks at harvest and to maximize returns by “hitting the market,” pays high dividends. Picking at the right time or, occasionally, plowing a crop under and replanting require good judgment and managing ability.

Outlook

The skillfully operated market garden units offer good opportunities in this region for energetic operators. Commercial vegetable farming on a family scale does not offer, other than family living, very good prospects to the small operator. New processing and production methods favor continued increases in units larger and more expensive than those discussed here.

Appalachian States—Dairy Farms

Specialized dairy farms are of two distinct types, depending on the method of marketing. Near urban areas the farms are more expensive but not necessarily larger in acreage; whole milk is sold under stringent sanitation regulations to city dealers at relatively high prices. These fluid-milk farms are all over the area, but are numerous in the Baltimore-Washington, Louisville, and Memphis milksheds. The second marketing type, under high but less stringent sanitation regulations, sells milk or butterfat to manufacturing plants where it is processed into evaporated milk, cheese, butter, and other milk products. This type is most numerous on the rolling land of Kentucky and Tennessee.

Many dairy farms of this region are not completely specialized, but depend for some income on cash crops and other livestock products. Of these, fruits, poultry, and vegetables are most common. Grain and hay are sold from some farms. In a
few areas, small acreages of cotton and tobacco are grown. While none of these is a major source of income, each assists in building up farm revenue and adds to profitable employment of farm resources.

The Job

Requires an active, resourceful man who can do a variety of jobs with at least average skill and, also, book and paper work necessary for good farm planning. Mechanical aptitude is necessary because a milking machine, farm truck, light tractor, mower, rake, sprayer, and other field equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock characteristics and weaknesses is essential, as well as skill in handling pasture and feed crops.

Outlook

Good opportunities in this region. Much of the land is well suited to dairy-farm needs, and developed markets are available. Experienced operators on the better farms can find profitable year-round employment with less fluctuation of income than on specialized crop farms.

Appalachian States—General Farms

From 120 to 500 acres, but cropland is not correspondingly larger in comparison with other types. Income is received from some combination of dairy, other cattle, horses, sheep, poultry, fruit, vegetables, tobacco, cotton, cash grain, peanuts, and other sources. Actual combination depends on soil, lay-out of farm, and preferences of the operator.

Among the best of this region are those in the Shenandoah area of Virginia and its Maryland extension, the central basin and Tennessee Valley in Tennessee, and the bluegrass country of Kentucky. All these areas emphasize livestock including dairy, beef cattle, sheep, and horses. Virginia and Maryland areas have considerable fruit. Potatoes and other vegetables are commonly grown as cash enterprises.

Many general farms are found in other parts. Income combination varies with localities, with more livestock on rolling lands and more cash crops on flatlands of the river terrace and tidewater. Cotton, tobacco, peanuts, potatoes, fruit, and vegetables are widely grown.

The Job

The operator must be vigorous, resourceful, well-trained and skilled in management. A wide variety of jobs must be well done and well supervised. Some knowledge of production methods and operating problems, such as disease control in cattle, poultry, sheep, fruit, vegetables and field crops, and fertilization, is necessary.

Outlook

General farms in this region offer good opportunities. The better located ones are among the best of their kind in the country. Planned to give full employment all year and to take advantage of their resources, these farms should be successful. Their year-to-year variations in income are exceptionally small compared with other types, but income may often be lower than those of specialty units.
Appalachian States—Part-Time Farms

Part-time farms are common in the Appalachian area. There are few urban areas, but much seasonal work in mines and forests.

Units range from 5 to 25 acres with a garden, small pasture, probably a cow and pig or two, small flock of chickens, and maybe a few fruit trees. None of this offers either large cash results or the often advertised “5-acres-and-independence.” Whenever the lay-out calls for full-time work by the operator and family or large cash expenses, the farm is no longer part time. Variations usually reflect soil resources of the farms and whims of the operator. Some don’t like livestock and have none. Some have seasonal jobs, which allow time for a small market garden or livestock. Others have large units with poor soil and have several dairy cows that are pastured on the farm but must be fed on feed and hay brought from the outside.

The Job

Fairly light work of a wide variety is customary. However, lack of equipment makes some work harder than similar effort on commercial farms.

This may demand considerable time of the operator, whose main purpose is to add to his real income by well-directed use of spare time.

Outlook

In the long run, more part-time units can be expected as workweeks are reduced, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Successful ones will be operated by families which buy within the limits of their resources and operate within the limit of their ability, both physical and financial. Lack of markets in this area and the present lay-out with full-time farms, successfully operated around most cities, tend to limit prospects of commercial part-time operation. However, the cow-chicken-hog-garden units, for family use only, will continue to be numerous as enterprising families try to stretch meager incomes to meet their needs.
This region is the older cotton South. Small units with small incomes are now typical. Cotton is the main cash enterprise of the South. Farms with from 5 to 15 acres of cotton, 5 to 10 of corn, some hay, a mule, a pig, a cow, and chickens are found in all States of the region.

During recent years, the addition of more land and other cash enterprises has become the goal of many cotton farmers who formerly raised little else. In some areas, especially in the Coastal Plains of Florida, Georgia, and Alabama, peanuts have been successfully substituted for part of the cotton. Also, tobacco has been of increasing importance in some sections of South Carolina, Georgia, and Florida. In the northern hilly areas dairy cattle add cash income to a considerable number of farms. Truck crops and sweetpotatoes are other sources of additional income over most of the region. Poultry as a cash enterprise is slowly becoming more common. With the increases in tractors during recent years, many units have added a considerable acreage of small grains. Well-managed forest land is a farm enterprise in selected areas.

Cotton is the biggest cash crop in the South. Much hard work such as the picking shown below limits the number of acres handled by any one farmer.
Cotton and crops found in combination with it require exceptionally long days of work, especially during the harvesting season. Relative to the income received, this is one of the hardest kinds of farming. Good knowledge of current methods is very desirable, because of quality price premiums on crops grown. Skill in handling of soils and use of fertilizer also is necessary.

Outlook
This is one of the oldest cotton regions. Some cotton will probably always be grown. If mechanization is reflected in cheaper production, fewer units and higher returns should be expected. Cotton on 150- to 250-acre farms, balanced with other crop or livestock enterprises, offer fairly good possibilities to operators. Cotton-peanuts-hogs and cotton-vegetable combinations offer diversity and higher incomes to units lacking room to expand to the more extensive dairy or livestock enterprises. Good living is unlikely on very small specialized units.

Southeast States—Peanut and Pecan Farms

Peanut production is an important enterprise on many southeastern farms. Pecans, though much less important, are grown over a wider area. Peanuts are usually grown in combination with cotton and a little livestock. The four States in this region grow over half the peanuts of the country; most of the production comes within a 200-mile radius of the Georgia-Alabama-Florida boundary intersection.

Peanut farms range from 30 to 125 acres and have 15 to 20 or more acres in cotton and peanuts. Important peanut varieties include the Spanish and Runners, which may be used for hoggings off or dug for sale. Spanish are usually dug for edible sale.

Cattle, poultry, truck crops, and sweetpotatoes add to cash income and farm family living on larger units or units having a limited acreage of soil suitable for peanuts. Corn and roughages are grown for home feed.

Pecans, though more widely grown than peanuts, are also limited by type of soil. With few exceptions, pecans are but one of the enterprises on fairly large cotton-peanut or cotton-livestock farms. Pecan orchards are expensive to develop and operate. However, where well established, they usually are a good source of income.

The Job
Peanuts and cotton require unusually large amounts of labor during the summer and fall. Much of this must be done by the operator and his family. Planting, growing, and harvesting is tiresome and often very hard work. Some help must be hired and supervised. Future prospects are for more mechanical aids, but these will require larger acreages and greater management problems.

Peanuts and pecans both require a high degree of skill and experience in production methods. High value and price-for-quality characteristics of these crops make it highly desirable that the operators have adequate knowledge and working experience in their culture.

Outlook
Diversified nature of peanut and pecan farms and important developments in the use of peanuts during World War II make them a fair prospect for potential farmers. For those interested in peanuts, this is one of the most favorable areas. However, large-scale mechanization and new production methods favor larger units than most of those now available.
Southeast States—General-Livestock Farms

Livestock and general farms in this region are rare. Competition for good land has kept the land in high value per acre crops and not in feed for roughage-consuming livestock; most farms are too small for livestock farming and production and marketing problems have been unusually difficult. Sheep numbers have been steadily decreasing, but cattle and hog volume has remained about the same for 30 years. There are some fair general farms in the Piedmont and Coastal Plains of Georgia and a few good livestock farms in areas like the Black Belt of Alabama.

Some units in the Alabama Black Belt are very similar to livestock and general farms in the Midwest and in the North, with a few beef cattle, hogs, some poultry, and cropland in corn, hay, and pasture. Small acreages of cotton and other cash crops are grown. In the Coastal Plains of Georgia, Alabama, and Florida, cattle and hogs are grazed over waste and undeveloped land. Cattle gain weight very slowly and losses from parasites have been high.

Also in the Coastal Plains are the peanut-hog farms, similar in organization but not in productivity to the corn-hog farms of the Corn Belt. In the Piedmont, a few livestock units are found on some farms are called general farms or just farms. On them, the operators may have a few cattle, hogs or chickens. They raise feed for the livestock, have one or two cash crops, and may sell some firewood or timber from a relatively large woodland acreage. Of all farms, these tend most to be self-sufficient.
land whose productivity is too low for cotton, peanuts, or other cash crops.

The Job

Requires active, resourceful management, and a considerable amount of physically hard work. Roughage crops must be grown and harvested, and stock must be very carefully managed. Knowledge of livestock care, breeding, and disease control is necessary. Very important is experience and market sense, for much of the profit in livestock farming results from good marketing.

Outlook

It is fair for livestock farms in a few areas. General farms have slightly better prospects, for they have stability in income and can take advantage of spotty land where a few acres of good cropland and more acres of rough land can be skillfully used for some combination of cash crops and grazing livestock. Recent developments in production techniques for improved pastures, feed crops, hay, and livestock are likely to improve this situation considerably. Income though stable is usually lower than that from specialty farms with comparable investments.

Southeast States—Dairy Farms

This is a stable and rather prosperous business for large operators. However, most dairy units in this region have from 10 to 15 cows; raise fodder, hay, and some grain; buy more grain and hay; and sell milk on the relatively low-price processing market. These units have from 100 to 150 acres with about half in crops. Poultry and a few pigs are kept, and other cash enterprises, such as sweet-potatoes or other vegetables, add to cash income. Income varies with size of unit, location, type of cattle and, most of all, with skill of operator.

In contrast to the family units described above are the large dairy farms common to areas near the larger cities in this region. These units have 100 or more cows, buy much of their feed, including roughage, and usually retail their milk. Unusually high investment and operating costs limit these units to operators with excellent experience and strong financial backing.

The Job

Requires an active, resourceful man who can do a variety of jobs with better than average skill and, also, paper and book work necessary for good farm planning. Mechanical aptitude is necessary because a milking machine, farm truck, light tractor, mower, rake, sprayer, and other field equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock characteristics is essential. Knowledge of soils, feed crops, pasture use, and fertilization is necessary.

Outlook

The opportunities for dairying are fairly good because most of this region is on an import basis for dairy products. An extremely low per capita consumption of milk and milk products should improve as purchasing power moves up with expected industrialization. Skilled operators will find good markets, but they continue to face serious production difficulties in the raising of cheap roughages and they must compete for land with high-value crops such as cotton, peanuts, truck, and fruit. They are developing good pastures and strains of high-producing, hardy, dairy cattle.
Southeast States—Fruit Farms

As a commercial venture, fruit is one of the most hazardous in this area. Citrus areas of central Florida are outstanding, although some fruit is grown throughout the region, including the well-known peach area in central Georgia. Except for citrus and a few peach farms, most fruit is grown in combination with other crops or livestock. Apples and peaches are grown in the northern, hilly parts of the region. Also grown, mostly in Florida, are persimmons, papayas, avocados, guavas, pears, and figs.

Most of these fruits are grown on small acreages. Even the small acreages are expensive to buy and operate. Citrus units of about 10 acres, peaches and pears of 20, and apples of 40 can be handled by one family, except for harvest. Crops can be grown in combination, especially when they supplement each other in demands for labor. For example, in Hillsborough County, Fla., citrus, strawberries, and peppers are grown on the same farm. Tomatoes and green beans can also be fitted to these organizations.

