U. S. DEPARTMENT OF LABOR

BUREAU OF LABOR STATISTICS

ROYAL MEEKER, Commissioner

BULLETIN OF THE UNITED STATES BUREAU OF LABOR STATISTICS . . . WHOLE NUMBER 162

MISCELLANEOUS SERIES: No. 7

VOCATIONAL EDUCATION SURVEY OF RICHMOND, VA.

AUGUST, 1915

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

CONTENTS.

BULLETIN OF THE
U. S. BUREAU OF LABOR STATISTICS.

WHOLE NO. 162. WASHINGTON. AUGUST, 1915.

VOCATIONAL EDUCATION SURVEY OF RICHMOND, VA.

FOREWORD.

In the spring of 1914, the executive committee of the National Society for the Promotion of Industrial Education arranged with the Richmond Board of Education to make a study of the schools and occupations in that city, preliminary to the annual convention of the society, which was to be held there in December of the same year.

The aims of the survey on the part of the National Society were:

1. To prove the necessity of a knowledge of industrial and school conditions in the making of a program for industrial education in a city.
2. To show the kind of facts about industry and about the schools which need to be gathered.
3. To develop a proper method for studying the industries and the schools for purposes of industrial education.
4. To secure the cooperation of national and local public and private agencies in the making of a type survey and to bring to bear upon the task the best expert service and advice that could be secured.
5. To make the annual convention of the society more helpful to the convention city by focusing much of the discussion on its problem, and leaving with it not only information as to conditions and possibilities but also wide discussion and expert advice through the membership of the National Society and others as to the development of industrial education in the city.

The purposes of the Richmond authorities in having the National Society make the survey were these:

1. To make the annual convention in Richmond most helpful to a city interested in providing practical education for its people.
2. To give the city a knowledge of the industrial and school facts and conditions which must be considered in developing a program of industrial education and the best expert advice as to what Richmond should do and how she should do it, in order that, as one Richmond school official expresses it, "Richmond may not be working in the dark."

Arrangements with the city of Richmond.—Richmond met the local expenses of the annual convention of the society for 1914 and the cost of making the school and industrial surveys. The National Society met the usual general convention expenses and in addition the expense of printing the bulletins of the society bearing on the survey, of its office force while engaged in the work of the survey, and of the general survey committee.

The general survey committee.—The agreement between the Richmond authorities and the National Society provided for a general survey committee to have direct charge of the survey, and a local survey committee made up of citizens of Richmond to cooperate with it. At the outset the general survey committee, which directed the conduct of the survey, consisted of the following: Dr. Leonard P. Ayres, director, Russell Sage Foundation, chairman; Mr. Charles H. Verrill, chief editor, United States Bureau of Labor Statistics; Mr. L. W. Hatch, chief statistician, New York Bureau of Labor; Dr. J. A. C. Chandler, superintendent of schools, Richmond, Va.; Prof. C. R. Richards, director of Cooper Union, New York; Mr. Charles H. Winslow, special agent, United States Bureau of Labor Statistics, and Mr. C. A. Prosser, secretary of the National Society.

For the purpose of dealing with the "Recommendations of the survey" there were added to the general survey committee the following persons: Mrs. Mary Schenck Woolman, formerly director, Manhattan Trade School for Girls, and professor of domestic art, Teachers' College, New York City; Miss Laura Drake Gill, president, College for Women, University of the South, Sewanee, Tenn.; Dr. P. P. Claxton, United States Commissioner of Education; Prof. R. W. Selvidge, Peabody College, Nashville, Tenn.; Mr. Arthur D. Dean, chief, division of vocational schools, Albany, N. Y.; Mr. M. P. Shawkey, State superintendent of free schools, West Virginia; and Dr. William M. Davidson, superintendent of schools, Pittsburgh, Pa.

The local survey committee consisted of the following: Mr. Frank W. Duke, chairman; Mr. James B. Doherty, Mr. John Hirschberg, Mr. W. T. Dabney, Mr. W. H. Owen, Mr. A. H. Hill, Mr. K. J. Hoke, Mr. J. G. Corley, Mr. L. H. Jenkins, Mr. J. D. Crump, Mr. John Stuart Bryan, Mr. Alvin Smith, Mr. E. C. Pelouze, Mr. F. C. Ebel, Mr. H. F. Smith, Mr. R. B. Greenway, Mr. J. J. Creamer, and Mr. Preston Belvin.

Director of the school survey.—Dr. Leonard P. Ayres, director of the division of education of the Russell Sage Foundation, was secured as director of the school survey. He was assisted in this work by R. R. Lutz, assistant director, and the regular staff of the division.

Director of the industrial survey.—Mr. Charles H. Winslow, expert on industrial education for the United States Bureau of Labor Statistics, was secured as director of the industrial survey. He was assisted in this work by Dr. John Cummings, statistician and research expert, formerly of the United States Census Bureau and later research expert with the United States Commission on National Aid to Vocational Education; Miss Cleo Murtland, assistant secretary for women's work of the National Society for the Promotion of Industrial Education; Dr. William T. Bawden, specialist in vocational education for the United States Bureau of Education; and an office and field force of workers.

Cooperating agencies.—The society has been fortunate in securing the hearty cooperation of many helpful agencies in the work of the survey. Perhaps its largest service has been that of bringing to bear upon the Richmond problem so much expert assistance from many different sources, much of which was given entirely without cost and the value of which can not be estimated in money. It would be impossible to acknowledge here all the aid which has been given in various ways.

Special acknowledgment, however, is due the following:

The United States Bureau of Labor Statistics, which gave six months' leave of absence to Mr. Charles H. Winslow so that he might serve as director of the industrial survey, is to issue the full report of the findings and recommendations of the survey as one of its publications, and has, through Dr. Royal Meeker, United States Commissioner of Labor Statistics, and Mr. Charles H. Verrill, its chief editor, cooperated with the survey by every legitimate means within its power.

The United States Bureau of Education, which through its commissioner, Dr. P. P. Claxton, gave wide publicity to the work of the survey and the convention.

The Russell Sage Foundation, which through its director of educational work, Dr. Leonard P. Ayres, conducted the school survey and met a large part of its cost.

The Richmond school people, who from the outset gave their earnest support and hearty cooperation to the work. Without their assistance the results achieved would have been impossible.

The citizens of Richmond, who aided in many ways. Special acknowledgment is due for the help given by the local survey committee, the local program committee, and the employers and employees who have made the survey a success by their willingness to furnish all the information requested.

Type classes.—The findings of the survey and the interest awakened in industrial education have made possible the organization of certain type classes in industrial education. The organization of these classes was under the general direction of Mr. Charles H. Winslow, Miss Cleo Murtland, Dr. William T. Bawden, and Mr. Alvin E. Dodd.

FACTS ABOUT RICHMOND.

Richmond, the capital of Virginia, is situated in the eastern part of the State at the head of navigation of the James River.

Population increasing rapidly.—The estimate of the United States census for 1914 gives the city 134,917 inhabitants. Between 1900 and 1910 the increase in population was 50 per cent, more than one-fifth of the total increase for the State being in Richmond. In 1900 it was the forty-sixth city in size and in 1910 the thirty-ninth city. Only 9 of the 50 cities having a population in 1910 of 100,000 or more show a percentage increase for the previous 10 years as high as that shown by Richmond.

Population massed in a relatively small area.—Only 6 of the 47 large cities covered by the census data of 1910 regarding area and population reported a population per acre within city limits as great as that of Richmond, each of these six cities having more than 300,000 inhabitants. The annexation of large suburban areas since 1910 has brought within the city limits considerable sparsely settled territory but has not reduced the density of the business and industrial sections. Richmond possesses a distinct advantage for industrial education over those cities whose industrial establishments are more widely scattered and necessarily more remote from any school center.

Richmond the rapidly growing manufacturing center of Virginia.—In the 10 years previous to 1909 the number of manufacturing establishments increased from 276 to 380 and the value of products from $24,670,000 to $47,358,000. Thirty-ninth in population among the cities of the country, Richmond ranks fifty-fourth in the value of its products, which outrank in value those of six different States. One out of every six persons in the State of Virginia who are engaged in manufacturing industries is employed in Richmond; one out of every seven dollars of the State's total capital invested in industry is used in Richmond, which produces one-fifth of the State's total manufactured product.

One out of every two persons is employed.—In 1910 approximately 63,000 persons were engaged in various employments. Out of every 100 of these 40 were employed in manufacturing and mechanical industries, 23 in domestic and personal service, 14 in trade and commerce, 8 in transportation, 8 in clerical occupations, 4 in professional service, and the remaining 3 in miscellaneous pursuits.

The problem primarily one of training a native population.—Less than 4 out of every 100 of Richmond's inhabitants are foreign born.

About 70 out of every 100 of the native inhabitants were born in Richmond and 86 out of every 100 in Virginia. Only two (Charleston, S. C., and Wheeling, W. Va.) out of the 109 cities of 50,000 or more inhabitants in the United States, according to the census of 1910, returned a larger portion of their population as born in the State in which the city is located.

The number of females greatly exceeds the number of males.—While in the State of Virginia the number of males is practically equal to the number of females, in Richmond the proportion of males to females is as 91 to 100, the excess of females over males being particularly marked among the Negroes. With the single exception of Nashville the ratio of males to females is lower than in any other large southern city.

More than one-third of the inhabitants are Negroes.—During the last 30 years the ratio of Negroes to whites has been slowly decreasing. With the exception of Memphis and Birmingham, Richmond has a larger proportion of Negro population than any other southern city of more than 50,000 people.

Illiteracy, while large, is on the decrease.—One hundred and ninety-six out of every 1,000 Negroes 10 years of age and over in Richmond are unable to read and write, the average for cities of 100,000 and over in the country as a whole being 126, and for Virginia almost 300. During the past 30 years illiteracy among the Negroes in Richmond has declined rapidly, 457 out of every 1,000 of them being reported as illiterates in 1890. On the other hand, only 12 out of every 1,000 native whites can neither read nor write, which is just one-half the number who were so reported 30 years ago. The proportion of illiterates among the native whites in cities of 100,000 and over for the entire country is 4 out of every 1,000 and in the State of Virginia 80.

The educational problem of Richmond.—The significant factors are two: (1) The large proportion of native whites of native parentage in the white population; (2) the large proportion of Negroes in the total population. Richmond is not confronted with the task of assimilating a large foreign element, but rather with that of training its native population for efficiency.

THE PUBLIC SCHOOLS OF RICHMOND.

The public-school system.—The public schools of Richmond are administered by a school board of nine members appointed, three each year, by the city council. The annual expenditures are approximately three-quarters of a million dollars, of which about one-tenth comes from the State and nearly nine-tenths must be voted each year as appropriations of the city council. Thus the school board has only indirect control over the amount and in some measure over the distribution of its funds. There are 35 school buildings, of which 22 are occupied by white children and 13 by colored children.

Public-school enrollment over 22,000.—The total enrollment in the public schools in 1913–14 was 22,459, divided as shown in the table following:

TABLE 1.—TOTAL ENROLLMENT AND AVERAGE ATTENDANCE IN PUBLIC SCHOOLS IN 1913–14.

Class of school.	Enrollment.			Total average attendance.	Per cent of attendance.[1]
	White.	Colored.	Total.		
Kindergarten	783	33	816	443	80.9
Special	203		203		
Elementary	9,768	5,916	15,684	12,760	94.0
High	1,593	358	1,951	1,509	95.6
Normal	21	38	59		
Night	2,571	1,175	3,746	1,701	80.0
Total	14,939	7,520	22,459		

[1] Based on average monthly enrollment.

Three thousand six hundred and sixty children in private and parochial schools.—Compared with most other cities of similar size, Richmond has few children in private and parochial schools. The number reported for the city for 1913–14 was 3,660.

School attendance.—Previous to November, 1914, school attendance in Richmond was not compulsory, and previous to this year children had not been admitted to the public schools before the age of 7. For these reasons this city has a smaller proportion of children in school than is the case in cities admitting children at 5 or 6 years of age under compulsory attendance regulations. According to the data presented by the United States census for 1910, 88 per cent of the white children and 77 per cent of the colored children between the ages of 10 and 15 had attended some school during the previous year.[1]

[1] United States census 1910. Population, Vol. I, pp. 1160–1184.

As compared with the five other southern cities of more than 100,000 population, this city made an average showing with respect to the proportion of children in school attendance between the ages of 10 and 15. Memphis, Nashville, and Birmingham have a slightly larger proportion of their white children of these ages in school, while Atlanta and New Orleans make somewhat poorer showings. With respect to their colored children of these ages, Birmingham and Nashville do a little better than Richmond, while the records of Atlanta, Memphis, and New Orleans are not quite so good. A similar situation exists when Richmond is compared with four other cities of Virginia. Norfolk and Portsmouth have a slightly smaller proportion of their colored children of these ages in school, while Lynchburg and Roanoke do somewhat better. With respect to the proportion of white children of these ages in school, all of the four other Virginia cities make somewhat better showings than does Richmond.

Compulsory education recently adopted.—Section 138 of the State constitution provides that the General Assembly may "provide for the compulsory education of children between the ages of 8 and 12 years, except such as are weak in body or mind, or can read and write, or are attending private schools, or are excused for cause by the district-school trustees."

In accordance with this provision, section 95 of the school laws provides that any county, city, or town may establish compulsory education when the school board submits the question to a vote of the people at any general election, and the resulting vote is in favor of the proposition. Provision is also made for securing the referendum vote by means of a petition.

In November, 1914, the establishment of compulsory attendance was submitted to the voters of Richmond and adopted by a heavy majority. The State law provides that in communities which establish compulsory education, parents or guardians having control of any child between the ages of 8 and 12 years must send it to the public school for at least 12 weeks in each school year, at least six of which shall be consecutive, unless the school trustees excuse the child, or unless he be weak in body or mind, or can read and write, or is attending a private school, or lives more than 2 miles from the school, or more than 1 mile from the free school-wagon route.

Clearly more effective compulsory education is essential within the near future. An amendment to the law so as to provide for attendance during the full school term could be enacted legally at any session of the general assembly. To secure an amendment to the constitution would probably require about five years. The past session of the general assembly appointed a codification commission which may recommend changes in the law or the constitution, or both.

Compulsory education should increase school attendance by about 1,050.—The adoption of compulsory education by the city of Richmond should bring into school all the children aged 8, 9, 10, and 11 years who are not now in attendance. A computation has been made based on the figures for age distribution and school attendance of the census of 1910 to discover the number of boys and girls, white and colored, at each of these four ages as well as the number attending school and the number not attending school.[1] These figures, as increased to indicate conditions in 1914, and corrected by reference to the present age, sex, and color figures of the public schools, show that there are approximately 1,050 children of these four ages who are not in school and who would presumably attend were compulsory education enforced. The distribution of these children is shown in the following table:

TABLE 2.—CHILDREN BETWEEN THE AGES OF 8 AND 12 WHO ARE NOT NOW IN PUBLIC OR PRIVATE SCHOOLS.

Age.	White.		Colored.		Total.
	Boys.	Girls.	Boys.	Girls.	
8 years	22	33	96	70	221
9 years	2	33	93	47	175
10 years	65	70	105	82	322
11 years	62	62	137	71	332
Total	151	198	431	270	1,050

It must be remembered that the figures of Table 2 are at best only a careful estimate derived from the census data. It is nearly certain, for example, that there are more than two white boys 9 years of age out of school. Nevertheless it is believed that the figure 1,050 fairly represents the number of children of these ages who will be brought into school by the enforcement of the compulsory-education law. The figure is probably an underestimate rather than an overestimate.

Child labor prohibited.—The Virginia child-labor law became effective July 1, 1914. It prohibits the employment in industrial and mercantile establishments of children under 14 and requires employment certificates issued by a notary public for children between 14 and 16. Employers of such children must post a list of their names near the entrances of their establishments. In cities of 5,000 population or over, boys under 10 and girls under 16 may not sell periodicals on the street and children under 14 may not be employed in messenger service. The law exempts mercantile establishments in towns of under 2,000 population and fruit and vegetable packing establishments between July 1 and November 1. Parents

[1] United States census, 1910. Population, Volume III, p. 947.

are permitted to work their own children in their own establishments. The school authorities have nothing to do with the enforcement of the law or the issuance of employment certificates.

Ages at which pupils leave school.—Relatively few children permanently leave school in Richmond before the age of 13. After 14 they begin to fall out rapidly. It is approximately true that of each 1,000 boys and girls, white and colored, the number remaining in school at each age is as indicated in Table 3. This and the following computations of elimination are based on the age and grade distribution tables for the years 1911–12, 1912–13, and 1913–14.

TABLE 3.—APPROXIMATE NUMBER OF SCHOOL CHILDREN AMONG EACH 1,000 BEGINNERS REMAINING IN SCHOOL AT EACH AGE.

Age.	White.		Colored.	
	Boys.	Girls.	Boys.	Girls.
11 years	1,000	1,000	1,000	1,000
12 years	977	1,000	1,000	1,000
13 years	901	914	837	918
14 years	737	792	617	777
15 years	478	560	343	493
16 years	267	376	161	319
17 years	141	215	64	191
18 years	49	94	33	115
19 years	11	26	11	65
20 years	2	5	2	24
21 years	....	1	1	5

It is to be noted that among both the white and the colored, the girls stay in school considerably longer than the boys.

Grades at which pupils leave school.—More than half of the white children, but considerably less than half of the colored ones, complete the elementary grades. It is approximately true that of each 1,000 boys and girls, white and colored, the number remaining in school at each grade is as indicated in the following table:

TABLE 4.—APPROXIMATE NUMBER OF SCHOOL CHILDREN AMONG EACH 1,000 BEGINNERS REMAINING IN SCHOOL AT EACH GRADE.

Grade.	White.		Colored.	
	Boys.	Girls.	Boys.	Girls.
Elementary school.				
First	1,000	1,000	1,000	1,000
Second	1,000	1,000	1,000	999
Third	1,000	998	959	983
Fourth	990	991	842	954
Fifth	945	975	673	866
Sixth	781	881	448	621
Seventh	568	738	272	439
High school.				
First	428	495	132	269
Second	232	276	67	182
Third	134	180	34	123
Fourth	94	156	26	110

The figures indicate that during their years of schooling the colored children make distinctly less progress than the white ones. It is most significant that in Richmond among both white and colored children the girls stay in school longer and make better progress than the boys. This condition is so marked that the proportion of colored girls completing the high-school course is greater than the proportion of white boys completing the high-school course.

Data secured through 13 and 14 year old children.—A considerable portion of the work of the school inquiry consisted of a study of certain facts concerning all of the 13 and 14 year old boys and girls in the public schools, their fathers, and their older brothers and sisters. The study was confined to the 13 and 14 year old children because those are the last years before many of them drop out of school. Moreover, since children of these ages leave school in large numbers to go to work, they may fairly be considered the raw material of vocational education.