The Job

Commercial fruit farming requires skill and experience to bring somewhat delicate crops through the year. Disease, insects, and weather must be constantly battled. Harvest and marketing must be timed to maximize returns. Fruit growers are less tied down, except in harvest, than are other farmers, but the work is quite hard and good supervisory ability is essential. Daily work requires considerable mechanical aptitude for equipment used and good judgment in timing seasonal operations. Bad investments are exceedingly dangerous in tree-fruit farms, because the cycle of growth covers such a long time. Due to this danger and because of soil and topographical limits of fruit farming, the purchase should be most cautiously made.

Outlook

Commercial fruit farming in areas having favorable soil and climate offer good opportunities for well-grounded, well-financed operators. Higher per capita fruit consumption, mild climate, and seasonal markets are particularly favorable to the smartly operated fruit farm.

Southeast States—Poultry Farms

Farm flocks are most typical in this region; however, commercial poultry raising has been increasing in recent years. A family broiler enterprise involves raising from 5,000 to 25,000 chicks to about 3 months of age. Started at different times of the year, such an enterprise is a full-time job. Farms of this type are scattered throughout the region, with a concentration in Northern Georgia. More investment is required but more stable incomes are received from a broiler-layer combination in which 1,500 to 2,500 birds are housed for egg production. A big share of the poultry in this region is in small flocks on crop farms.

The Job

The work is quite specialized. As in most farming, certain chores, such as gathering and delivering eggs, feeding, watering, and cleaning, must be done every day. Houses must be disinfected and repairs made; birds killed and marketed or separated for sale. None of this is very hard physically but it is monotonous. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Cleanliness is unusually important in poultry farming in this area. High mortality, particu-
larly among grown birds, can very quickly wipe out a year’s profit. Among the best protections against disease are cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Outlook

Increases in per capita consumption of poultry and eggs are expected. In spite of relatively high feed costs, this region is likely to increase its poultry production somewhat, particularly broilers. In part, these increases represent a catching up with fast progress made in other regions, but they are to be expected because of recent improvements in production techniques and the small acreages needed for poultry. In part, additional progress will be limited by marketing facilities and outlets.

Southeast States—Tobacco Farms

South Carolina and Georgia are the important tobacco States of this region. The farms range from 50 to 250 acres in size. Supplementary sources of income include cotton, dairy, poultry, hogs, fruit, peanuts, sweetpotatoes, and other vegetables. Flue-cured tobacco is most commonly grown, although Georgia and Florida grow some heavier cigar tobaccos including a small acreage of high-priced shade-grown tobaccos.

The Job

Much hard work is involved, and much hand labor is necessary in the summer months. Labor requirements are often over 50 man-days per acre. Curing and handling are necessary after harvest. A knowledge of tobacco culture and curing is essential, because quality has a substantial effect on its price. The level of family living on small units also depends on adequate production of milk, eggs, and vegetables which require diverse skills on the part of the operator.

Outlook

Some areas of this region are well suited to tobacco. Production of lighter cigarette tobaccos has good prospects—better in some areas than cotton or peanuts. As this is an allotment crop, purchasers should be sure of a good base and reasonable price.

Southeast States—Vegetable Farms

The Southeast has been an outstanding producer of fresh vegetables for early and “out-of-season eastern markets.” Farms range from 20 to 300 acres, with most units from 50 to 125 acres. Intensity varies widely; for example, 30 acres in Sanford celery is quite likely to net an income equal to 200 in early potatoes. While vegetables are widely grown in small commercial acreages, the most concentrated production is on the Florida east coast, the Okeechobee area, and on the coastal plains of Georgia and South Carolina. Peppers are concentrated in central Georgia and the Florida coastal areas. Tomatoes are widely grown with large acreages in Florida. Watermelons are also widely grown, but are heavily produced in the coastal plains of Georgia and South Carolina. Other vegetables include potatoes (early Irish in Florida and Alabama), sweetpotatoes, asparagus, sweet corn, cucumbers, cabbage, peas, lettuce, onions, turnips, and less popular varieties.

Most commercial production has been for early sales in metropolitan centers of the Northeast and Midwest. A few vegetables, such as peppers, are grown almost exclusively in this area.

The Job

Vegetable production requires long hours of hard physical work in the field and in the packing house. The family works, but the operator must also be a goodhirer and supervisor of seasonal help, mostly “stoop” laborers. Planning lay-out for the year, to prevent impossible seasonal labor
peaks at harvest and to maximize returns by “hitting the market,” pays high dividends and requires good judgment and managing ability.

Outlook

The early market and specialty or high-quality trade offer good opportunities in this region for energetic operators. The remainder of commercial vegetable farming does not offer very good prospects, other than a living to the small operator. New processing and production methods favor continued increases in units larger and more expensive than those discussed here. These developments also favor more highly productive areas in the north and central sections of the country not formerly in competition with the Southeast.

Southeast States—Part-Time Farms

The number of part-time farms in the Southeast has been increasing. They usually have from 5 to 25 acres with a garden, small pasture, a cow and pig or two, small flock of chickens, and a few fruit trees. None of this offers either large cash results or the often advertised “5-acres-and-independence.” Whenever the lay-out calls for full-time work by the operator and family or large cash expenditures, the farm is no longer part time.

Variations usually reflect soil resources of the farm and whims of the operator. Some do not like livestock and have none. Others do not like crops. Some have jobs which allow time for a small market garden.

The Job

Fairly light work of a wide variety is customary. Some of this work may be exacting, and the operator whose main purpose is to add to his real income by well-directed use of his spare time has little leisure.

Outlook

In the long run additional part-time units can be expected as workweeks are reduced, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Units will be successfully operated by families who buy within the limits of their resources and operate within the limits of their ability, both physical and financial. Cow-chicken-hog-garden units, for family use only, will continue to be numerous as enterprising families try to stretch meager incomes to meet family needs. This is especially true in Florida where winter employment in resort areas can be combined with summer farming.
**MISSISSIPPI DELTA STATES**

Mississippi Delta States—Cotton Farms

This region includes some of the best and some of the poorest cotton farms. Delta soils are among the most productive in the country. Family units here range from 40 to 150 acres and are usually rented as a part of a former plantation with from 5 to 30 acres in cotton and somewhat more in corn. All units have been shifting from mule to tractor power and replacing part of their cotton with oats, hay, corn, and soybeans. Oats followed by lespedeza have become important on most Delta farms with over 50 acres of cropland.

In the hill land of the Delta States, family units are larger and have more acres of cotton. Livestock is not much more important on these farms than in the Delta areas.

Oats, lespedeza, soybeans, truck crops, dairy cattle, hogs, beef cattle, and sheep are found in combination with cotton throughout the region. Oats followed by lespedeza became very much more important on Delta soils during World War II and are expected to stay. Soybeans for beans became important too, but low yields resulting from weather conditions indicate that other alternatives may be more desirable. Livestock offers diversity and additional income.

### The Job

Cotton and cash crops found in combination with it require long days of work during the growing and harvest season. Relative to the income received, this is one of the hardest systems of farming. Knowledge of current methods is very desirable, because of quality price premiums on the crops grown. On larger livestock-cotton units an understanding of general farming is essential, including skill in use of fertilizer and handling of soils.

### Outlook

The Delta lands offer one of the best opportunities for prospective farmers, although farms will be difficult to buy and opportunities for new farms are limited. Productive soils and adaptability to mechanization are found in excellent combination. Diversity in hay crops, soybeans, oats, and livestock (also benefiting from technological advances) add to the prospects for farms on this land. Upland cotton farms probably will shift steadily toward larger units and toward more of the alternatives mentioned above. Cotton, however, will continue as the major source of cash income.

Mississippi Delta States—Fruit Farms

Commercial fruits and vegetables of this region are grown in about the same areas. Strawberries are the big fruit crop of this region, accounting in 1943 for about half the fruit income from the region. Largest acreages of strawberries are in the Hammond area of Louisiana and in western Arkansas. Grapes are grown mostly in northwestern Arkansas, oranges and tangerines in the extreme south of Louisiana, apples and blackberries in the hill land of Arkansas, and peaches on the uplands of both States.

Most fruit is grown in combination with vegetables, a little cotton, and some livestock. Units range upward from 20 acres. Peach orchards are the main enterprise on a few farms largely in the hill areas of Arkansas.

### The Job

Work is hard and requires both skill and experience to bring somewhat delicate crops through the year. Disease and weather must be constantly
battled. Harvest and marketing must be timed to maximize returns. Fruit growers are fairly tied down to the farm, especially at harvest. Good supervisory ability is essential at harvest. Daily work requires mechanical aptitude for equipment used. Bad buys are especially dangerous, because the cycle of growth covers such a long time. Due to this danger and because of soil and topographical limits of fruit farming, the purchase should be most cautiously made.

**Outlook**

Commercial fruit farming in areas having favorable soil and climate offers a good opportunity for the well-grounded, well-financed operator. Farms geared only to the high-price early markets must compete with areas taking advantage of recent advances in processing, particularly quick freezing. Further development in some areas will depend on market outlets and facilities.

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**Mississippi Delta States—Truck Farms**

The Delta States form an important early and late fresh vegetable area with some market gardens and a large amount of shipping. Some vegetables are grown all over the region, but commercial production on an extensive scale is concentrated in southern and northern Louisiana, southwestern and central Mississippi, northwestern, southwestern, and to some extent northeastern Arkansas. Units range from 20 to 200 acres with wide diversification, including tree fruits and livestock on the larger units.

Wide variety of crops is grown in the southern Louisiana areas with some very intensive small units growing two or more crops on the same land. In some parts of this area strawberries and truck are combined; in others sugarcane, potatoes, and truck crops; sweet potatoes are widely grown for sale, home use, and feed.

Commercial vegetables in Arkansas have still more varied combinations with very heavy concentrations of tomatoes but considerable diversity, especially in the western areas. In the Fayetteville area, strawberries, peaches, dairy, poultry, and a broad range of vegetables are combined in many ways. In the more southern areas, some cotton is grown on the vegetable farms along with considerable fruit.

Mississippi areas have fewer commercial vegetable farms, but have many combinations with dairy, poultry, fruit, and cotton. Outside of these concentrations, some vegetables on smaller acres are grown for sale.

Among the most important vegetables are tomatoes, beans, cabbage, cucumbers, shallots, onions, melons, watermelons, and potatoes. Peas, lima beans, beets, carrots, sweet corn, and a number of other vegetables are also grown.

**The Job**

It requires long hours of hard physical work in the field and in the packing house. The family works, but the operator must also be a good hirer and supervisor of seasonal help, mostly “stoop” laborers. Planning lay-out for the year, to prevent impossible seasonal labor peaks at harvest and to maximize returns by “hitting the market,” pays high dividends and requires both good judgment and managing ability.

**Outlook**

Early market and specialty or high-quality trade offer good opportunities in this region for energetic operators. The remainder of commercial vegetable farming does not offer very good prospects to the small operator, other than family living. New processing and production methods favor units larger and more expensive than those discussed here.
Mississippi Delta States—Dairy Farms

Fairly stable, but not too prosperous business, for the small operator. Most common units in this region have from 10 to 25 cows; raise grain, silage, hay, and some fodder; usually buy additional grain. They have from 50 to 150 acres with about half of it in crops with some cotton. Poultry and a few pigs are kept, and some other enterprise, such as truck crops, add to cash income.

Income varies with size of unit, location, type of cattle and, most of all, with skill of the operator. Dairying in this region has slowly become an accepted farming system as other alternatives became less profitable and as technical problems in cattle disease and growth of roughages have been solved.

Large producer-distributors are common to areas near the larger cities in this region. These units have 100 or more cows, buy much of their feed including roughage and usually retail their own milk. Unusually high investment and operating costs limit these units to operators with excellent experience and strong financial backing.

The Job

Working dairy farms requires an active, resourceful manager who can do a variety of jobs with at least average skill and, also, paper and book work necessary for good farm planning. Mechanical aptitude is necessary because a milking machine, farm truck, medium tractor, mower, rake, sprayer, and other field equipment must be kept in operating condition, and buildings kept in repair. Skill in handling livestock and pastures is essential.

Outlook

Fair for dairying. An extremely low per capita consumption of milk and milk products will improve, if purchasing power stays above pre-World War II levels. Skilled operators will find good opportunities, but must continue to face marketing problems and serious production difficulties in the raising of good roughages. They must compete for land with high value crops and develop good pastures, as well as foster the breeding of strains of high-producing, hardy dairy cattle.

Mississippi Delta States—Poultry Farms

Commercial poultry has increased in this region in recent years, especially in Arkansas. Farm flocks for home use are still very common—in 1943, more than one-third of the chickens in the region were consumed on the farms compared with 10 percent in the Northeast. However, in recent years large broiler units have been increasing particularly in Arkansas and the number of turkeys have increased considerably in Arkansas and northern Mississippi.

The Job

The work is quite specialized. As in most farming, certain chores must be done every day; eggs must be picked up and delivered; feeding, watering, and cleaning cannot be neglected. Houses must be disinfected, birds killed and marketed or separated for sale, and repairs made on equipment. None of this is very hard physically but it is exacting work. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Cleanliness is unusually important in poultry farming. High mortality, particularly among grown birds, can very quickly wipe out a year’s profits. Among the best protections against disease are cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Outlook

An increase in per capita consumption of poultry and eggs is expected. In spite of present relatively high feed costs, this region is likely to ex-
AGRICULTURAL OCCUPATIONS—MISSISSIPPI DELTA STATES

Pand production, particularly of broilers and turkeys. In part, these increases represent a catching up with the progress made in other regions, but they also are to be expected because of recent improvements in production techniques and small acreages needed for poultry.

Mississippi Delta States—Rice Farms

This is the major rice region of the country. Farms vary from 150 to 300 acres with roughly a third of the land in rice. Corn, oats, soybeans, and hay are also grown, largely for livestock feed. Rice farms are limited to fairly level lands with soil of the type suited to rice. Central Arkansas, the Louisiana-Gulf coast extending down along the coast of Texas, plus the Central Valley of California are the areas which grow practically all the country’s rice.

Large units are quite common and the number may increase with the introduction of mechanization. Within limits of desirable rotations, this shift may also increase rice acreages on present farms, if land is no longer needed for raising feed for work stock.

The Job

The size of investment on rice farms determines management problems. On smaller units, there is a wide variety of mechanical and laboring jobs that require skill and a strong body. A knowledge of pumping-plant operation and irrigation are essential. Rice growing is a highly specialized type of farming and should be thoroughly studied before commitments to buy or rent are made.

Outlook

The expansion of rice growing is limited by water and soil. Unsettled conditions in Asiatic rice exporting areas suggest a continued strong demand for American rice. This coupled with possibilities of highly mechanized production emphasizes the desirability of farms of sufficient size to make the use of expensive machines practicable and profitable.

Mississippi Delta States—Sugarcane Farms

Cane production is concentrated in the lower part of the region, although some cane is grown in most of the humid south. Except for a small area near Lake Okeechobee, Fla., commercial sugarcane is concentrated on plantations and family farms in southern Louisiana. Most family farms range from 50 to 200 acres with about half the land in crops. Some cotton, sweetpotatoes, and vegetables may be grown in a diversified farming program. Feed crops, usually corn, occupy about as much land as sugar, because of desirable rotation practices. A large part of the cane is produced on large plantations.

The Job

Cultivation and harvesting of sugarcane is hard physical work. Unless modern machines are used, the operator and his family can do only about 10 percent of the total work. Some labor must be hired and supervised.

Quality and tonnage depend on the operator’s knowledge of cane varieties and proper techniques in production. Rapid increases in mechanization place a still heavier burden on the managerial skills of the operator.

Outlook

Family cane farms with some diversification offer a good living to a few energetic operators with good financial backing. However, most commercial cane will continue to be grown on the larger plantations.
Mississippi Delta States—Pecan Farms

Pecans are quite widely grown in this area. Orchards are found principally in the Shreveport area of Louisiana and the Mississippi-Gulf coast. Many orchards in the Gulf-coast areas are the main enterprise on farms of from 50 to 150 acres. In the Shreveport area, farms are larger and grow cotton, corn, hay, and peanuts.

The Job

High value and price-for-quality characteristics of pecans especially make it very desirable that the operator have extensive knowledge and working experience in their culture.

Outlook

Pecans are more favorably grown outside the region, though they make a good additional enterprise in certain areas.

Mississippi Delta States—Part-Time Farms

A few part-time farms are scattered around New Orleans and other urban areas. Lack of cropland and high land values tend to discourage part-time farming. Some successful units are found around mill towns, but are largely confined to residence units with very small off-farm sales.

They usually have from 5 to 50 acres, some combination of a garden, small pasture, a cow and a pig or two, small flock of chickens and a few fruit trees. None of this offers large cash results or the often advertised “5-acres-and-independence.” Whenever lay-out calls for full-time work by the operator and family or large cash expenditures, the farm is no longer part time.

The Job

Fairly light work of a wide variety is customary. None of this is too demanding on the operator, whose main purpose is to add to his real income by well-directed use of spare time.

Outlook

In the long run more such units can be expected as workweeks are reduced, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Successful units will be managed by families which buy within the limits of their resources and operate within the limits of their ability, both physical and financial. The lack of markets in this area and the limited number of desirable locations will discourage any great expansion in this field. However, the cow-chicken-hog-garden units for family use only will continue to be numerous as enterprising families try to stretch meager incomes to meet family needs.
OKLAHOMA AND TEXAS

Oklahoma and Texas—Cash Grain Farms

One of the most fully mechanized types of farm. Those of family size vary from 160 to over 1,200 acres; about 400 acres is the minimum acreage needed for efficient operation. Wheat and grain sorghum are the main crops in the northwestern part of the section. Corn, oats, barley, and rye are also grown. Broomecorn is a specialty crop in Oklahoma.

Low rainfall of the western part of this region limits dry-land farms to grains such as wheat, sorghums and rye. Some livestock is also kept as a complementary enterprise using wheat pasture, native pasture land and sudan pasture. Sorghums, corn, and wheat are sometimes used in feeding out cattle or sheep. Steady increase in acreages has resulted from low yields and mechanization, mostly in the past 25 years. Today, the more successful dry-land farmers operate from 800 to 1,200 acres.

In broken areas of the Panhandle, some cash grain-livestock combinations are successful; but specialization is still the more common. In the East and South, cotton and other cash crops reduce cash grains to minor enterprises.

Rice production is limited to favorable soils in the coastal prairie of southeastern Texas. Rice units are more fully presented under Mississippi Delta types of farms.

The Job

Requires an active, resourceful man who can do many jobs with at least average skill and, also, paper and book work necessary for good farm planning. Mechanical aptitude is necessary, as the combine-harvester, truck, tractor, drill, and a wide variety of other field equipment must be kept in operating condition. Availability of working equipment, when needed, is vital on these highly mechanized farms. An understanding of livestock is desirable.

Outlook

This region contains some of the better wheat-land in the Nation. Although wheat has been a surplus crop, large acreages of it will continue to be grown. Some reduction is needed in the lighter soils to reduce wind erosion; and a smaller total demand for wheat after the current emergency would call for additional reductions. With sufficiently large acreage, well operated, farmers can provide their families with an adequate living in all but drought years. New and more easily produced grain sorghums are steadily increasing in many sections. Rice probably will not hold its World War II peaks.

Oklahoma and Texas—Cotton Farms

Cotton is grown in all but the most arid and most northern areas. Even in the arid western and southern districts, cotton farms are found on the few favorable soil types. In the extreme western part of Texas, cotton is grown under irrigation in the El Paso district.

Acreages operated range from under 10 to over 1,000, but most common are those from 20 to 100 acres in cotton, on farms from 50 to 360 acres. Although widely grown, cotton has definitely favorable areas. These are the Corpus Christi, High Cotton Plains, Rolling Plain, Black and Grand Prairies, and Rio Grande irrigated areas of Texas, and southwestern and central Oklahoma. On some farms even in the best of these areas, soil or climate may make production impossible.

Mechanization of cotton production has advanced more in this region than in any other. Large tractor operations are common, especially in the Corpus Christi High Plains and Black Waxy areas of Texas. There are great variations in competing or supplementary enterprises. These include practically every enterprise of the area. Most common in the dry-land sections
are wheat, grain sorghums, and livestock; rice, fruit, vegetables, small grains, and livestock are important in southeast Texas; peanuts are an important competitor on light, sandy land in both States. Livestock usually means beef cattle. However, dairy cattle and poultry enterprises have been considerably increased in recent years, particularly on farms with relatively small cotton allotments.

**The Job**

Cotton and crops found in combination with it require exceptionally long days of work during the growing season. Relative to the income received, this is one of the hardest kinds of farming. Knowledge of current methods is very desirable, because of quality price premiums and wide variations in yield and growing conditions and recent developments in mechanization.

**Outlook**

For large-scale production, this region contains some of the best cotton areas. Some cotton will always be grown. However, if mechanization is reflected in lower-cost production, large units and more stable returns should develop. Cotton on 150- to 400-acre farms, balanced with other crop or livestock enterprises, offers good possibilities to intelligent operators.

**Oklahoma and Texas—Range Livestock Farms**

Organizations vary widely in this type of operation common to the broken and arid lands. Some ranches are found in every type of farming region, but are concentrated in areas like the Edwards Plateau; “Breaks” of the Rio Grande, Canadian, Brazos, Pecos, Colorado, Red, and Arkansas Rivers; partly drained areas of the Coastal Plains, and rougher lands of the High and Rolling Plains of both States. Sheep and goats are most common on the Edwards Plateau. Cattle are everywhere.

Hay is the usual ranch crop, and considerable wheat and sorghums (grain and forage) are grown. Most ranches have headquarters units raising a wide range of grains, hay, potatoes, and other vegetables. However, the usual ranch operator is interested in grazing a maximum number of livestock and maintaining only enough cropland to insure a supplemental and emergency feed. This practice is encouraged by lack of sufficiently large contiguous tracts of cropland in the grazing areas.

Family units range from 100 to 500 cattle and 750 to 1,500 sheep. Stock is grazed on both public and private land. Large land ownership is convenient, but not necessary. Water rights are essential.

**The Job**

Range livestock does not demand unusually heavy or monotonous work. Management skill and knowledge of livestock are important both in raising and marketing. If combined with irrigated farming, harder work and a still higher degree of managerial skill in planning and operating are required.

**Outlook**

Steadily increasing markets for meat favor range livestock operation. Well-managed units, particularly in the Trans-Pecos and Edwards Plateau, are among the best ranches in the country. A high degree of skill and substantial assets are prime requisites, and with them this region holds good prospects.
Oklahoma and Texas—Dairy Farms

Although dairy cow numbers have been increasing, there are still relatively few dairy farms. Most of them are in the East. Usually they are medium-sized farms from 160 to 300 acres, whose operators have increased their dairy at the expense of other cash enterprises. Some wheat, corn, and oats are grown, and some sheep or cattle may be fed out. Occasionally, these other enterprises may contribute a major part of the income, but, during most years, the dairy herd of from 15 to 40 cows is the chief source of money. Milk is usually sold on a butterfat basis to creameries and processing plants.

A considerable number of the more specialized farms are concentrated near the larger towns and cities such as Tulsa, Oklahoma City, El Paso, Houston, Dallas, Fort Worth, San Antonio, and Galveston. Whole milk is sold under strict sanitary regulations for fluid use in town. More cows are milked and more feed is both raised and bought than on the butterfat type of farm, although the fluid-milk farms may be smaller in acreage. They often include wheat and sometimes cotton farming.

The Job

A resourceful operator is required who can do a variety of jobs with at least average skill and, who also, is well-schooled in dairy husbandry. Mechanical aptitude is necessary because a farm truck, tractor, and a considerable quantity of field and barn equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock characteristics is essential.

Outlook

Good opportunities in the eastern part. Much prairie land is well suited to dairy farming, and developed markets are available. Experienced operators on the better properties can find profitable year-round employment with less fluctuation of income than on crop or livestock farms.

Oklahoma and Texas—Fruit Farms

Fruit is not a primary crop, although it is grown commercially on farms of widely varying size in a few areas. Irrigated citrus orchards (grapefruit and oranges) of the lower Rio Grande Valley are best known, but they cover a very limited area. A few cherries are grown in the coast prairie around Galveston. Peaches and a few apples are found in the rolling prairie, mostly in eastern Oklahoma but fairly well scattered through the northeastern part of the region. Other fruit crops include strawberries, blackberries, and papayas.