In all, information was gathered from 6,591 persons, the data being secured by means of schedules filled out by the 13 and 14 year old school children, assisted by their teachers or principals, and from schedules filled out by the older brothers and sisters of these children. These cases were not selected in any way. They include data for all of the 13 and 14 year old children in the public schools for whom the facts could be secured and for the fathers and older brothers and sisters of these children. In all, data were gathered from 6,591 persons, as follows:

White boys 13 and 14 years old	839
White girls 13 and 14 years old	930
Colored boys 13 and 14 years old	295
Colored girls 13 and 14 years old	526
Fathers of 13 and 14 year old white children	1,769
Fathers of 13 and 14 year old colored children	821
Older brothers of these white pupils—gainfully employed and under 21 years of age	618
Older sisters of these white pupils—gainfully employed and under 21 years of age	350
Older brothers of these colored pupils—gainfully employed and under 21 years of age	297
Older sisters of these colored pupils—gainfully employed and under 21 years of age	146
Total	6,591

Thirteen and fourteen year old children in all grades from first elementary to third high.—The first data secured showed the school grades of the children and brought to light three significant facts. The first is that although these boys and girls are of nearly the same ages, they represent almost every stage of school advancement and are scattered through the grades from the first elementary to the third high. The second fact is that one-half of these white boys and girls are in the sixth grade or below. The third significant fact is that more than half of the colored boys and girls are in the fifth grade or below. These figures indicate that large numbers of these boys and girls may be expected to leave school soon and go to work with an educational preparation so inadequate as to hamper them in their vocations and seriously to reduce their value to the community. This situation is important from the point of view of vocational education. The figures showing how these 2,590 boys and girls are distributed through the grades are presented in Table 5.

TABLE 5.—GRADES OF 13 AND 14 YEAR OLD BOYS AND GIRLS IN MAY, 1914.

Grade.	White.		Colored.	
	Boys.	Girls.	Boys.	Girls.
Elementary school.				
Special	5			
First	1		4	8
Second	2		28	20
Third	27	15	30	54
Fourth	79	56	55	98
Fifth	150	156	74	126
Sixth	205	221	58	117
Seventh	212	285	36	63
High school.				
First	123	161	10	37
Second	31	34		3
Third	4	2		
Total	839	930	295	526

Birthplaces of fathers and children.—The next facts secured were data giving the birthplaces of the children and their fathers. They showed that about nine-tenths of the Richmond school children and more than five-sixths of their fathers were born either in the city of Richmond or elsewhere in Virginia. This statement is based on data concerning the birthplaces of 1,769 white children, 1,769 white fathers, 821 colored children, and 821 colored fathers. The percentage figures showing the birthplaces are presented in the next table.

TABLE 6.—BIRTHPLACES OF 13 AND 14 YEAR OLD SCHOOL CHILDREN AND THEIR FATHERS.

Birthplace.	White.		Colored.	
	Children.	Fathers.	Children.	Fathers.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
City of Richmond	70	37	81	48
Elsewhere in Virginia	17	38	14	36
Other States in United States	11	16	5	15
Foreign countries	2	9		1
Total	100	100	100	100

Most other cities of similar size have far more migratory populations than Richmond. The data indicate that if present conditions maintain in the future, Richmond may safely train a larger proportion of her children for future participation in her local industries than would be wise for the average city.

Occupations of fathers, older brothers, and older sisters of school children.—Data were secured as to the occupations of all of the older brothers and sisters and nearly all of the fathers of these school children. Their occupational distribution is shown in the table which follows:

TABLE 7.—OCCUPATIONAL DISTRIBUTION OF FATHERS AND OLDER BROTHERS AND SISTERS OF 13 AND 14 YEAR OLD SCHOOL CHILDREN.

Occupational group.	White.			Colored.		
	Fathers.	Older brothers at work.	Older sisters at work.	Fathers.	Older brothers at work.	Older sisters at work.
Extraction of minerals	24	4		8	3	
Building trades	243	59		80	12	
Manufacturing, metal	229	70		44	9	
Manufacturing, other	248	122	121	73	31	22
Transportation	205	34	25	127	63	
Trade	358	131	57	54	24	
Public service	78	17		21	6	
Professional service	64	10	7	17	1	7
Domestic and personal service	59	8	1	274	127	112
Clerical occupations	85	163	139	25	21	5
Total	1,593	618	350	723	297	146

Occupations of older brothers and sisters educationally important.—It is important to consider the nature of the occupations in which the older brothers and sisters of these school children are engaged because they furnish probably the most reliable available index to the sorts of occupations which the boys and girls now in school may be expected to enter during the next few years.

Most numerous occupations of the white older brothers.—Nearly two-thirds of the white older brothers are engaged in 13 occupations. These occupations, which include all engaging 10 or more, are listed below:

Older brothers of 13 and 14 year old white school children engaged in all occupations including 10 or more workers.

Occupation.	Workers.
Clerks	115
Salesmen	99
Machinists	27
Plumbers	22
Printers and pressmen	21
Messengers	16
Teamsters	16
Iron and steel workers	13

Older brothers of 13 and 14 year old white school children engaged in all occupations including 10 or more workers—Concluded.

Occupation.	Workers.
Electricians	13
Stenographers	13
United States sailors	13
Operatives, tobacco	10
Painters	10
Total in these occupations	388
Total reporting	618
Per cent in these occupations	63

It is noteworthy that more than one-third of all the white older brothers for whom we have information are engaged as clerks or salesmen. The first seven occupations listed include more than one-half of all the cases.

Four-fifths of white older sisters in seven occupations.—Four-fifths of the white older sisters are engaged in seven occupations. These occupations, which include all engaging 10 or more, are shown below:

Older sisters of 13 and 14 year old white school children engaged in all occupations including 10 or more workers.

Occupation.	Workers.
Stenographers	78
Operatives, tobacco	69
Saleswomen	55
Clerks	24
Telephone operators	24
Operatives, paper	18
Bookkeepers	11
Total in these occupations	279
Total reporting	350
Per cent in these occupations	80

It is significant that more than one-fifth of all these young women are stenographers, another fifth operatives in tobacco factories, and nearly one-sixth of them saleswomen.

Two-thirds of colored older brothers in five occupations.—Two-thirds of the colored older brothers are engaged in five occupations. These occupations, which include all engaging 10 or more, are as follows:

Older brothers of 13 and 14 year old colored school children engaged in all occupations including 10 or more workers.

Occupation.	Workers.
Porters, trade	74
Teamsters	49
Laborers	44
Messengers	15
Operatives, tobacco	14
Total in these occupations	196
Total reporting	297
Per cent in these occupations	66

Four-fifths of colored older sisters in four occupations.—Four-fifths of the colored older sisters are engaged in four occupations. These occupations, which include all engaging 10 or more, are listed below:

Older sisters of 13 and 14 year old colored school children engaged in all occupations including 10 or more workers.

Occupation.	Workers.
Servants	48
Laundresses	37
Nurse girls	19
Operatives, tobacco	11
Total in these occupations	115
Total reporting	146
Per cent in these occupations	79

Reasons for leaving school.—Among the 620 older brothers and sisters at work, reasons were given for leaving school as shown below. The distribution of these reasons is about the same for the boys and the girls, the white and the colored.

Reasons given for leaving school.

To go to work	260
Wanted to	62
Poor health	56
To support family	50
Had to go to work	31
Graduated	26
To learn a trade	22
Failure in studies	16
Moved	9
Disagreement with teacher	8
To accept position	6
Miscellaneous	14
Not stated	60
Total	620

Age at beginning work.—The ages given for beginning work range from 8 to 20, with an average of a little over 15 years for white and colored boys, and not quite 16 for white and colored girls.

Schooling received before children went to work.—The amount of schooling which these young people claim to have received before they went to work ranges from the first grade to the complete high-school course. The average amounts were as follows:

Colored boys	4th grade.
Colored girls	5th grade.
White boys	6th grade.
White girls	7th grade.

Part-time schooling of young people at work.—Among these 620 young people at work, 365 say they have never attended evening school. The remaining 255 claim to have attended for periods ranging from three nights to seven years, with an average of about three months.

Correspondence courses.—Among the 620 young people at work, 36 state that they have taken correspondence courses, the majority being taken by white boys.

Duration of employment of young people at work.—The 620 young people at work furnished information as to the number of years since they had first gone into any form of gainful occupation. This information is presented in the table which follows:

TABLE 8.—OLDER BROTHERS AND SISTERS OF 13 AND 14 YEAR OLD SCHOOL CHILDREN WHO HAVE BEEN AT WORK EACH SPECIFIED NUMBER OF YEARS.

Years at work.	White.		Colored.	
	Older brothers.	Older sisters.	Older brothers.	Older sisters.
1 year	72	59	35	22
2 years	76	39	30	15
3 years	55	23	24	13
4 years	36	13	16	14
5 years	19	5	14	6
6 years	9	2	5	
7 years	3	2	6	1
8 years	1		1	
9 years			1	
10 years				
11 years			1	
12 years			1	1
Total	271	143	134	72

Number of positions held by older brothers and sisters.—The same number of the older brothers and sisters supplied data as to the number of different positions they had held since going to work. These range from one to seven positions apiece, as shown in the table following:

TABLE 9.—OLDER BROTHERS AND SISTERS OF 13 AND 14 YEAR OLD SCHOOL CHILDREN WHO HAVE HELD EACH SPECIFIED NUMBER OF POSITIONS SINCE GOING TO WORK.

Number of positions.	White.		Colored.	
	Older brothers	Older sisters.	Older brothers.	Older sisters.
One	140	99	76	56
Two	61	32	23	9
Three	56	9	17	4
Four	10	3	12	2
Five	3		3	1
Six	1		2	
Seven			1	
Total	271	143	134	72

An analysis of the figures shows that the four groups differ but little in the average number of years they have been at work and in the average length of time they have been employed in each position.

Ages and wages of young people at work.—Data were secured showing the ages and wages of 496 older brothers and sisters of the school children. All of them were employed and they were all under 21 years of age. These data are presented in the following table:

TABLE 10.—WEEKLY WAGES OF OLDER BROTHERS AND SISTERS OF 13 AND 14 YEAR OLD SCHOOL CHILDREN.