The Job

Requires skill and experience to bring somewhat delicate crops through the year. Disease and weather must be constantly battled. Harvest and marketing must be timed to maximize returns. Growers are less tied down, except during harvest and spraying, than are other farmers, but the work is quite hard and good supervisory ability is essential at harvest. Daily work requires considerable mechanical aptitude for equipment used and, also, good judgment in timing seasonal operations. Bad investments are exceedingly dangerous in tree-fruit farms, because the cycle of growth covers such a long time.

Outlook

Good opportunities, in areas having favorable soil and climate for well-grounded, well-financed operators. Outside of these areas, many unfavorable production and marketing conditions make it difficult, if not impossible, to operate commercial fruit farms. Demand for fruit is still increasing in this country, but its production is difficult and marketing is highly competitive.
Oklahoma and Texas—Peanut and Pecan Farms

Peanuts have been widely grown on the light sandy lands of the prairies and timbered lands of Texas and Oklahoma. During World War II and, also, periods of cotton depression (price and boll weevil), peanuts received quite an impetus as a competing crop for cotton. Most commonly they are grown on cotton or cotton-livestock farms. Spanish varieties are used. Peanut hay is usually fed to livestock.

Pecan orchards are scattered through northeast Texas. They are usually only one enterprise on fairly large farms growing cotton, corn, and peanuts.

The Job

Much of the commercial peanut cultivation in these States has been mechanized. Future prospects are for more mechanical aids. Yields, however, are considerably lower than in the Southeast. These crops require a high degree of skill and experience in production methods. The high-value and price-for-quality characteristics of these crops make it desirable that the operator have good knowledge and working experience in their culture.

Outlook

Present experiments in mechanized production will make peanuts a more favorable crop in this region, but soil and erosion control is necessary for permanent farming.

Oklahoma and Texas—Poultry Farms

Much of the poultry in this region is not produced on specialized poultry farms. Farm flocks are most typical in this region. However, commercial poultry has been increasing in recent years. A family broiler enterprise involves raising from 5,000 to 25,000 chicks to about 3 months of age. Started at different times of the year, such an enterprise is a full-time job. Farms of this type are a recent development in southeast Texas and northeast Oklahoma. More investment is required but more stable incomes are received from a broiler-layer combination in which 1,500 to 2,500 birds are housed for egg production. A few such combinations are successfully operated in suburban areas. A big share of the poultry is in small flocks on crop farms. Turkey units are located in the prairie and timbered areas of both States, often a part of grain or general farming.

The Job

The work is quite specialized. Certain chores, such as gathering eggs, feeding, watering, and cleaning, must be done every day. Seasonally, houses must be disinfected, birds killed and marketed or separated for sale, and repairs to equipment made. Some of this is hard physically; much is monotonous. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Cleanliness is unusually important in poultry farming. High mortality, particularly among grown birds, can very quickly wipe out a year’s profits. Among the best protections against disease and cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Outlook

Increases in per capita consumption of poultry and eggs are expected to furnish good markets. Poultry production, particularly broilers and turkeys, should increase because of recent improvements in production techniques and small acreages needed for poultry.
Oklahoma and Texas—Vegetable Farms

Texas, one of the largest commercial vegetable States, grows both early and late vegetables. Vegetables are produced in the eastern part of this region, but much of the production is for home use. One or two vegetables are often rotated in the cotton-peanut area as an additional cash enterprise. Intensive commercial vegetable farms of 30 acres and up are found in definite areas. These are parts of the Rio Grande Plains, the Lower Rio Grande Valley, Corpus Christi, Houston, northeast Texas, Tulsa, Oklahoma City, and to some extent eastern Oklahoma. Most cities in the humid areas have a few surrounding market garden farms.

All these areas produce tomatoes, watermelons, melons, and dry onions. Green and snap beans, spinach, carrots, beets, and cabbage are grown in the lower valley and plains of the Rio Grande. Corpus Christi has large acreages of cucumbers, beets, cabbage, and spinach. The Houston and Tulsa areas have cabbage, spinach, and sweet corn. Other vegetables include limas, broccoli, lettuce, peas, peppers, squash, turnips, and radishes. Melons and sweetpotatoes are widely raised for home use and for sale. Irish potatoes are grown only in the more humid eastern areas, and large acreages are uncommon.

The Job

Requires long hours of hard physical work in the field and in the packing house. The family works, but the operator must also be a good hirer and supervisor of seasonal help, mostly “stoop” laborers. Planning lay-out for the year, to prevent impossible seasonal labor peaks at harvest and to maximize returns by “hitting the market,” pays high dividends and requires both good judgment and managing ability.

Outlook

Early market and specialty or high-quality trade offer good opportunities for energetic operators. Market gardens are stabilizing around larger cities. New processing and production methods favor continued increases in units larger and more expensive than those discussed here, with some possibility of cooperative plants buying from smaller farms.

Oklahoma and Texas—Part-Time Farms

There are large and small part-time units in this region. Some suburban units from 1 to 50 acres have a garden, cow, pig, and chickens as the source of family food and some cash. Small retail routes to dispose of excess produce are not uncommon.

Another kind of operation is the small commercial unit, usually grain, found most often in the wheat areas. Some operators own or lease 160 to 320 acres of cropland with a few buildings and occasionally no equipment. For example, a small-business man in a small town may seed 160 acres of wheat, return to town and wait for the harvest. If it “hits,” he has a substantial addition to his cash income. If it does not, he has lost but little.

The Job

Fairly light work of a wide variety is customary. None of this is too demanding on the operator, whose main purpose is to add to his real income by well-directed use of spare time. The part-time grain farmer usually hires most of his work done; his problem is largely supervision and waiting.

Outlook

In the long run more part-time units will be added to the area as workweeks are reduced, submarginal farms fail as commercial units, and pensioners find suitable locations. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Successful ones will continue to be numerous and will be operated by families which have bought within the limits of their resources and which plan to operate within the limits of their ability, both physical and financial. Small cash grain or range livestock units may become more numerous as supplements to pensions and annuities.
Northern Plains States—Cash Grain Farms

This is one of the most fully mechanized types of farms. Those of family size vary from 320 to over 1,200 acres, but about 480 acres are the minimum necessary to provide an adequate level of living for a farm family in the wheat areas. Wheat is the main crop; winter wheat in the southern area and spring wheat in most of the north. Corn, oats, barley, and rye are also widely grown and in some parts of the region one or more of these alternative crops may be more profitable than wheat. Flax is raised in the north, especially along the eastern border of the Dakotas. Wheat-livestock combinations are more common in the northern area, wheat-fallow or wheat-grain sorghums in the south.

Low rainfall of the western part limits dry-land farms to hardy small grains—largely wheat, barley, and rye. Summer fallow tends to stabilize production. Livestock is often kept especially in the northern areas. In the winter-wheat areas sheep and cattle are fed as a complementary enterprise using wheat pasture. Steady increase in acreage has accompanied mechanization, mostly in the past 25 years. Today the more successful dry-land farmers operate 800 to 1,200 or more acres.

Wheat-corn combinations on smaller acreages are found on the more humid and better protected soils of the eastern portion. Wheat-grain sorghum combinations have developed in southwest Kansas and adjacent areas.

The Job

It requires an active, resourceful man, who can do a variety of jobs with at least average skill. Mechanical aptitude is necessary because the combine-harvester, truck, tractor, drill, and other field equipment must be kept in operating condition. Availability of working equipment, when needed, is vital on these highly mechanized farms. An understanding of livestock is desirable.

Outlook

This region contains some of the better wheat land in the world. Although wheat has been a surplus crop, large acreages will continue to be grown. In the high risk areas reduction of wheat in favor of grass and livestock is needed. If demand for wheat decreases after the current emergency, additional reductions in wheat will be desirable. With sufficiently large well-operated acreage, farmers can provide their families with an adequate living in all but drought years.

Northern Plains States—Cash Grain-Livestock Farms

This is the Plains version of a Corn Belt prairie farm. Range from 400 to 2,500 acres; the larger units with cattle more common in the western plains, and the smaller units with hogs more general in the east. Where soil and rainfall are consistently favorable, a wheat-corn-hog-beef cattle combination gives diversity and fairly high income. These units feed out the livestock or cut back on stock and sell their grain in accordance with their immediately best opportunities. Hay crops and rotation pasture are a permanent part of the farm plan.

Farther west, there is more wheat and barley, but less corn. Hogs are fewer and cattle and sheep more common. More of the cattle are raised rather than bought as feeders. Dairy cattle, which are fairly common in the Eastern Plains, give way to dual-purpose or beef types.

The Job

It requires more management skill and more year-round work than specialized cash grain farming. Mechanical aptitude is necessary for operating combines, tractors, and a variety of field equipment. Knowledge of livestock management is essential. Maintaining highest profit combination of grain and livestock sales requires a high degree of managerial skill. Work is more continuous and operators have less leisure time than strictly cash grain farmers.
Outlook

Addition of livestock to cash grain units gives more profitable employment to the operator and greater diversified outlet for his products. Annual fluctuation of income will be less than on specialized cash grain units. Well bought units of this type offer good opportunities to industrious intelligent operators.

Northern Plains States—Range Livestock Farms

Range livestock farms are a fairly limited type of operation. They usually have from 125 to 400 or more cattle and from 750 to 2,000 or more sheep. Cattle units are more common and are concentrated in the Sand Hills of Nebraska and the Black Hills of South Dakota.

Acreage owned includes the ranch headquarters, with hay and a little grain the only crops harvested. Much of the hay is wild. Cattle are grazed over some of the owned acreage and over a larger area leased or held in State and Federal grazing districts. Indian lands may also be grazed under lease. On some ranches, small acreages of irrigated land help furnish the wintering roughages. On ranches with good wheat land, this grain offers additional cash income to the operator.

Livestock is sold as feeders or grass-fat cattle. Sheep may be sold as feeders or held for partial fattening when surplus grain is available. Unusually high acreages of grazing land and wild hay typify range livestock operating units.
The Job

Work is not unusually heavy or monotonous. Management skill and knowledge of livestock is essential both in raising and marketing. If combined with irrigated farming, harder work and still higher degree of managerial skill in planning and operating are required.

Outlook

These States with few exceptions are really the fringe of range livestock operations. Well-planned operations can be successful in view of our steadily increasing needs for meat, but location in the Plains should be carefully compared with possibilities farther west.

Northern Plains States—Dairy Farms

Limited type for this area. Fairly well scattered in the eastern half of this region. Usually they are medium-sized farms, from 160 to 800 acres, whose operators have increased their dairy enterprise at the expense of cash grain and other livestock. Some wheat, corn and oats, hay, and pasture are grown; some sheep or cattle may be fed. Occasionally, these other enterprises may contribute a major part of the income, but, during most years, the dairy enterprise of from 15 to 40 cows is more common. Milk is usually sold on a butterfat basis to creameries and processing plants.

A considerable number of dairies are concentrated near the larger towns and cities, such as Kansas City, Omaha, Lincoln, Sioux Falls, Fargo, Topeka, and Wichita. These dairies sell whole milk under rigid sanitary regulations for fluid use in town. The number of cows milked is higher and more stock feed is both raised and bought on fluid milk farms, although these may be smaller than the butterfat type.

The Job

It requires resourceful operators who have good knowledge of dairy husbandry and can do a variety of jobs with at least average skill. Mechanical aptitude is necessary because a farm truck, tractor, and a considerable quantity of field and barn equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock characteristics is essential.

Outlook

Opportunities are rather limited, except near urban areas in the eastern part. Much of the land is well suited to dairy farm needs and developed markets are available. Experienced operators on the better farms can find profitable year-round employment with relatively low fluctuation of income.

Northern Plains States—General Farms

General farms are a fairly stable type that offer a maximum of security and employment. They comprise from 160 to 800 acres or more. Income is received from some combination of beef cattle, hogs, sheep, dairy, poultry, small grain, corn, flax, potatoes, sugar beets, or vegetables. Actual combination depends on soil, climate, lay-out of farm, and preference of the operator. Smaller acreages but additional skills are required in the irrigated areas in the western part.