Ages.	$2 to $3.99	$4 to $5.99	$6 to $7.99	$8 to $9.99	$10 to $11.99	$12 to $13.99	$14 to $15.99	$16 to $17.99	$18 to $19.99	$20 to $21.99	$22 to $23.99	$24 to $25.99	Total.
White brothers.													
14 years		1	1	1									3
15 years	4	7	4		1								16
16 years	4	16	8	2	2	2	1						35
17 years	1	11	17	6	1	8	1						45
18 years		3	15	8	8	4	4		2			1	45
19 years		1	3	8	12	6	6		2		1		39
20 years		2	2	3	5	6	6	2	1	1			28
Total	9	41	50	28	29	26	18	2	5	1	1	1	211
White sisters.													
14 years		1											1
15 years	1	5	1	3		1							11
16 years		8	8	6	2								24
17 years	1	4	12	5	1	2							25
18 years		2	5	4	9	1	2	1					24
19 years		2	4	7	7	2	1						23
20 years			4	4	3	1	3						15
Total	2	22	34	29	22	7	6	1					123
Colored brothers.													
12 years		1											1
13 years	2												2
14 years		1		1									2
15 years	4	3	2										9
16 years	4	12	5	3	1								25
17 years	3	4	6	4		1							18
18 years	3	7	6	1	1	1							19
19 years		4	6	6									16
20 years		3	5	2	1								11
Total	16	35	30	17	3	2							103
Colored sisters.													
12 years	1												1
15 years	1	2											3
16 years	11	3	1										15
17 years	6	2											8
18 years	4	6	2	2									14
19 years	5	3	1	1									10
20 years	4	4											8
Total	32	20	4	3									59

These data reveal four significant conditions:

1. The earnings of the boys are larger than those of the girls, especially at the upper ages.

2. The earnings of the whites are larger than those of the colored, especially at the upper ages.

3. Among white boys and girls earnings show a marked increase at the age of 18.

4. Among the colored boys and girls, earnings show little increase with advancing age, and this is especially true among the girls.

Occupations older brothers and sisters wish to follow.—Of these young people at work, 439 stated not only the occupations in which they were engaged at the time of the survey, but each one indicated in addition the occupation he or she wished to follow as a life work. These data are valuable, as they indicate in a general way the kinds of instruction the continuation and evening schools will be called on to give. The data have been classified, so as to show how many workers are already engaged in the occupation chosen or in work related to it, who will require only supplementary training, and how many desire to take up work entirely unrelated to their present occupations.

Nearly half of the white older brothers desire to engage in commercial and clerical work.—The range of choices includes 60 occupations. About the same number expressed a preference for industrial pursuits, and less than 10 wished to enter professions. More than two-thirds are employed in the occupations chosen or in related work. The distribution is shown in the table following:

TABLE 11.—OCCUPATIONAL CHOICES OF OLDER BROTHERS OF 13 AND 14 YEAR OLD WHITE SCHOOL CHILDREN.

Occupation chosen.	Engaged in same or related work.	Engaged in entirely different kind of work.	Total.
Machinist	10	12	22
Clerk	15	3	18
Bookkeeper	9	4	13
Merchant	10	....	10
Electrician	4	6	10
Office work	8	1	9
Salesman	7	1	8
Plumber	5	2	7
Printer	5	2	7
Commercial traveler	3	3	6
Boiler maker	4	1	5
Stationary engineer	1	4	5
Banker	4	....	4
Locomotive engineer	....	4	4
Painter	4	....	4
45 other occupations	50	18	68
Total	139	61	200
Per cent	70	30	100

Three-fourths of the white older sisters desire to follow commercial and clerical pursuits.—Clerical work, principally stenography and bookkeeping, was selected by two-thirds of the girls, the choices of the remainder being distributed among commercial, industrial, and teaching occupations. Over three-fifths are employed in the occupations chosen or in related work. The most important of the 19 occupations chosen are listed in Table 12.

TABLE 12.—OCCUPATIONAL CHOICES OF OLDER SISTERS OF 13 AND 14 YEAR OLD WHITE SCHOOL CHILDREN.

Occupation chosen.	Engaged in same or related work.	Engaged in entirely different kind of work.	Total.
Stenographer	20	17	37
Bookkeeper	7	10	17
Saleswoman	6	....	6
Office work	3	1	4
Tobacco operative	4	....	4
Telephone operator	3	....	3
13 other occupations	12	6	18
Total	55	34	89
Per cent	62	38	100

Nearly three-fifths of the colored older brothers are engaged in work entirely unrelated to the occupations chosen.—About two-fifths of the colored older brothers desire to follow industrial occupations. One-sixth selected various kinds of domestic or personal service. The preference for occupations entirely different from the ones they are now engaged in is noticeable. The range of choices includes 44 occupations, the more important of which are listed in the table following:

TABLE 13.—OCCUPATIONAL CHOICES OF OLDER BROTHERS OF 13 AND 14 YEAR OLD COLORED SCHOOL CHILDREN.

Occupation chosen.	Engaged in same or related work.	Engaged in entirely different kind of work.	Total.
Carpenter	2	9	11
Teamster	7	....	7
Barber	2	3	5
Porter	3	1	4
Clerk	....	4	4
Blacksmith	....	3	3
Machinist	....	3	3
Bricklayer	....	3	3
Shoemaker	2	1	3
Physician	....	3	3
Cleaner and presser	3	....	3
33 other occupations	19	23	42
Total	38	53	91
Per cent	42	58	100

Two-thirds of the colored older sisters are engaged in work entirely unrelated to the occupation chosen.—As in the case of the colored older brothers, there is a marked tendency to select occupations quite different from the ones in which they are employed. Nearly one-half wish to be seamstresses or dressmakers. The range of choices includes 12 occupations. The distribution is as follows:

TABLE 14.—OCCUPATIONAL CHOICES OF OLDER SISTERS OF 13 AND 14 YEAR OLD COLORED SCHOOL CHILDREN.

Occupation chosen.	Engaged in same or related work.	Engaged in entirely different kind of work.	Total.
Seamstress	2	12	14
Dressmaker	1	10	11
Teacher	5	5	10
Nurse	5	1	6
Servant	2	2	4
7 other occupations	5	9	14
Total	20	39	59
Per cent	34	66	100

Relation between present occupations and those the workers wish to follow.—The results presented in Tables 11, 12, 13, and 14 differ sharply for the four groups and inspection of the per cents at the bottom of the tables shows that it is approximately true that, out of every 10 of these young white men at work, 7 wish to engage permanently in the lines of work in which they are now engaged. Among the young white women, about 6 in each 10 desire to continue permanently in their present kind of work. Among the young colored men, only about 4 in each 10 hope to make their present sort of work their life work, while among the young colored women the number is only a little more than 3 in 10.

PRESENT STATUS OF TECHNICAL AND VOCATIONAL EDUCATION.

Manual training and domestic science from fifth grade up.—In all the schools of Richmond, both white and colored, courses in manual training and domestic science are offered from the fifth grade up. This work had its inception 11 years ago. About half of the schools are well-equipped centers, in which these classes are carried on and to which children go from the other schools for this work. Of the 20 buildings for white children, 10 are equipped as manual-training centers and 9 as domestic-science centers. Of the 11 buildings for colored children, 5 are equipped as manual-training and domestic-science centers. All of the classes meet once a week, the period for the fifth-grade children being 45 minutes, for the sixth grade 60 minutes, and for the seventh grade 90 minutes. This manual-training and domestic-science work, while of conventional type, is of distinctly better than average quality. Most of the instructors are unusually practical and progressive. During the past two years there has been in existence an ungraded prevocational class composed of about 20 boys of upper-elementary-school ages, one half of whose time has been given to classroom work and the other half to manual work.

Classes in evening elementary schools.—There are four white and two colored evening elementary schools giving instruction in woodworking and domestic science. The session of these classes ranges from one to two hours per week during the 30 weeks that the schools are open.

Classes and courses in day high schools.—The white and the colored high schools both maintain commercial courses and courses for the training of teachers. In addition, both schools offer courses in domestic science, shopwork, mechanical drawing, and applied art. The material equipment and teaching personnel in the John Marshall High School for white students are particularly good. The popularity of these courses in this school is steadily increasing. During the second session of the school year 1913–14 the total enrollment in the manual-arts course was 126, in the commercial course 187, and in the short commercial course 129. In addition, a considerable portion of the 468 pupils in the elective course and the 59 special pupils were taking work in manual arts or commercial subjects.

The John Marshall night high school.—The John Marshall night high school is in the John Marshall High School Building and has been in operation three years. It offers courses in general education, shopwork, commercial branches, and household arts. Thirty-one of the 44 members of the teaching staff are college students or teachers in the public schools. The remainder are engaged during the day in commercial and professional pursuits, excepting two millinery teachers and four housekeepers. The school is open six and one-half months, from October to April, three nights each week. About two-thirds of the students attend three nights a week and the remaining third one night a week. The sessions are from 7.30 to 9.30. The minimum entering age is 14 years and the average age is between 16 and 17 years. The student body is nearly equally divided between the two sexes.

Over one-half of the total time is devoted to general education—that is, work of the upper-elementary and high-school grades. About 36 per cent is devoted to commercial subjects, 11 per cent to household arts, and less than 3 per cent to industrial subjects. The total enrollment for the past year was 1,521, while the average attendance was 615. Sixty per cent of the pupils attended less than half the number of nights the school was open. With the teaching force as it existed at the close of the past school year a much larger number of pupils could be effectively cared for than were then in attendance.

The Virginia Mechanics' Institute.—The Virginia Mechanics' Institute was founded in 1854 and receives an annual subsidy from the city, amounting in 1914 to $11,500, which, combined with moneys received from other sources, makes a total income of about $15,000. The present value of the building and equipment is estimated at about $125,000. The institute is governed by a practically self-perpetuating board of 24 members composed of prominent business and professional men. A superintendent, appointed by the board, is in immediate charge of the school. The institute is entirely independent of the local public-school organization. No detailed reports are made to the school board or to the city council as to the financial and educational administration.

The institute offers courses in general, engineering, shop, and commercial subjects. Six of its 29 teachers are employed by day in mechanical work and the building trades and 6 are mechanical or civil engineers. Ten of them hold other teaching positions.

The school is open seven months in the year, five nights a week, from 7.30 to 9.30. It is open only in the evening. With the present teaching force the maximum capacity of the school is about 340 students per night, which would be equal to a yearly output of 95,200 student hours on the present basis of 140 sessions of two hours each. An estimate based on the available data gives as the actual output for the past year 57,820 hours. It thus appears that with the present financial resources the output of the school could be considerably increased. With more ample resources the year might be extended to 40 or 50 weeks, and, if conditions warranted, day sessions could be established. By such changes the output of the school could be increased anywhere up to ten times the present amount. It is not suggested that this should be done, but the possibility exists should the need arise.

Males only are admitted, and their ages range from 15 years up, the average being about 19. About one-seventh of the students are over 24 years of age. Each student pays $3 for the first course and $1 for each subsequent course. The average enrollment during the past year was 387, but this does not represent the number attending or expected on any one night. Part of these students receive instruction two nights a week and the remainder three. Less than one student in five attended more than one-half of the nights that the school was in session during the past year.

The machine-shop equipment was largely donated by the Richmond Locomotive and Machine Works, and is mostly too big and too old for the most effective use. The institute has a library of something over 5,000 volumes.

Vocational work in Richmond during the past year.—A close approximation of the potential output of the schools during the past year is given in the next table. Accurate attendance figures were not available for some of the schools, and the total number of student hours for the year is computed on the basis of enrollment. Owing to irregular attendance, the actual output was considerably less.

TABLE 15.—ENROLLMENT AND TOTAL STUDENT HOURS OF INSTRUCTION HAD EACH PUPIL ATTENDED THE FULL TERM, 1913-14.

	Enrollment.	Student hours for year.
Trade and industrial education.		
John Marshall High School:		
Cabinetwork	55	11,000
Pattern work	12	2,400
Forge work	27	5,400
Machine work	8	1,600
Mechanical drawing	116	18,560
Total	218	38,960
Per cent of total trade and industrial education	....	42
Armstrong High School (colored): Shopwork	15	1,800
Per cent of total trade and industrial education	....	2
Prevocational school	18	9,900
Per cent of total trade and industrial education	....	11
Night high school:		
Cabinetwork	16	832
Machine work	12	1,248
Mechanical drawing	36	3,744
Total	64	5,824
Per cent of total trade and industrial education	....	6
Elementary night schools:		
Shopwork (white schools)	87	3,840
Shopwork (colored schools)	32	1,920
Mechanical drawing (white schools)	13	570
Total	132	6,330
Per cent of total trade and industrial education	....	7
Virginia Mechanics' Institute (night):		
Automobile	36	3,024
Plumbing	9	1,008
Machine work	16	1,792
Cabinetmaking	8	896
Pattern making	8	896
Practical electricity	36	4,032
Estimates of building	7	784
Instrumental drawing	60	6,720
Mechanical drawing	28	3,136
Architectural drawing	16	1,792
Free-hand drawing	35	3,920
Total	259	28,000
Per cent of total trade and industrial education	....	30
Railroad Y. M. C. A. (night)	20	2,400
Per cent of total trade and industrial education	....	2
Total trade and industrial education	726	93,214
Commercial education.		
John Marshall High School:		
Phonography	149	19,800
Typewriting	331	48,040
Bookkeeping	171	22,760
Total	651	90,600
Per cent of total commercial education	....	56
Armstrong High School (colored): Bookkeeping	37	11,100
Per cent of total commercial education	....	7
Night high school:		
Stenography	187	9,724
Typewriting	187	9,724
Bookkeeping	234	12,168
Writing	304	15,808
Rapid calculation	35	1,820
Banking	28	1,456
Total	975	50,700
Per cent of total commercial education	....	32

TABLE 15.—ENROLLMENT AND TOTAL STUDENT HOURS OF INSTRUCTION HAD EACH PUPIL ATTENDED THE FULL TERM, 1913-14—Concluded.

	Enrollment.	Student hours for year.
Commercial education—Concluded.		
Virginia Mechanics' Institute (night):		
Bookkeeping	59	6,608
Telegraphy	8	1,344
Total	67	7,952
Per cent of total commercial education		5
Total commercial education	1,730	160,352
Household arts education.		
John Marshall High School:		
Cooking	88	17,600
Sewing	53	10,600
Art work	165	30,720
Total	306	58,920
Per cent of total household arts education		43
Armstrong High School (colored): Domestic science	200	47,520
Per cent of total household arts education		35
Night high school:		
Cooking	75	3,900
Sewing	89	4,628
Art work	111	5,772
Total	275	14,300
Per cent of total household arts education		10
Elementary night schools:		
Cooking (white)	118	7,620
Cooking (colored)	67	3,660
Sewing (white)	8	480
Sewing (colored)	68	3,870
Total	261	15,630
Per cent of total household arts education		12
Total household arts education	1,042	136,370

Trade and industrial instruction constituted less than one-fourth of the total output, commercial instruction over two-fifths, and training in household arts a little over one-third. The public day schools furnished considerably over one-half of the total amount of instruction in trade and industrial subjects, the Virginia Mechanics' Institute nearly one-third, and the public night schools about one-eighth. The day high schools have done the greater part of the work. Seventy-eight per cent of the instruction in household arts, 67 per cent of the instruction in commercial subjects, and 65 per cent of the instruction provided by the public-school system in trade and industrial subjects have been furnished by the two day high schools.

FINANCIAL SUPPORT OF THE PUBLIC SCHOOLS.

Richmond a relatively wealthy city.—According to the report of the United States Census on Financial Statistics of Cities for 1913, there are 40 American cities of from 100,000 to 300,000 population.[1] With respect to population, Richmond is in the middle of this group, 20 of the cities being larger and 19 smaller. The per capita wealth of the people living in these 40 cities is $1,245. In Richmond the per capita wealth is $1,489, and the city ranks seventh in this comparison. Richmond possesses decidedly more taxable property for each inhabitant than the average of the cities of her class.

Richmond's expenditures for schools are low.—The census report on cities for 1912 listed 38 cities of from 100,000 to 300,000 population. In this group of 38 cities the annual expense for schooling for each child in average attendance in elementary schools was $35, whereas in Richmond it was only $24. The corresponding figures for the high schools were $77 for the group and $55 for Richmond. In the night schools the corresponding figures were $16 for the group and $12 for Richmond.[2] The corresponding data for 1913 are not yet available.

School expenditures low as compared with wealth.—According to the census report on cities for 1913, these cities of from 100,000 to 300,000 population spend annually $3.64 on the support of public schools for each $1,000 worth of taxable property that they possess. Richmond, on the same basis, spends only $1.94.[3] This may be stated in another way by saying that in proportion to wealth the expenditures of this group of cities for school support is $1.88 for each $1 that Richmond spends.

Rank in per capita and percentage expenditures.—The census report on Financial Statistics of Cities for 1913 gives the expenditures per capita of population for the support of the different divisions of municipal government.[4] It also gives figures showing the per cent of the total municipal expenditures devoted to each of these purposes. These two sets of figures enable us to discover how Richmond compares with her sister cities in the amount spent for each inhabitant on the support of each branch of municipal government and also how she compares in the per cent of her total annual expenditures for running expenses devoted to each separate purpose. The standing of Richmond among these 40 cities of from 100,000 to 300,000 population is shown in the following table, in which the figures represent the rank of this city among the 40 cities.

[1] Bulletin 126, Financial Statistics of Cities, Bureau of the Census, pp. 18–25.
[2] Bulletin 118, Financial Statistics of Cities, Bureau of the Census, pp. 66–68.
[3] Bulletin 126, Financial Statistics of Cities, Bureau of the Census, pp. 18–25, 45.
[4] Idem, pp. 44–47.

The figures of this comparison show that both absolutely and relatively the expenditures of Richmond for the support of public education are low.

TABLE 16.—THE RANK OF RICHMOND AMONG THE 40 CITIES OF 100,000 TO 300,000 POPULATION IN PER CAPITA EXPENDITURES AND IN PER CENT OF TOTAL EXPENDITURES DEVOTED TO EACH BRANCH OF MUNICIPAL GOVERNMENT IN 1913.

Object of expenditures.	Rank in per capita expenditures.	Rank in per cent of total expenditures.
Highways	Third	First.
Sanitation	Fourth	Fourth.
Charities and correction	Fifteenth	Sixteenth.
Police	Seventeenth	Nineteenth.
Recreation	Twenty-second	Twentieth.
Fire	Twenty-sixth	Twenty-ninth.
General	Twenty-seventh	Twenty-seventh.
Schools	Thirty-eighth	Fortieth.

No State aid for industrial education.—Richmond now receives no State aid for industrial education. Under the Virginia vocational education law, the legislature is authorized to appropriate, and the State board of education to distribute funds appropriated, for the support of industrial, agricultural, household arts, and commercial education. The same law authorizes any school district to establish all-day, part-time, continuation, or evening classes designed to meet the vocational needs of persons over 14 years of age of less than college grade. Under this law the State appropriates $30,000 a year for the support of agricultural education in the rural districts. Thus far no appropriation has been made for the other three forms of practical training or for work of any kind in the cities. While the law authorizes the employment of supervisors for vocational schools, the State board has as yet employed none.

State funds could be wisely appropriated in aid of vocational education in Richmond.—The city of Richmond pays into the State treasury far more than it receives for educational purposes. For every $5 the city pays into the general school fund it receives back only $2 for school support. The State gives each year from the general fund $275,000 for rural elementary schools, $100,000 for rural high schools, $30,000 for agricultural schools, and $20,000 for normal high schools. The Richmond schools receive no part of this money. It seems apparent that the State might with great propriety and wisdom appropriate money in partial support of vocational education in the cities. This would be particularly fitting in the case of Richmond, the capital city, which should and does serve as an experimental station and practical demonstration for the other cities of the State.

THE INDUSTRIAL SURVEY.

Fields of employment in Richmond.—According to the United States census volume on occupations for 1910 the following are the occupational groups of Richmond in the descending order of the number of workers which they include:

TABLE 17.—PERSONS 10 YEARS OF AGE AND OVER ENGAGED IN EACH SPECIFIED OCCUPATION IN CITY OF RICHMOND, CLASSIFIED BY SEX.