Among the best farms are those of the Red River Valley and the Corn Belt fringe in South Dakota, Nebraska, and Kansas. In the northern areas, beef or dual purpose cattle, hogs, and sheep are the most common livestock; wheat, barley, and corn for silage are the most common feed crops. Cash crops include potatoes, sugar beets, and flax. In the southern areas, general farms have more corn for grain, more hogs, and fewer sheep, and raise less cash crops and more feed crops.

The Job

The operator must be vigorous, resourceful, well-trained, and skilled in management. A wide variety of jobs must be well done or well super-
AGRICULTURAL OCCUPATIONS—NORTHERN PLAINS STATES

vised. Some knowledge of production methods and operating problems, such as disease control in cattle, hogs, sheep, and field crops, is necessary.

Outlook

Good opportunities for profitable farm operations. The better located farms compare favorably with similar units in the Corn Belt States. Planned to give full employment all year and to take advantage of soil and climatic resources, well-managed units should be successful. Their year-to-year variations in income are small compared with other types, although their average income will be lower.

Northern Plains States—Part-Time Farms

Comparatively few in number, but acreages are considerably higher than those farther east. Vary widely in size and kind. Suburban units from 1 to 50 acres are found around cities of the Eastern Plains with garden, cow, pig, and chickens as the source of family food and a few cash sales. Small retail routes offer outlets for some operators. Another kind is the small commercial unit, usually grain, found most often in the wheat areas. Some operators own or lease 160 to 320 acres of cropland with few buildings and occasionally no equipment. For example, a businessman in a small town may seed 160 acres of wheat, return to town and wait for the harvest. If it "hits," he has a substantial addition to his cash income. If it doesn’t, he has lost but little.

The Job

Work of a wide variety is customary on suburban units. None of this is too demanding on the operator, whose main purpose is to add to his real income by well-directed use of spare time. The part-time grain farmer often hires most of his work done; his problem is largely supervision and waiting.

Outlook

More part-time farms will be added to the area as workweeks are reduced, submarginal farms fail as commercial units, and pensioners find suitable locations. Units will be operated successfully by families which buy within the limits of their resources and plan to operate within the limits of their ability, both physical and financial.
Mountain States—Cash Grain Farms

Cash grain farms are a highly mechanized type, common to only a few areas. They vary from 80 to over 1,200 acres, but about 480 acres is the minimum dry-land acreage likely to bring decent level of living to a family in the wheat area. Wheat alone or with some livestock is most common in the plains of Montana, Wyoming, and Colorado. Wheat and dry peas are the main crops on cash grain farms in northern Idaho and western Montana. Barley and rye are also grown and, in some parts of the region, one or more of these alternative crops may be more profitably grown than wheat. Some flax is grown in Montana. Sorghums are raised largely on the eastern slope of New Mexico and Colorado.

Low rainfall limits dry-land farms to hardy small grains; largely wheat, barley, and rye. Some livestock is often kept, and in some areas sheep and cattle are fed as a complementary enterprise using wheat pasture. Steadily increased acreages have accompanied mechanization, mostly in the past 25 years. Today, the more successful dry-land farmers operate from 800 to 1,200 or more acres.

The Job

It requires an active, resourceful man who can do a variety of jobs with at least average skill. Mechanical aptitude is necessary because the com-
bine-harvester, truck, tractor, drill, and much other field equipment must be kept in operating condition. Availability of working equipment, when needed, is vital on these highly mechanized farms. An understanding of livestock is desirable.

**Outlook**

Opportunities for dry-land cash grain farms in the best adapted specialized areas are among the best in the country. Relatively, there are fewer cash-grain units than farther east, but, of these few, some are excellent.

**Mountain States—Range Livestock Farms**

This region includes the most extensive range area of the country. On ranches the major source of income is from livestock. Large acreages are the rule, and cropland usually is limited to hay and grains for feed production. Principal variations include adaptability of the ranch to cattle or sheep production; number of acres of range necessary for each animal (carrying capacity); length of winter feeding season, which determines amount of hay required per head; winter-feed-producing ability which depends upon acreage adapted to crop production, quality of land and water rights belonging to the property. Few ranchers own all their range-land requirements, so availability of leases or public-land-grazing permits is important. While these are physical factors, each operator makes numerous personal decisions that vary the type of operation.

Class of livestock sold by ranchers depends largely on type of operation for which the ranch is adapted. Relative market price for different classes of livestock determines type of operation at a particular time. Some ranchers sell calves, above heifer replacement needs, at weaning time in the fall. Others hold their calves over, selling them as long yearlings or as 2- or even 3-year-olds. All sell aged or defective cows as culls. While some ranchers produce grass-fat cattle in the more favorable years, most cattle sold from this region go on the market as feeders.

Income from sheep ranches is largely from sale of wool and lambs. Sheep are shorn in the spring or early summer. Lambs are weaned and sold usually as feeders during the period August to October. To replace aged ewes and animals which die, ewe lambs numbering about 20 percent of the total of sheep run are retained each year.

**The Job**

Occasionally very hard, but probably is more interesting and less arduous than farm work. Management skill and knowledge of livestock are essential both in production and marketing. Irrigation of cropland used adds to managerial problems. Skill in handling stock is essential because low losses and high calf or lamb crops are the major determinants of annual income.

**Outlook**

Greater meat production will be necessary to meet demands of our steadily increasing population. Wool outlook is favorable. This region is basic to our livestock industry and offers good opportunities to industrious, intelligent operators. Investment necessary to return adequate income to operators is among the highest. Sufficient financing and unusually thorough training are necessary.
Mountain States—Irrigated Farms

Irrigated cropland is the major source of income. Usual type has certain specific rotations including alfalfa, small grain (nurse crops), and pasture. Aside from this, most farms have one or more specialty cash crops, developed from a combination of natural advantages and available markets. They vary from 40-acre cash-crop hay units to thousands of acres in long-staple cotton.

Common crop specialties include sugar beets, potatoes, field beans, small grains, and alfalfa. Cotton highly specialized under irrigation is grown only in a few counties along the Pecos, Rio Grande, Yuma, Gila, and Salt Rivers in Arizona and New Mexico. Sugar-beet acreage is concentrated along the Snake River in Idaho, the Platte in Colorado and Wyoming, the Arkansas in Colorado, and the Yellowstone and Milk Rivers in Montana; also, west of the Wasatch Range in Utah, particularly in the Salt Lake area, and in north-central Wyoming. Potatoes are quite widely grown but have large concentrations on upper and lower Snake River in Idaho, San Luis Valley, and Greeley areas of Colorado. Field beans and alfalfa have been grown in most irrigated areas.

Some livestock is on most irrigated farms, and some farms in beet areas have intensive feeding operations.

The Job

Crop specialties require resourceful, vigorous operators with good training in field work and horticulture. Irrigation adds to the work and complexity of managerial problems. Both gravity and pump irrigation are common to this region.

Hard work is the rule, especially during the growing season. Hay rotations usually bring some livestock into the organization and more year-round work.

Outlook

Prospect for adequate income from hard work is quite good for crop specialty units in this region. Markets are usually good, and production, especially under irrigation, is fairly even year by year. The larger units with reasonable diversification furnish the better farming opportunities in the country.

Mountain States—Dairy Farms

Many farms have four to six cows and sell a little milk or cream. Larger commercial dairy farms are found mostly near cities and towns requiring fluid milk, such as Butte, Boise, Ogden, Denver, Cheyenne, Albuquerque, and Phoenix. Irrigated hay, feed crops, and pasture are operated with the dairy. However, many large dairies have few crops and buy most of their feed.

A few commercial dairy farms, not primarily concerned with fluid milk markets, are on land that is too thin to be used for cash crops. Units of this type are found on the western slope in Colorado, around Boise, Idaho, and east of Great Salt Lake.

The Job

Requires an active, resourceful man who can do a variety of jobs with at least average skill and who also can do paper and book work necessary for good farm planning. Mechanical aptitude is necessary because a farm truck, tractor, and a considerable quantity of field and farm equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock is essential.

Outlook

With the exception of local urban markets, dairy farming in this area is limited to thin lands. Experienced operators can find profitable year-round employment with less fluctuation of income than on more specialized crop or livestock farms. As an enterprise on irrigated farms, a larger dairy may be developed to use labor and alfalfa.
AGRICULTURAL OCCUPATIONS—MOUNTAIN STATES

Mountain States—Vegetable Farms

A wide variety of fresh vegetables are grown in the irrigated valleys. Commercial vegetable units range from 40 acres upward, with the largest units in the highly commercial valleys of southern Arizona, Salt Lake area, Lower Snake River in western Idaho, and irrigated valleys of Colorado. Many commercial vegetables come from general and crop-specialty farms that have one or two vegetables in their rotation.

Lettuce is concentrated in Yuma and Salt River Valleys of Arizona, San Luis Valley and northwest Colorado, and the Snake-Boise area in Idaho; net and smooth melons along the Arkansas River in southeastern Colorado and in the Salt River Valley near Phoenix, Ariz.; cabbage in the San Luis and Greeley, Colo., areas; peas in these areas plus Salt Lake, Utah, and the Boise-Boise area of Idaho; onions along the Arkansas, in San Luis Valley, and on the western slope of Colorado—also the Salt Lake and Boise-Boise areas; hot peppers along the Rio Grande in northern and southern New Mexico. Other vegetables grown to some extent include beans, carrots, cauliflower, celery, sweet corn, and cucumbers.

The Job

Long hours of hard physical work during the growing season are required. The family works, but the operator must also be a good hirer and supervisor of seasonal help, mostly “stoop” laborers. Planning lay-out for the year to prevent impossible seasonal labor peaks at harvest and to maximize returns by “hitting the market,” pays high dividends and requires good judgment and managing ability.

Outlook

Out-of-season deals and specialty or high-quality trade offer good opportunities for alert, energetic operators. There also are good prospects for a few market garden units near urban areas. Many commercial vegetable farms offer little more than living to the small operator. New processing and production methods favor continued increases in units, larger and more expensive than those discussed here. These developments also favor increased competition for the West from other commercial vegetable areas.

Mountain States—Part-Time Farms

Part-time farms are scattered throughout this region. Gardens, beef and dairy cattle, sheep, hogs, chickens, and a very few acres of land are among the enterprises that can be part of such units. A larger acreage with considerable pasture and a few acres in feed crops is also possible, particularly in the foothills where rainfall is heavier.

Actual enterprises followed usually reflect soil resources of the farm and desires of the operator. Some don’t like livestock and have none. Some have seasonal jobs, which allow time for a small market garden. Others, with large units, have cattle or sheep that are pastured but fed on feed and hay bought from the outside.

The Job

Fairly light work of a wide variety is customary. None of this is too demanding on the operator, whose main purpose is to add to his real income by well-directed use of spare time.

Outlook

In the long run more units will be added to the area as workweeks are reduced, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Successful ones will be operated by families which buy within the limits of their resources and operate within the limits of their ability, both physical and financial.
PACIFIC STATES

Pacific States—Fruit Farms

In parts of California and some of the irrigated valleys of Oregon and Washington, fruit farms dominate the agricultural economy. Most are on irrigated land, so family units are relatively small, from 15 to 50 acres. Oranges are concentrated in the southern San Joaquin Valley and on the south coast of California; lemons on the south coast, and grapefruit in the Imperial Valley and south coast. Deciduous fruits are more widely grown, for there are numerous areas where soil, climate, and topography favor peaches, apples, pears, cherries, and the various berries. However, apples are concentrated in the Yakima and Wenatchee-Okanogan areas of Washington, the Hood River district of Oregon, and on the central coast of California. Walnuts are centered in the Central Valley and south coast of California and the Willamette Valley regions of Oregon. Almonds are a California specialty, although grown to some extent in Oregon.

There are numerous other specialty areas. Dates are found only in the Imperial and Coachella Valleys. Pears are grown in several valley and foothill regions in California, in Hood River and Rogue River Valleys in Oregon, and in the Yakima Valley in Washington. Table, raisin, and wine grapes are specialized almost entirely in central California. As for figs, olives, plums, prunes, apricots, and peaches, each has regions where conditions are favorable. Briefly, this is a fruit region with a tremendous range in latitude and altitude.