[Source: Thirteenth United States Census, 1910, Vol. IV, pp. 194-206.]

Occupational groups.	Sex.		Total employed.	
	Male.	Female.	Number.	Per cent.
Manufacturing and mechanical industries	19,214	5,886	25,100	40.00
Domestic and personal services	3,391	10,909	14,300	22.79
Trade	7,862	1,183	9,045	14.42
Transportation	5,047	159	5,206	8.30
Clerical occupations	3,470	1,589	5,059	8.06
Professional service	1,444	1,273	2,717	4.33
Public service	913	7	920	1.47
Agriculture, forestry, and animal husbandry	310	7	317	.51
Extraction of minerals	76	....	76	.12
All occupations	41,727	21,013	62,740	100.00

The report primarily concerned with wage earners, particularly industrial workers.—It is not concerned with the training of persons in Richmond who, according to the census, are engaged in transportation, professional service, public service, agriculture, or the extractive industries, but is either directly or indirectly concerned with those who are engaged in manufacturing and mechanical pursuits, domestic and personal service, and department-store employment.

The scope of the survey includes analyses of four large mechanical industries of Richmond and, in addition, the department stores. The four industries embrace 108 occupations, distributed as follows: Twenty-six in the printing trades, 35 in the building trades, 30 in the metal trades, and 17 in the tobacco industry. These 108 occupations and the department stores represent more than 15,000 workers, embracing the principal well-defined skilled occupations and a very considerable number of semiskilled and unskilled employments. Other industries, such as box making, paper and pulp works, canning and preserving, and baking-powder industries, while important, employ relatively few skilled workers, their product being produced largely by automatic machines. The leather industry employs a large number of workers, but is to a considerable extent a jobbing industry, except in the shoe factory where the work is done on automatic machines, and in the harness works where the skilled workers are few in number.

As regards the women workers in Richmond the survey is concerned primarily with those employed in stores and in tobacco manufacturing.

It does not include analyses of dressmaking and millinery, the traditional skilled trades for women, owing partly to the limited time available, partly to the fact that a knowledge of these trades is already in hand, and partly to the fact that the need for information with reference to semiskilled and unskilled employment is, at this time, much greater. The tobacco industry was studied as typical of the industries employing largely semiskilled and unskilled workers as well as because it is one of the largest employers of women in Richmond.

The information concerning these groups of trades and occupations was secured through two types of schedules: (1) The establishment schedules, representing concerns, as noted above, employing more than 15,000 workers; (2) the individual schedules obtained from more than 700 workers representing all the important occupations in the five groups noted.

Method of the industrial survey.—Eight months' time was given to the survey, which was directed by Mr. Charles H. Winslow and a corps of 20 workers, of whom 17 were men and 3 were women. In addition there was an office force of 5 clerks and stenographers. The field work required six months, during which time at least 6 people were continuously employed. All the agents were regularly employed, no volunteer help being utilized in this portion of the survey. Much night work was done.

Interviews were held with employers to explain the purpose of the survey and the filling out of the schedules and to secure their cooperation. Interviews were held also with workers in the shops or at their regular meeting places for the same purposes. Each interview represented a personal conference of about 20 minutes. Visits were made to shops and factories to study industrial processes and conditions, and numerous conferences were held with men and organizations familiar with the industrial and commercial conditions of Richmond. Occupations were studied by trade groups and a complete analysis of each occupation prepared which summarizes the information given by employers and employees in Richmond under "Findings about the trade," which bear more or less upon the problem of training for it, and "Findings about education for the trade," which bear directly upon the problem. These "findings," it should be emphasized, are simply summaries of the statements of employers and employees in the trades and do not necessarily represent the conclusions of the survey committee. All the statements of the "findings" based on the data gathered were submitted to employers and workers for criticism. This analysis is presented for each trade group briefly in chart form and in text. The statistical information gathered from the workers' and employers' schedules is presented in tables in Appendix A.

Descriptive analysis of occupations.—As has already been stated, the occupations studied were those belonging to the five industry or trade groups—printing, metal, building and woodworking, department store, and tobacco. A description of each of these occupations within a trade group has been prepared, which explains the processes or operations as carried on in Richmond, the physical, hygienic, and economic conditions of the work, the requirements upon workers, and the kind of schooling needed. The text for this descriptive analysis, covering many different occupations, is published in the appendixes at the close of this report. (See pp. 94 to 279.)

A tabular analysis of occupations by industry or trade groups has been prepared on charts which give for each group a brief tabulation covering all the points about each occupation within the group which admit of tabulation. The purpose of this is to present brief summaries of the full description of each occupation as found in Richmond and to show the characteristics of the occupations in comparative form. A chart for each trade group presents the analysis under two general heads—"Findings about the trade" and "Findings about education for the trade."

ANALYSIS OF FINDINGS BASED ON THE INDIVIDUAL SCHEDULES SECURED FROM WORKERS IN PRINTING, BUILDING, AND METAL TRADES.

Points covered by the individual schedules.—The individual schedules secured from 509 workers in the various occupations of the printing, building, and metal trades supplied valuable data, which have been tabulated and are presented in Appendix A. From this material information is furnished on such important points as the following: Age distribution of apprentices and workers and the nativity of workers, by trades; the regular hours of daily and weekly labor, by trades; time lost by workers, by trades; causes of loss of time; extent of part-time employment, by trades; extent of overtime worked, by trades; years of experience of workers as wage earners; years of experience in present occupation and in other occupations; age of entrance upon wage-earning occupations, by trades; period of apprenticeships served in years by workers in different trades; relation of years of experience to hourly wage; change of place of employment during apprenticeship, and reasons for changing, by trades; extent to which workers received proper instruction in the shop while learning the trade; highest, lowest, and average wages, within trades, by occupations; locality in which workers learned trades; change of occupations of present workers, by trades; misfits in present positions, as to natural ability, training, and experience, by trades; employees working under conditions causing strain or impairing health; possibilities of learning different trades completely in the shop; age of leaving school of apprentices and workers, by trades; lack of general school training of apprentices and workers; hourly and weekly wages of apprentices and workers, by trades.

This analysis can only undertake to summarize briefly the information secured in the individual schedules, which must be considered in the formulation of any program of industrial education for Richmond. These follow:

No children under 14 were found employed in the printing, building, and metal trades. The apprentices in these trades, who are very few in number, are almost without exception between 16 and 20 years of age. About 14 out of every 100 of the total number of workers covered by the individual schedules were under 21 years of age, 71 out of every 100 were between 21 and 45 years of age, and 12 out of every 100 were between 46 and 65 years of age.

Most of the city workers trained in Richmond.—Out of every 100 of them 68 were born in Richmond, 15 elsewhere in Virginia, 14 in other States of the Union, and only 3 in foreign countries. An unusually large proportion of the city's workers were born and educated in the city and State. Since it seems probable that this condition will continue in the future, Richmond and Virginia seem justified in training a larger proportion of workers for local industries than most other localities.

More than half work less than nine hours.—An eight-hour day was the shortest reported. Out of every 100 workers reporting, it is approximately true that 52 work less than 9 hours, 36 work 9 hours and less than 10 hours, and 12 work 10 or more hours. Two-thirds of the workers have a short-time Saturday. The employers commonly report a tendency toward a shorter day.

Time lost from employment relatively inconsiderable.—Out of every 100 of these workers, 53 reported no time lost during the year, 18 lost from 1 to 4 weeks, 11 from 5 to 9 weeks, and the remaining 18 lost 10 weeks or more. The least time was lost by men in the printing trades, considerably more time by those in the metal trades, and the largest losses were reported by the building trades. With the exception of the building trades, there are few if any seasonal occupations, and there are few if any violent fluctuations in employment.

Little time reported lost by accidents.—Of the workers reporting lost time, the largest number gave temporary lay off as the reason. The next largest cause was the shutting down of factories; the third in importance was sickness, with accidents a comparatively small fourth.

Part-time and overtime employment small.—The facts about part time and overtime show once again the comparative regularity of employment.

Workers shift employment but little.—The total years of experience of these workers as wage earners range from 1 to 60 years. Nearly 40 per cent of them have been at work from 6 to 15 years. The relative infrequency with which Richmond's workers shift from occupation to occupation is shown by the fact that the data as to years of experience in their present occupations differ but slightly from those showing years of experience in any sort of gainful occupation, the per cent of those who have been in their present occupations from 6 to 15 years being 42. Two out of every three have never been in any other occupation than the present one.

Few of these workers began under 14 years of age.—Practically none of these workers in the printing, building, and metal trades became wage earners before the age of 14. Seven out of every eight began work after they became 15 years of age. More than half entered employment after this age and under 18. Apparently these three highly skilled trades in Richmond do not employ young workers under 14, and the success of the artisan is not dependent upon his entering the trade at an early age. Apparently the age at which workers in these industries leave school to enter employment has little bearing upon their subsequent earning capacity.

Four years the average of a variable period of apprenticeship.—Out of every 100 of these workers, 93 reported that they had served some period of apprenticeship to the trade, ranging in duration from less than three to more than seven years. Exactly one-half of those who have served any apprenticeship gave four years to it. The apprenticeship in the printing trades averaged somewhat longer than in the other two.

Wage increased with experience.—Wage began in each of these three trades at about 15 cents per hour and rose steadily with experience and age for the first 10 years of service when it reached about 40 cents per hour and thereafter remained relatively stationary.

Apprentices shift employment but little.—Further evidence of the stability of Richmond's workers is furnished by the fact that 69 out of every 100 learned their trade in one shop only, while most of the rest learned it in two shops, and only three in each hundred worked in two or more communities.

Reasons for shifting among apprentices.—The 151 out of 509 workers who changed their place of employment while learning their trade gave the following reasons for doing so which are listed in the descending order of the frequency with which they are alleged: To get wider experience; to get more money; shop closed; laid off; disliked employer; family moved away; discharged; strike.