The Job

Requires skill and experience to bring somewhat delicate crops to harvest and market. Disease and weather must be constantly battled. Harvest and marketing must be timed to maximize returns. Fruit farmers have quite a bit of seasonal work, much of it is hard. Good supervisory ability is essential at harvest. Daily work requires considerable mechanical aptitude in caring for equipment used and, also, good judgment in timing seasonal operations. Investments should be made very carefully, because the cycle of growth covers such a long time. Due to this danger and because of soil and topographical limits of fruit farming, purchases should be most cautiously made.

Outlook

Good opportunities in favorable areas for well-grounded, well-financed operators. Outside of the better areas, unfavorable production and marketing conditions are likely to force continuation of recent decline and the continued adoption of a less specialized combination of enterprises. There is less opportunity than with most other types of farming for expanding total production because overproduction and low prices may quickly occur. Outlook for future profits varies widely with different fruits, so the prospective fruit grower must look carefully into prospects for fruit under consideration.

Pacific States—Vegetable Farms

This region has several outstanding vegetable areas, largely under irrigation. Large-scale specialized operations are typical of commercial vegetable production, especially in California. Grower-shippers may, however, rent units of 20 to 50 acres to producers, whose main job is to get crops ready for harvest. Small-scale producers should be sure of a market outlet for their products. In irrigated areas of Washington and in the Willamette Valley of Oregon, there are also small owner-operated units. There are relatively few market gardens in the region.

Main vegetable producing areas are Spokane, Walla Walla, Yakima, and Puget Sound of Washington and the Willamette Valley; and, for green peas, Umatilla of Oregon; the Sacramento, San
Joaquin, and Imperial Valleys; and the central and south coast of California.

Among the more heavily grown crops are lettuce, tomatoes, green peas, celery, onions, artichokes, asparagus, green beans, melons, carrots, and sweet corn. Other vegetables include beets, broccoli, cabbage, cauliflower, brussels sprouts, cucumbers, peppers, spinach, squash, watermelons, and rhubarb. Many lesser known and a few exotic vegetables are grown particularly in southern California.

The Job

It requires long hours of hard physical work in the field, in the packing house, and sometimes in the market. Operator must be a good hirer and supervisor of seasonal help, mostly unskilled or semiskilled laborers. Planning lay-out for the year, to prevent extreme seasonal labor peaks at harvest and to maximize returns by “hitting the market” pays high dividends. Picking at the right time or, occasionally, plowing a crop under and replanting require good judgment and managing ability. Knowledge of horticulture, experience in its practical application, and smart market sense are very essential in this highly competitive business.

Outlook

Good opportunities in this region for energetic, skillful operators. While it is difficult to get in on a family scale, there are prospects for good living to the small operator. New processing and production methods favor continued increases in units larger and more expensive than those discussed here. Smaller ones are favored in new and old irrigation developments under Government regulations, but are more vulnerable to price fluctuations.
Pacific States—Irrigated Farms

In value of products, irrigated cropland is predominant in this region. Much of this land is in a combination of crop specialties, field crops, and livestock. Units of from 20 to 120 acres are quite common in the Yakima, San Joaquin, Sacramento, Imperial, and smaller valleys. These units have some combinations of fruit, vegetables, dairy, poultry, beef, pasture, alfalfa, sugar beets, potatoes, and specialty crops.

Actual combination varies with soil, climate, inclination of operator, and availability of markets. Vegetables, alfalfa, and sugar beets are usually grown for predetermined markets or under contract with processors or dealers. For example, Imperial Valley alfalfa is sold largely to dealers or large dairies with dry-lot operations in the Los Angeles area. Usually, alfalfa, small-grain nurse crops, and some pasture are parts of irrigated rotation, and specialties are developed in line with soil, climate, and markets.

Specialized units include cotton, potato, alfalfa, and sugar beet. Most cotton units are located in the San Joaquin and Palo Verde Valleys. These are all irrigated areas; high per acre and per farm production is the rule, much of it under contract.

Potato farms are found in both irrigated and dry-land areas. Most recent development has been expansion of the early potato acreage in Kern County, Calif. Potatoes are important in Klamath and Deschutes Counties of Oregon and, as a high-altitude crop, are one of the best cash crops in the Cascade foothills. Specialized potato units in the Yakima or Willamette areas are not common, but a few units are always found wherever the potato is a prominent cash enterprise.

The Job

Operator must be resourceful, well-trained, and skilled in management. A wide variety of jobs must be well done or well supervised. Some knowledge of production methods and operating problems, such as disease control in cattle, poultry, sheep, fruit, vegetables, and field crops, is necessary. Skill in irrigation or a business large enough to hire such skill is essential.

Outlook

Good opportunities at rather high investment levels for profitable farm operation. Irrigated units, which are basic to the industry and well-being of the area, have a definitely good future. Some specialities, such as fruit and cotton, are less desirable immediate prospects because of high investments and uncertain prices. Well-managed, well-financed units, having considerable flexibility in production possibilities, should be sound investments.

Pacific States—Range Livestock Farms

Range areas are similar to the intermountain area to the east. Ranches have livestock, sheep, or cattle, as the major source of income. Operating acreages are large and there is relatively little cropland. Ranchers in this region usually own a higher proportion of total land operated than do intermountain ranchers. This is particularly true where per acre carrying capacity is high.

The nature of cattle and sheep operations varies widely with the kind of range and supplemental feed available. Some ranchers operate breeding herds and sell feeder cattle, calves and steers, or lambs. Others on better ranges, can market grass-fat cattle. Some may buy feed and sell finished stock. Still others may buy feeders for partial finishing and resell them in the fall. Sheep ranchers sell early or late lambs (the former being very common in California), mutton, and wool. Lambs may be sold as feeders or fat.
AGRICULTURAL OCCUPATIONS—PACIFIC STATES

The Job

Ranching is occasionally hard, particularly during lambing or emergency winter feeding. However, to many people, it is more interesting and less arduous than farming. Management skill and knowledge are essential both in production and marketing. In some areas, irrigation both of pasture and cropland adds to managerial problems. Skill in handling stock is essential because low losses and high calf or lamb crops are major determinants of income.

Outlook

Increase in meat consumption during World War II and the marked growth in population on the Pacific coast indicate that greater meat production is desirable. The region has several excellent range livestock areas, and cut-over land offers limited new possibilities where development costs are reasonable. Wool prospects are good. Difficulty in the stock business is not in poor future earnings but rather in the fact that range facilities in the West are already fully utilized and allotted to existing ranchers.

Pacific States—Cash Grain Farms

This region has some of the best small-grain areas of the country. Wheat, rice, oats, barley, flax, dry peas, and field beans are the most important crops. Rice is limited by soil largely to the Sacramento Valley; flax to San Joaquin and Imperial Valleys. Wheat production is most concentrated in the Palouse-Big Bend of eastern Washington and Oregon. Peas are grown in rotation in parts of the Palouse. Small grains are widely raised as a nurse crop in irrigated areas.

There are important variations in size of farms. Adequate units need at least 80 acres irrigated or 800 dry-land, but irrigated ones have from 40 to 160 acres, dry-land units from 160 to 2,500 acres or more. There are numerous inadequate-sized dry-land units in both the wheat-peas and wheat-fallow areas. Successful sizes also vary widely with rainfall, which has an average range in this region from 9 to 70 inches, and higher in isolated mountain areas.

Some carry a substantial livestock enterprise. Cattle, both beef and dairy, sheep, and poultry are effectively combined with grain and add to income at small cost, as stubble, hay, and grazing are given their most profitable employment.

The Job

Requires an active, resourceful man who can do a variety of jobs with at least average skill and, also, paper work necessary for good farm planning. Mechanical aptitude is very necessary because the combine-harvester, picker, truck, tractor, drill, and a wide variety of other field equipment must be kept in operating condition. Availability of working equipment, when needed, is vital on these highly mechanized farms. An understanding of livestock is desirable.

Outlook

This region contains some of our best cash grain land. Although some cash grains, especially wheat, have been surplus crops, large acreages will continue to be grown. Some reductions in parts of this region are needed to reduce soil erosion; and after the current emergency less wheat may be needed for food. With sufficient well-operated acreage, farmers can usually provide their families with an adequate living.

Pacific States—Dairy Farms

Dairy farms in these States are of two distinct kinds, depending on the type of market outlets. Near urban areas, farms are more expensive, have a large number of cows, but are not necessarily larger in acreage; whole milk is sold to city dealers or retailed at relatively high prices but under stringent sanitation regulations. These fluid milk farms are all over the area, but are numerous in the Los Angeles, San Diego, San Francisco, Portland, Puget Sound, and other milksheds. The
second marketing type, under high but less stringent sanitation regulations, sells milk or butterfat to manufacturing plants where it is processed into evaporated milk, cheese, butter, and other milk products. This type is most numerous in western Oregon and Washington, where the number of cows is small.

Many are not specialized, but depend for some income on cash crops and other livestock products. Of these, fruits, poultry, and vegetables are most common. Grain and hay are sold in some instances. Each of these assists in building up farm income and adds to the profitable employment of farm resources. Size of unit varies from 20 to over 500 acres, depending on number of cows, kind of operation, and extent of irrigation. Where dairying is the only source of income, 15 to 20 cows with the required feed land is about the minimum satisfactory size.

The Job

Requires an active, resourceful man who can do a variety of jobs with at least average skill and, also, paper and book work necessary for good farm planning. Mechanical aptitude is necessary because a milking machine, farm truck, light tractor, mower, rake, sprayer, and other field equipment must be kept in operating condition, and buildings kept in repair. An understanding of livestock characteristics is essential. Irrigated units demand added skills in the use of water. Dairying requires twice-a-day milking and feeding every day of the year.

Outlook

It has a good future. Much of the land to be developed by irrigation is well suited to dairy farms, and some of it is poorly adapted to anything else. Developed markets are available. Experienced operators on the better properties can find profitable year-round employment with less fluctuation of income than on more specialized crop or fruit farms.

Pacific States—Poultry Farms

This is an important egg-producing region with some highly specialized poultry farms. Small specialized chicken-egg farms are fairly well scattered throughout California, though more common in the coastal half of the State. This is still more true in Oregon and Washington, where most poultry farms lie between the Cascade and Coast ranges.

Adequate family units should have from 1,500 to 2,500 laying birds, which amounts require raising from 3,500 to 8,000 chicks. Meat sold is from culls and cockerels. Turkey and broiler units, which specialize in meat production, may raise from 1,000 turkeys to 25,000 broilers. Early development of egg marketing associations, selling on eastern markets, has resulted in more emphasis on eggs than meat, but broilers and turkeys have increased considerably in the past 15 years.

The Job

Work is more specialized than dairy or general farming. Certain chores, such as gathering eggs, feeding, watering, and picking up sick birds, must be done every day. Seasonally, houses must be cleaned and disinfected, chicks brooded, birds killed and marketed, and repairs made. Mechanical aptitude is not so important as on farms with much field work, but good management and planning are.

Sanitation is unusually important, as high mortality can very quickly wipe out a year’s profits. Among the best protections against disease are cleanliness, knowledge of diseases and their remedies, and establishment of disease-free stock.

Outlook

Poultry farming in the West, if properly located as to feed supply and markets, can hold its own in competition with other regions. The long-time outlook is fairly good, but the poultry business is one that frequently becomes overexpanded and resulting prices drop too low for any but the better producers to make a profit. But weaker ones are soon eliminated and profitable prices return within a year or two. The beginner will do well to time his entry into the business just before one of these profitable years rather than just after.
Pacific States—Part-Time Farms

There is an unusually large proportion of part-time units. These units, whether they be cut-over poultry farms or 5 acres of oranges, have one thing in common. They are too small to produce an adequate living. Only a few exceptional units, started on a part-time basis, can be expanded into a full-time family farm. These are the exceptions.

Units are numerous in this region for several reasons, but mainly because the climate has attracted many retired couples and because too many units were established with less land and equipment than is now necessary for full-time operation. They are located in all areas, though most common in valleys near larger cities and in foothills, particularly of the coastal range. Perhaps the most advertised areas are southern California and Puget Sound, and each of these has its quota.

Because of marketing and production difficulties, some enterprises are not well suited to part-time operation. However, there is a definite place for units with enterprises such as fruit, vegetables, poultry, flowers, and rabbits. Fairly large fruit units are part time because much of the work is done by contract. Subsistence units, from which milk, eggs, and garden products are produced for home use only, are more numerous than farms designed solely to add to family cash income.

The Job

Fairly light work of a wide variety is customary on a part-time unit. Although much of this is hand work, due to absence of commercial farm equipment, little of it is too demanding on the operator, whose main purpose is to add to his real income by well directed use of spare time.

Outlook

In the long run more units can be expected as workweeks are reduced, submarginal farms fail as commercial units, pensioners find suitable locations, and urban people indulge their back-to-the-farm urge. These long-time trends may be slowed down or halted as a result of defense activities during the next few years. Successful ones will be those operated by families which buy within the limits of their resources and operate within limits of their ability, both physical and financial. However, the cow-chicken-garden units for family use only will continue to be numerous as enterprising families try to stretch meager incomes to meet their family needs.
OTHER AGRICULTURAL OCCUPATIONS

Farming is the biggest field open to students of agriculture. Yet, it is far from being the only one. Thousands of people are required in teaching, research, farm service, and many other vocations associated with farming. The U. S. Department of Agriculture alone employs about 75,000 full- or part-time personnel, in numerous professional, technical, and clerical lines. Agricultural teachers in the land-grant colleges, universities and high schools also number in the thousands. Specific studies of these opportunities have not been made, but an idea of their scope is given below.

Professional Opportunities

A recent publication of the U. S. Department of Agriculture lists 65 specialized jobs in various bureaus of the Department and further says that the listing is only partial. Many of these jobs are professions in the field of agriculture.

The possibility of using an agricultural education off the farm is apparently excellent and many individuals probably serve agriculture better off the farm than they would on. An intense curiosity about soil structures and good training in physics, chemistry, and bacteriology will help a farmer, but such interests are especially likely to make a good agronomist or soils scientist. Farmers must know a great deal about insects and other pests, yet a top-notch student of entomology may serve better as a quarantine officer or research entomologist.

Teaching, one of our oldest professions, is a mainstay of agriculture. Young folks, even before high school, meet their county club agents and teachers of vocational agriculture. Their fathers are familiar with the county agent and professors at the State college or university. Their mothers know the home demonstration agent. The combined effort of these and other teachers is one of the reasons why farming efficiency in the United States has been increasing so rapidly. In terms of financial inducement, the exacting requirements of the agricultural teacher are relatively well rewarded; such teachers are usually employed 12 months in the year and are partially supported by Federal funds. Opportunities in the field are expanding, owing to increased enrollments in colleges of agriculture, rapid growth of the Federal-State Extension Service, and the widespread use of demonstration agents by farm equipment companies, cooperatives, and public utilities.

See also Chapter on Teaching Field, page 43.

Teaching is only one of the many services being provided in increasing quantity to farmers. An outstanding job is being done by the veterinarian whose job of controlling diseases of animals involves long hours under difficult conditions. Still more veterinarians may be required as farmers increase their stock of pigs, cattle, and poultry to keep pace with our growing population (see Veterinarians, p. 70). Specialists in breeding, feeding, and marketing will be required for the same reason. Agricultural engineers have been largely responsible for the introduction of modern technological developments to farming; additional engineers will be needed in the future.

Services to farmers by county, State, and Federal governments have increased substantially in recent years. Many of these are required by operations under the "farm program." Many more are byproduct of modern technology and of increasing specialization on the farm. Similar or allied occupations are also available outside Government. The marketing of farm products—getting them off the farm and to consumers all over the world in the form the consumer desires—takes large numbers of people, many of whom have come from farms and agricultural schools. The miller, meat packer, transportation specialist, storage operator, and others need to be intimately acquainted with agriculture. The banker, local
merchandiser, farm equipment dealer, and utility men all are concerned with the farmer and his problems.

While the opportunities for employment in agricultural occupations off the farm are not specifically known, the best guess today indicates more rather than less such employment. Farmers as such have been steadily declining as a percentage of our total population, but service occupations as discussed here have been more than holding their own. These changes are the result largely of the increasing specialization associated with expanding technology in agriculture. In terms of job opportunities, the student in agriculture should consider carefully these allied opportunities.

**Farm Service Jobs**

In almost every farming community there are various jobs and services which farmers want done and are willing to pay for. Some of these call for considerable skill and experience, some can be done with almost no previous training. Some require expensive equipment, others virtually none. Such jobs can sometimes be combined well with a small part-time farm, or can be done to piece out the income of a man living in a village and engaged part time in other work.

*Whitewashing Service*

In the dairy and poultry regions particularly, the necessity for keeping the interior of stables and chicken houses whitewashed makes a year-round job for a whitewashing outfit. This necessitates a light truck with spray rig large enough to do this kind of work. One man sometimes does the job; occasionally there is work enough to keep two men busy. In the ordinary course, such a whitewashing outfit will have a regular route, which covers a large number of farms and goes back over the same route perhaps once in 3 months. In most market milk areas in the North and East, the sanitary regulations require this whitewashing of cow stables. Ordinarily the farmer pays so much for the job, possibly $5 to $20, depending upon the size of the buildings. An outfit can usually do several jobs in a day.

*Feed Grinding*

The mobile feed-grinding outfit offers a year-round job in dairy and livestock regions. The outfit consists of a light truck equipped with a gasoline engine and feed grinder. Some go to farms on call while others maintain a regular route, planned to arrive at certain farms on certain days. In either case, the farmer will have his grist ready and the grinding is done with a minimum of time lost on the part of the outfit. Several farms are visited in one day. The grinder is usually paid so much per hundred pounds of grain. Some feed grinders also add a skilled mixing service and are prepared to mix balanced rations to the farmer’s order, in some cases adding the necessary protein concentrates which are carried in the truck.

In parts of the South and elsewhere the grain-grinding outfit may be in a fixed location, perhaps run in connection with a store or garage, and farmers take their grain to it.

*Fruit Spraying*

In the orchard sections, such as Wenatchee and Hood River Valleys of the Northwest, or in California, or in the Shenandoah and Hudson Valleys of the East, and other notable fruit sections, there is a fruit-spraying job which may occupy a man with a mobile spraying outfit several months of the year. The equipment is usually a light truck with a good spray rig, which will reach to the height of fruit trees. One man can operate such a rig, with the help of the grower who employs him. Two men often own and operate together. The spray outfit goes from orchard to orchard, usually on a fairly regular route, and is paid either by the job or so much per tree, or in some cases is paid by the season to keep the orchard properly sprayed.

*Fruit Caretaker Service*

In the citrus fruit regions a more elaborate caretaker service will occasionally be found. Some of these are quite extensive organizations having tractors and all kinds of heavy tillage and spraying machinery and employing a force of men. For
a fee they will take entire care of an orange or grapefruit grove—tillage, pruning, spraying, some even going so far as to pick and market the fruit.

**Grain Elevator Jobs**

Throughout the grain-growing regions of the Midwest, country elevators are always in need of managers and workers. The job as an elevator man does not need a great deal of training, but does require a background knowledge of grain and the handling thereof, together with some understanding of how the railroads and markets operate.

**Mobile Blacksmith Shop**

In regions where blacksmith shops have disappeared, the mobile blacksmith job offers a good living to a man who knows how to shoe horses and do ordinary rough work with metals. The outfit usually consists of an old car or light truck with rear end equipped with a forge, anvil, and space for necessary tools and fuel. With such an outfit, a man can cover a wide range of territory, sometimes parts of more than one State. In regions where there are good-sized stables of horses a few such stables together with the local farm work will keep a man busy the year round. Such blacksmiths now get from $2 to $6 per horse for a complete shoeing job, rates varying widely in different parts of the country.

**Garage and Repair Shop**

The country garage and farm-machinery repair shop is a profitable enterprise in almost every part of the country. Of course, this requires some capital, either owned or borrowed—enough to buy or rent a building, acquire necessary tools and enough stock and parts to do ordinary repair jobs. The equipment does not have to be elaborate to start with, but does need to cover the usual small tools. Probably $1,000 to $2,000 would be necessary, in addition to the building and a car or truck. There is no lack of work in this field. Most garages and repair shops of this kind have a waiting list of cars, tractors, and farm machines in for repairs. Some such places are able to add to their business by getting an agency for farm machinery, fertilizer, or other such items.

*See also* Automobile Mechanics, page 159.

**Electrical Service**

For the electrician there is a year-round job in certain rural areas doing electrical wiring, repair work, radio repair, and the like. Usually the electrical-service man will live in a village or on a small farm and do work both in his village and in the surrounding farm territory. Such a job requires a car and usually also means a little shop at home with ordinary repair tools and a small stock of wire, fixtures, radio parts, and other supplies.

*See also* Electricians (Construction), page 393; and Radio and Television Technicians, page 173.

**Artificial Insemination**

The comparatively new field of artificial insemination, in the dairy regions, has opened up new jobs which a man can fill with very short training. Usually a group of owners of a particular breed of cows will organize an association and buy one or more purebred bulls of that breed. The bull is kept in some central place and when a cow is to be bred on any of the farms in the organization, the farmer telephones to the inseminator who takes semen to the farm and the cow is artificially bred. This work of handling the bull and the breeding operations was formerly done by veterinarians, but now much of it is done by young men who have had short training for the job. It is a steady, salaried job, and pays a comfortable living.

**Cow Testers**

Wherever there is an organized cow-testing association there is a job for one or more herd testers. The tester is employed by the association of dairy farmers. He has a fixed route, visiting each of the farms once a month. He goes to a given farm, usually spending a day there, or if the herd is large he may have to spend 2 days. He weighs the milk from each cow, tests it for butterfat, weighs the feed fed to each cow and computes its cost. He then makes out a report for the farmer, showing the pounds of milk and fat produced by each cow and the amount and cost of feed. He is paid on a basis which gives him a salary of $100 to $200 a month, the lower salaries being in addition to room and board. The herd tester usually lives somewhere in the area of his work (which is usually inside one county). In most cases, he must have a car.
Carpenters

Country carpenters are in great demand almost everywhere. A man who owns a kit of carpenter tools and knows how to use them can keep busy the year round at building and repair work in farm areas. The country carpenter does not need to be an expert cabinetmaker, by any means. He does need to know the rudiments of framing and construction, be able to lay out foundations, walls, roofs, and be able to tackle practical repair jobs. At present there is a tremendous backlog of repair and new construction work to be done on farm buildings. This offers well-paying jobs to men who have reasonable skill at carpentry work.

Men with moderate craft skills sometimes vary the carpenter’s job with special work in slack season, turning out such products as ladders, potato crates, fruit baskets, etc. Of course, there is also a steady demand in the country for masons.

See also Carpenters, building trades, page 356.

Mobile Repair Shop

The mobile repair shop makes a year-round job in some farm regions, especially in the Midwest. This outfit usually consists of a covered truck, its interior equipped with tools for both metal and woodwork. It must have a forge as well as ordinary bench equipment and supplies. These mobile repair trucks will stop at a farm or come on call and fix anything from a broken plow handle to a heavy tractor. Some of these outfits furnish a good income to the owner, but an investment of $1,000 to $3,000 is necessary in the essential equipment.

A variation is the mobile welding outfit, sometimes operated virtually as a business by itself, in conjunction with a welding shop in town, or it may be a part of the general repair business.

Custom Machine Work

Custom machine work of various kinds provides jobs for many men, often part-time work for farmers or their sons. Such work includes threshing, trucking, combining, tractor plowing, hay and straw baling, potato digging, spraying, terracing, etc. Ordinarily, a man will own (or sometimes rent) the threshing machine, combine, truck, or whatever machine he uses for such custom work. He will go from farm to farm doing the job, usually having a list of jobs scheduled ahead. A great deal of trucking especially is now done on a custom basis; the trucker will haul farm produce to market, sometimes a considerable distance, and return loads of fertilizer, feed, coal, or other supplies to the farms. Nearly all of this custom work pays well, but means an investment in one or more machines used.

Livestock Trucking

One specialized trucking job in livestock regions is that of transporting horses, cattle, or smaller animals. This livestock trucking is something of a specialized job and requires a truck with body especially fitted to handle big animals. It provides virtually a year-round job in certain regions.

Recreation Jobs

In the North and West, around the Gulf, and elsewhere where recreation areas are popular, there are seasonal jobs as guides, camping experts, or recreation leaders of various kinds. Hundreds of men are so employed from the beginning of the spring fishing season to the close of fall hunting, many of these men being part-time farmers or sons of local farmers or ranchers. This will loom larger as a profitable job, as the 5-day week and more automobiles make it possible for many more people to indulge their love for outdoor recreation. For some such jobs a man needs nothing more than expert knowledge of the region and skill in outdoor matters; in other cases one may own or lease considerable equipment, including boats, horses, guns, fishing tackle.