Seven out of ten learned the trade in Richmond, and one out of every four elsewhere in the United States. The number of foreign trained workers was negligible. The printing trades contain the largest per cent of workers trained in Richmond and the building trades the smallest.

Few misfits in the trades.—Out of each 100 of the workers answering the question as to whether or not they were working in the occupation for which they were best fitted by natural ability, 61 answered in the affirmative and the remaining 39 in the negative. When the same question was asked them as to training and experience, 89 out of each 100 answered in the affirmative and only 11 answered in the negative. It must be remembered that these answers represent only the personal opinions of the men themselves.

More than one-third reported physical or nervous strain.—One out of every three workers said that his occupation involved peculiar physical or nervous strain or both. The proportion does not differ greatly for the three groups of trades.

More than one-fourth reported occupational diseases in their trades.—One out of every four workers said that he worked in a trade in which there were diseases peculiar to the occupation. This was most frequently reported in the printing, less frequently in the metal, and least frequently in the building trades.

Difference in opinion as to adequacy of shop instruction.—Out of every four men in the printing trades reporting, three say skill in the trade processes can be acquired thoroughly in the shop, while the fourth is of the contrary opinion. For the building trades only one out of every three reporting answered in the affirmative and the remaining two in the negative. In the case of the metal trades, two out of every five reporting answered in the affirmative, the remainder in the negative. It must be emphasized that these answers do not refer to either general education or knowledge related to the trade.

Richmond workers come from the elementary schools.—About one-half of these workers left school at the age of 14 or younger. Ninety-two out of every 100 of them left school before reaching the age of 18. Contrary to the usual impression those in the printing trades withdrew from the schools at an earlier age than those in either the building or metal trades. However, the tendency in late years in all the above trades is to remain in school longer. This is shown by the fact that out of 54 apprentices reporting, only 3 had entered employment under 13 years of age, and only 12 under 14 years of age, while 36 did so between 14 and 16 years of age. Practically none of these workers had received any high-school training, and most of them much less than a complete grammar-school training.

The typical Richmond worker has had less than seven years of schooling.—Out of every 100 of these workers, 5 had attended school 3 years or less, while 80 had received not over 7 years of any sort of school training. Only 6 workers out of 509 had received as much as 11 years of schooling and none more than that. Much of this school attendance was in ungraded classes in rural districts. The amount of schooling of the workers in the printing, building, and metal trades in Richmond is practically the same.

Lack of school training hampers progress of workers.—Sixty out of every 100 of these workers reported that because of lack of schooling they were hampered in becoming efficient in their several trades. All workers having three years or less of schooling said they had been handicapped. More than 62 out of every 100 of those who had received seven years or less of instruction so declared. Out of 54 apprentices reporting, 22 said they had been held back in their work by insufficient education. Of these, 18 had attended school not more than seven years.

Many workers have taken courses since leaving the regular schools.—Out of every 100 of these workers, 37 had tried to improve their economic condition by securing schooling after they became wage earners. Six out of every 10 apprentices reporting had taken additional courses. Seventy-four out of every 100 of these student workers took courses in night school and 22 in correspondence classes, while 4 attended day school. Sixty-eight took courses bearing upon their trades for every 32 who took work unrelated to their occupations. Out of 509 workers reporting, 135 said they had paid tuition for instruction either in day, evening, or correspondence courses since going to work. The total amount paid was $5,465.05, of which $3,176.80 was spent by 52 students in correspondence schools, an average of $61.09 per student. The largest sum paid by any student was $340.

Other benefits of schooling greater than the financial one.—Four out of every 10 workers answering the question as to whether they had received an increase in wages as the result of taking courses answered yes, the remaining 6 answering no. Nine out of every 10 workers answering the question as to whether they had received benefit other than an increase of wage replied in the affirmative and only 1 in the negative.

Wages in the building trades highest.—Out of every 100 of the workers in the groups selected, 11 earned under $10 per week, 10 earned from $10 to $15, 67 earned from $15 to $25, and 11 earned $25 or more. The wages in the building trades range slightly higher than in the printing and metal trades, in which they are about the same.

Workers ask for certain courses.—Approximately 50 subjects for evening or part-time school instruction were suggested by these workers to help them in their present occupations. These requests came from both apprentices and journeymen. These subjects ranged all the way from such elementary school work as reading, writing, spelling, and arithmetic, and such regular high-school work as algebra, geometry, and physics to such practical work as shop mathematics, mechanical drawing, plumbing and steam fitting, and gas engineering. About three out of every five subjects suggested were very practical courses helpful to the worker's employment. In the printing trades the characteristic demand was for trade chemistry, design, color harmony, and ink mixing. In addition, there was a pronounced demand for English and composition. In the building trades the characteristic demand was for mechanical drawing, architectural drawing, shop mathematics, and estimating. In the metal trades the characteristic demand in much larger proportion was for shop mathematics, mechanical drawing, and arithmetic.

ANALYSIS OF FINDINGS BASED ON THE ESTABLISHMENT SCHEDULES SECURED FROM EMPLOYERS IN THE PRINTING, BUILDING, AND METAL TRADES.

The employers' schedules cover the following important points not dealt with in the individual schedules:

Products of the different establishments represented.

Busy and slack seasons of the various trades.

Difficulties in securing competent workers in specific occupations, with the reasons.

Period of maximum productivity in various occupations.

Years of experience necessary to minimum wage.

Probable increase and decrease in the demand for workers.

Relative demand and supply for skilled and unskilled labor.

Frequency and line of promotion from occupation to occupation in use.

Shifting of workers from process to process to give wider experience and training.

Opportunities for untrained beginners in specific occupations.

Relative efficiency of foreign and domestic trained workers.

Relative instability of employment of trained and untrained workers.

Conditions affecting the welfare of the worker.

Character of instruction received by workers in the shop.

Relative advantages of indentured and unindentured apprenticeship.

Character of apprenticeship agreements.

Relation of general school training to efficiency.

Extent of the educational deficiencies of beginners.

Types of schools and kind of training necessary in the judgment of employers to increase the efficiency of workers.

Willingness of employers to cooperate in part-time schooling.

Kind of part-time and evening schooling favored.

Practical tests used in determining the efficiency of applicants and workers.

Willingness of employers to make the shop experience of young workers more educative.

Field covered by schedules.—In printing, 50 shops with 1,244 workers, covering practically the entire field. In metal trades, 17 shops with 4,924 people. In building trades, 20 concerns with 875 people.

Size of establishments covered.—Printing trades, 31 out of 50 employ 20 people or less; remainder 31 to 110. Metal trades, 9 out of 16 employ under 100; remainder 100 to 1,000. Building trades from 3 to 100, the average per concern being 43.

Seasonal fluctuations are smallest in the printing trades, according to employers' statements, the difference between maximum and minimum number employed being only 12 per cent. There is almost steady employment in railroad shops. General machine shops and foundries lay off about one-third of their workers employed in the busy part of the year. Rolling mills and ornamental iron works are affected more than the others of the metal-trades group, being compelled to reduce working force by almost one-half in dull seasons. The building trades are affected more by seasonal fluctuations than any other of the trades mentioned.

Supply of efficient journeymen reported inadequate.—Employers almost unanimously maintain that the supply of efficient journeymen in all the groups of trades mentioned is inadequate.

Larger demand for skilled workers in the near future.—Most of the employers, but particularly those in the metal trades, say that there will soon be a greatly increased demand for skilled workers in Richmond.

Chances of promotion slight.—In the metal and building trades employers say chances of promotion from one occupation to another are slight. Where an affirmative answer was received, the statement was invariably made that the specific occupation open to promotion was that of foreman. All these trade groups suggest, of course, the promotion from apprentice to journeyman.

The amount of systematic instruction given in the shops apparently small.—If given at all it is given by the foreman alone, who is, of course, burdened with many other responsibilities. In most of the trades, beginners other than apprentices are used only in unskilled work. In spite of the fact that practically none of the metal, building, or printing trades can be learned properly without systematic instruction, the number of apprentices reported is small.

The amount of apprenticeship small.—Most apprenticeship agreements when made are verbal. Few employers indenture their apprentices in any of the trades. No regular apprenticeship system exists in the metal trades, only 3 firms out of 16 reporting any. Written agreements for apprenticeship exist only in trades well organized and the terms are usually regulated by the union. Conditions similar to those in the building trades are found in the printing trades.

Three hundred and twenty-six "apprentices and young learners" were reported by the firms returning schedules, distributed among the trades as follows: Two hundred and twenty-three in the metal, 62 in the printing, and 41 in the building trades. Out of every 100 workers employed in the metal trades, 8 were apprentices and young learners. In the printing trades and in the building trades there were 5 in each 100.

The period of apprenticeship varies for the different trades.—Where agreements are reported, the period of apprenticeship for the printing trades is most frequently given as five years, for the building and metal trades as four. An automatic upward sliding scale of wages is provided for the apprentice in all these trades where written agreements are in force.

Employers, on the whole, report conditions under which work is performed as causing no particular strain to the workers.—Some of those in the building trades, chiefly contractors and builders, mention lead poisoning in the painting trades and tuberculosis in the stonecutting trades. In the metal trades, the rolling mill and ornamental iron establishments say that sudden changes in temperature usually associated with their work might possibly affect the physical and nervous condition of their employees. Only 2 of the 50 firms representing the printing trades mentioned any conditions that might affect the health of the workers, these being found in the bronzing and photoengraving departments.

The lack of general schooling reported as a handicap of workers in all trades.—This is particularly true of printing. In the metal and building trades, employers reported in addition the great need of a better knowledge of shop mathematics and drawing. When asked specifically what the schools should do for the worker before he enters the shop, the almost invariable answer of all employers was that they should give him more general education.