Well Drilling

Well drilling is a part-time job in many farming regions. In some places it keeps a man busy 8 or 9 months of the year. It requires some knowledge and experience of the work, and for deep wells, equipment consisting at least of a tractor and a derrick or drilling rig, plus some tools and supplies. Ordinarily the driller gets so much a foot, this fee varying widely in different parts of the country and depending on the nature of the soil and depth and character of the well. Of course the owner supplies the pipe and often help and services of various kinds. For a well of a hundred foot depth, the driller may thus get from $300 up, and in a good season may take in several thousand dollars.
Airplane Dusting of Crops

Airplane dusting for insect control is a growing practice in certain cotton, truck crop, and orchard regions. It may have large future possibilities. Manifestly, this work can only be done by a man who owns or can get the use of a plane equipped with dusting apparatus. It offers paying sideline work for some young pilots who are undertaking airplane enterprises of one kind or another.

See also Airplane Pilots, page 438.

Mobile Grocery Store

The mobile grocery store is an established institution in many farm sections, providing a good income the year-round for the merchant. This enterprise requires a covered truck, equipped for carrying all kinds of groceries, often including refrigerator, plus some kind of store or warehouse building in town to serve as a base of operations. The traveling store covers fixed routes each day, sometimes making the same route twice a week or sometimes only once. No great amount of experience is necessary, although the project will be more successful in proportion as the merchant has a working knowledge of the peculiar needs of his customers, and likewise has profitable outlets for the eggs, furs, butter, honey, or other farm produce which he will often have to or want to take in exchange.

Chick Hatchery

Commercial hatching of chicks has now become a regular business. It is done on a large scale in some places, but can also be done in a small way as a sideline. The equipment necessary is an outbuilding or dry basement, incubators (usually electric), plus the necessary access both to a supply of fertile eggs and market for the chicks.

Small Poultry-Dressing Plant

In the poultry-raising regions the small killing and dressing plant can often find a profitable place. Almost any old barn or building can be used, subject to local sanitary regulations. The work requires only small experience and may pay fairly well as a side-line job.

Country Butcher

In livestock and poultry regions there is usually some man in every community who makes a part-time or more or less year-round job of slaughtering and allied work and who makes a considerable part of his living thereby. He goes from farm to farm on call; depending on the season, he may be called to butcher hogs, veal calves, or cattle, or possibly to caponize a flock of cockerels, castrate some pigs, "float" (file) a horse's teeth, shear a flock of sheep, or do other jobs relating to the livestock. He does not have to have much equipment other than a few knives, meat saw, and the like, but must have skill in sticking a hog, skinning and dressing meat animals, caponizing, and a general know-how in handling animals.

See also Meat Cutters, page 240.

Sheep Shearing

Sheep shearing makes a seasonal job—6 to 8 weeks—in central and western sheep-growing regions. The only equipment required is a pair of good sheep shears, plus means of transportation. Usually a farm or ranch keeping any number of sheep will have power clippers, and in the West frequently shearing machines. Good shearers make up to $25 a week.

Salesman of Farm Supplies

In some active farming sections there are jobs for men selling or serving as distributors of hybrid seeds, fertilizer, lime, seed-inoculation materials, fencing, quick-freezing units, and the like. A salesman would need to have a car. To take on a distributing agency would probably also require some capital and a central building for a warehouse.

Livestock Trader and Buyer

This is a job for a man who knows livestock and stock values. To do much business he also needs a truck that will handle cattle or horses, plus a barn and pasture. Shrewd stock traders often do well financially, but one must not only have some facilities for handling stock but must be experienced in judging animals, values, and market outlets. Some men establish egg and poultry buying routes and specialize in handling poultry products, though they are likely also to buy wool, honey, maple sirup, or other native products in season. There are jobs also in some sections for workers in cream- and poultry-buying stations.
Kennels

Especially near the larger cities and towns, the kennel business offers possibilities with a comparatively modest outlay of capital. Such places may raise dogs or cats or may specialize in boarding pets for others.

Landscape Gardening

In various suburban areas where there are numerous landscape-gardening concerns and nurseries, various jobs become available working for such concerns. Such work may be largely in the country or may be done largely in town, depending on the clientele. If one has some land he may gradually work into the nursery business for himself.

Farm Appraisers

In some parts of the country a properly qualified man may find a full-time or part-time job working for private country banks, Farm Credit Administration, insurance agencies, and the like, appraising, servicing loans, writing insurance, etc.

General Farm Services

In some progressive farming regions, young men have set up what is variously known as a general farm service. One such office has been established by two young veterans in Montgomery County, Md. In order to make such a service succeed one must have had practical experience, a thorough knowledge of local agriculture, and preferably agricultural college training. The two men who operate the Maryland Advisory Service mentioned above, offer advice on breeding, feeding, all phases of crop growing and marketing, maintenance of equipment, drawing of farm leases, etc. If a suburban dweller with one cow wishes to find a bull of the same breed, they will arrange for such bull service. If a large dairyman wishes to buy a carload of purebred cows, they will find them for him. If a newcomer wants a complete plan and continuing oversight of his farm management they will supply it. Manifestly, this type of service requires a keen mind, a great deal of practical experience, and usually professional training in farm management to back it up. It has been known to pay fairly well, especially in the Midwest, and near some of the larger cities.
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(Guide to occupations described in the Handbook through entry occupational classifications; Part IV of Dictionary of Occupational Titles)

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Other Occupational Outlook Publications of the Bureau of Labor Statistics

Three types of reports on occupational outlook are issued, in addition to the Occupational Outlook Handbook:

*Occupational outlook bulletins* describe the long-run outlook for employment in each occupation and give information on earnings, working conditions, and the training required.

*Special reports* are issued from time to time on such subjects as the general employment outlook, trends in the various States, and occupational mobility.

*Occupational outlook summaries*, which briefly describe the conclusions of each new study, are sent to all schools and organizations which have asked to be placed on the occupational outlook mailing list.

These reports (except the summaries) are issued as bulletins of the Bureau of Labor Statistics, and may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

**OCCUPATIONAL OUTLOOK BULLETINS**

Employment Opportunities in Aviation Occupations, Part II—Duties, Qualifications, Earnings, and Working Conditions.

- Bulletin No. 837–2 (1946). Illus. ................................................................. 30 cents

Employment Outlook in Foundry Occupations.

- Bulletin No. 880 (1946). Illus. ................................................................. 15 cents

Employment Outlook for Business-Machine Servicemen.

- Bulletin No. 892 (1947). Illus. ................................................................. 15 cents

Employment Outlook in Machine-Shop Occupations.

- Bulletin No. 895 (1947). Illus. ................................................................. 20 cents

Employment Outlook in Printing Occupations.

- Bulletin No. 902 (1947). Illus. ................................................................. 20 cents

Employment Outlook in the Plastics Products Industry.

- Bulletin No. 929 (1948). Illus. ................................................................. 20 cents

Employment Outlook in Electric Light and Power Occupations.

- Bulletin No. 944 (1949). Illus. ................................................................. 30 cents

Employment Outlook in Radio and Television Broadcasting Occupations.

- Bulletin No. 958 (1949). Illus. ................................................................. 30 cents

Employment Outlook in Railroad Occupations.

- Bulletin No. 961 (1949). Illus. ................................................................. 30 cents

Employment Outlook in the Building Trades.

- Bulletin No. 967 (1949). Illus. ................................................................. 50 cents

Employment Outlook for Engineers.

- Bulletin No. 968 (1950). Illus. ................................................................. 55 cents

Employment Outlook for Elementary and Secondary School Teachers.

- Bulletin No. 972 (1949). Illus. ................................................................. 40 cents

Employment Outlook in Petroleum Production and Refining.

- Bulletin No. 994 (1950). Illus. ................................................................. 30 cents
SPECIAL REPORTS

Occupational Data for Counselors: A Handbook of Census Information Selected for Use in Guidance.

- Price: 15 cents

Factors Affecting Earnings in Chemistry and Chemical Engineering.

- Bulletin No. 881 (1946)  
- Price: 10 cents

OCCUPATIONAL OUTLOOK MAILING LIST

Schools, vocational guidance agencies, and others who wish to receive brief summaries of each new occupational outlook report may be placed on a mailing list kept for this purpose. Requests should be addressed to Bureau of Labor Statistics, U. S. Department of Labor, Washington 25, D. C., specifying the occupational outlook mailing list. Please give your postal zone number.

LIST OF BUREAU OF LABOR STATISTICS COMMUNITY WAGE SURVEYS AND OFFICE WORKER REPORTS

(For information as to contents, see p. 9.)

Community Wage Survey Reports:

- Grand Rapids, Mich.
- Portland, Maine
- Rockford, Ill.
- Shreveport, La.
- Trenton, N. J.

Available free from U. S. Department of Labor, Washington 25, D. C., while supply lasts.

- Denver, Colo. (Bull. 985)  
- Buffalo, N. Y. (Bull. 991)  
- San Francisco-Oakland, Calif. (Bull. 996)  
- Philadelphia, Pa. (Bull. 1008)

- Price: 30 cents
- Price: 35 cents
- Price: 35 cents
- Price: 35 cents

Office Worker Reports:

- Atlanta, Ga. (Bull. 986)  
- Indianapolis, Ind. (Bull. 987)  
- Memphis, Tenn. (Bull. 988)  
- Milwaukee, Wis. (Bull. 990)  
- Oklahoma City, Okla. (Bull. 989)  
- Boston, Mass. (Bull. 992)  
- Chicago, Ill. (Bull. 995)  
- New York, N. Y. (Bull. 997)  
- Detroit, Mich. (Bull. 999)  
- Los Angeles, Calif. (Bull. 1002)  
- Providence, R. I. (Bull. 1006)

- Price: 15 cents
- Price: 15 cents
- Price: 15 cents
- Price: 15 cents
- Price: 15 cents
- Price: 20 cents
- Price: 20 cents
- Price: 15 cents
- Price: 15 cents
- Price: 15 cents
- Price: 15 cents

The complete titles of the community wage surveys are “Occupational Wage Survey” and Name of city. For the office workers series the titles are “Office Workers” and Name of city.

Copies of these bulletins with the exception of those which have been indicated as available from the U. S. Department of Labor, can be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for the prices indicated.
You Can Help Us To Plan Future Editions of This Handbook

The Bureau of Labor Statistics will be helped greatly in making future editions of the Occupational Outlook Handbook more useful to its users if we know how they use it, and if we have their suggestions on its content. Your cooperation in filling out and returning this form will be appreciated. Please mail to the Bureau of Labor Statistics, U. S. Department of Labor, Washington 25, D. C.

1. I use the Handbook in the following ways:
   (Please check as many as apply; double-check most important uses.)
   - a. For my own use in counseling.
   - b. To give to persons being counseled for their own reading.
   - c. In a library or occupational file, available for general reference.
   - d. As a text or reference for secondary school students in a class in occupations, social studies, etc.
   - e. As a text or reference in counselor training.
   - f. As a reference for a teacher or administrator in planning a training program for specific occupation.
   - g. As a source of information for use in determining personnel policies.
   - h. As a reference in planning local occupational research programs.
   - i. For my own personal information.
   - j. Other uses (please specify): _______________________

2. I receive inquiries about, or am myself interested in, the following occupations or industries which are not covered by this edition: ______________________
   - ______________________
   - ______________________
   - ______________________

3. This Handbook would be more useful to me if its make-up or arrangement were changed in the following manner: ______________________
   - ______________________
   - ______________________

4. This Handbook would be more useful to me if it provided additional types of information on the occupations included, as follows: ______________________
   - ______________________
   - ______________________
   - ______________________

(over)
5. Remarks: 

Now Perhaps We Can Help You

☐ Send me copies of all the previously issued occupational outlook summaries and wall charts which are still available.

☐ Place my name on your mailing list to receive occupational outlook summaries and wall charts as they are published, and an announcement of publication of the next edition of the Occupational Outlook Handbook.

(Note.—Even if you believe you are already on the mailing list, please check this box so we can make sure that you will receive the material.)

(Name)  (Position Title)

(School or Organization)  (Street Address)

(City and Postal Zone)  (State)