Distribution of workers among occupations within trades.—Out of every 100 workers in the various trades of building, there are 26 carpenters, 13 plasterers, 10 bricklayers, 9 mill workers in wood, 8 cabinetmakers, 7 cement finishers, 4 plumbers, and 4 wood finishers, the remaining 19 being distributed among 17 other occupations, making a total of 25 occupations; the proportion of apprentices is 5 out of every 100 workers. Out of 100 in the metal trades there are 24 machinists, 11 boilermakers, 9 molders, 4 rolling mill hands, 4 blacksmiths, 2 stove erectors and mounters, 1 pipe fitter, 1 pattern maker, and 1 nickel plater and finisher, the remaining 43 being distributed among 11 occupations, making a total of 20 occupations. Out of every 100 workers in the printing trades there are 18 bookbinders, 12 press feeders, 12 hand typographers, 9 cylinder and platen pressmen, 7 unclassified workers, 4 linotype operators, 3 paper cutters, and 2 proof readers, the remaining 33 being distributed among 21 other occupations, making a total of 29 occupations.

Subjects needing to be taught for the various trade groups.—In printing, employers emphasize the following in the order given: English, arithmetic, punctuation, to be supplemented by courses in design, drawing, history of printing, chemistry, color harmony, color mixing, and physics. The suggestions made for courses for workers in the metal trades are chiefly of a strictly vocational character, such as "steps of the trade," "whys of the trade," "theory of the trade," in addition to mathematics, free-hand and mechanical drawing, chemistry, physics, and in some instances metallurgy. In the building trades the suggestions vary according to the particular line of work done by the employer. The leading suggestions are shop mathematics, drawing, and blue-print reading, adapted to specific trades or occupations, such as plumbing or carpenter work. Subjects proposed for painters are color harmony, designing, modeling, lettering, and the chemistry of the trade. Only one employer in the building trades suggested that general education be given.

Courses suggested for evening classes for journeymen.—In printing, employers gave the following in the order of their frequency: English, design, drawing, history of the trade, estimating costs, arithmetic, color harmony, chemistry of the trade. For the metal trades: Mathematics and drawing, mechanical designing, electrical mechanics and estimating, fundamentals of the trade, and general education. Seventeen out of 20 employers in the building trades suggest free-hand drawing and mechanical or architectural drawing; 11, shop mathematics; 4 (chiefly painters and decorators), color harmony, paint mixing, chemistry of the trade, modeling, designing and lettering; and 4 mention general education.

Most employers favor evening in preference to part-time industrial schools for apprentices.—Sixteen out of 20 firms in the building trades, 8 out of 16 in the metal trades, and a considerable majority in the printing trades so reported.

Many firms report a willingness to cooperate with part-time day schools for their workers.—The question was asked as to whether the employer would be willing to enter into an agreement providing for a definite period of attendance of apprentices at a part-time day school for a definite number of hours and pay them the usual wage while in school. Twenty-four out of 50 firms in the printing trades answered in the affirmative, as did 5 out of 16 in the metal trades, and a majority of the establishments who employ apprentices. The usual suggestion as to the number of hours per week to be given to part-time schools is from six to eight, usually in two-hour periods per day.

No written records of individual efficiency of workers are reported as being used in any of the shops. No entrance tests of the worth of applicants for positions are used except "actual trial on the job."

Most of the employers report a willingness to cooperate with the schools by organizing the shop practice for the better training of workers. In answer to the question as to whether they would be willing to cooperate with the schools in an effort to organize shop practice so as to develop interest and efficiency on the part of the worker, 15 out of 20 firms in the building trades, 13 out of 16 in the metal trades, and 24 out of 50 in the printing trades answered in the affirmative.

ANALYSIS OF INDIVIDUAL SCHEDULES SECURED FROM WOMEN AND GIRLS IN RETAIL STORES.

Scope of the investigation.—Data relating to the employment of women and girls in retail stores, especially those engaged in the buying and selling of goods, were secured from 11 stores employing workers in various capacities. The inquiry reached practically every store in the city in which dry goods, specialties in women's wear, and general merchandise are sold, and was confined in the main to stores of this type. This kind of work employs women in large numbers, the number of women employees in Richmond being 1,185 and of men employees 344.

The study concerned itself with the education of employees, years of experience, wages, training for the work, and promotion. These facts were supplemented with an inquiry into what the employee and the employer consider the requisites for a well-trained and successful worker in the various kinds of employment in the store.

For this study, two kinds of schedules were used, one for each employee and one for each employer (both of which contained many points in common) for the purpose of getting the two points of view on the same problems.

Types of establishments.—Unlike factories, which are characterized by their product, stores which handle a few exclusive things, or practically all the things needed for clothing, for shelter, and food, as is many times the case in the large department store, are best classified by types of store organization. Those included in this inquiry in Richmond fall under the following classification: (1) Department stores, (2) specialty stores, and (3) general dry-goods stores.

Five and ten cent stores, which represent still another type, were not included in this study. The neighborhood store, found in great numbers in large cities, practically does not exist in Richmond. The general dry-goods store takes its place.

The department store.—Richmond has three department stores, though specialty stores have adopted a departmental system to some extent. These stores are organized on similar lines, the type now being pretty generally established. In these stores each department is practically what may be termed a unit store, with its buyer and sales people; its stock bought, cared for, and sold only by employees of that department. It also has its own system, for which the buyer is usually responsible, for ascertaining costs, amount of sales, and profits, thus making the department organization a complete store within a store. Under such a system, the workers in one department remain in the one place for all their work.

The general store.—The general store, known in the past as the dry-goods store, still holds an important place in the city. This type includes stores which carry exclusive, high-priced merchandise, and cater to exclusive patronage, and the stores which carry cheaper, popular-priced merchandise, and, like the department store, serve practically all classes of customers. The general store, as a rule, does not use the department system, but has the merchandise arranged in sections, the sales persons passing from one section to another to supply all the wants of the customer. In some stores the general-store plan is still adhered to somewhat, but has some modern departments. This is true of stores which have added to their general merchandise such stock as millinery or suits and dresses, etc.

The specialty store.—The specialty store represents still another type which is more or less departmental. This type of store is characterized by the stock it carries, which is almost exclusively ready-to-wear clothing, dresses, and millinery. One or more departments, where the store is not large, may be under the charge of one buyer, who, like the head of a department in the store which is strictly departmental, has charge of a store within a store.

This classification does more than show the different types of stores. It becomes, later in the study, the basis for classifying and analyzing the kinds of work to be done in the stores and the kind of experience and training necessary for each.

Skilled and unskilled work.—For store occupations there are no terms equivalent to "skilled" and "unskilled," which in the workshops and factories apply to work done with the hands. Yet there is required of store employees in various ways some manual skill which is an important feature of the work, but more important, especially in selling goods, is the skill in dealing successfully with people. Rarely, except for traveling salesmen and a few others engaged in special lines, is this quality or power consciously sought for and developed.

There are very few if any really unskilled occupations in store work. The relation of one position to another in the various kinds of work is clearly defined, the less skilled work in each instance being distinguished by the amount and quality of knowledge about the work and of experience required, rather than a different kind of knowledge and experience. The description and analysis of the types of occupations in a later chapter[1] will discuss this point more fully.

Labor supply.—Practically all the employees in the stores are native Americans, the larger proportion being natives of Virginia.

Men and women in the buying and selling departments and to some extent in the office departments enter the stores under practically the same conditions, both younger boys and girls beginning in the lower occupations in the lines open to them and advancing as experience or opportunity admits. There are, however, some departments given over exclusively to women and girls, such as notions, ribbons, neckwear, leather goods, dresses and suits, millinery departments, and others; some exclusively to men, as men's clothing, men's furnishings, men's shoes, carpet and rug departments, and others; and some employ both men and women, as shoes, domestics, china, linens, silks, household furnishings, and others.

Young boys and girls enter the stores without training for the work they are taking up, and frequently without sufficient rudimentary education.

Experienced workers, when they can be secured, are usually employed in preference to inexperienced boys and girls. These are obtained for the most part by a shifting of workers from one place of employment to another, either because of dissatisfaction, desire for change, promotion, or higher wages, for the supply of experienced men and women is much smaller than the demand. Buyers, and to some extent managers, are secured from distant cities, though these are relatively few as compared with the total numbers employed. Colored people are not employed except as porters, cleaners, and elevator men. The number of people so employed is very small.

Sex of employees.—The census of 1910 shows 1,239 men and 650 women employed as sales persons in the stores of Richmond.[2] In the employers' schedules secured from the 11 stores included in the study, 344 were men and 1,185 were women. Women and girls, therefore, form the greater proportion of store employees, though positions of responsibility and the higher salaries are, with some exceptions, held by men.

Age of entrance to retail store employment.—Virginia has not had until recently a compulsory education law which enforced school

[1] See page 227.

[2] The number of clerks in stores was given as 709 males and 221 females. The Census report notes that many of the "clerks" are probably salesmen or saleswomen. See Thirteenth Census of the U. S. Vol. IV, Occupation Statistics, pp. 202, 204.

attendance, but the child-labor law has within recent years forbidden the employment of boys and girls under 14 years of age. The merchants of Richmond, with no exception, report that boys and girls under 16 years of age are of no value to the business, and that gradually those under 16 are not being employed. Of the 358 employees interviewed, 106 had been employed before they were 16 years of age. The greater proportion of these people are older workers who began to work before any restrictions as to age and schooling were placed upon employment.[1]

Fluctuation of employment.—Employment in store work probably fluctuates less than in some of the factory industries in this city, notably the tobacco industry, which, from the standpoint of numbers employed and wages paid, may be considered the rival of the retail stores. With the exception of a few weeks during the summer months, which are considered a vacation, though except in a few instances wages are not paid for this time, employment is reported practically constant for the greater proportion of the workers. There are, however, a number of people employed for the holiday season and for special sales who do not become permanent employees at once. These "supplies," as they are frequently called, are engaged for a short time only, the employer retaining for regular employment those who show the greatest aptitude for the work. The others may be employed again during the busy season.

Methods of selecting workers.—This choice from the "supplies" is the chief method of selecting employees when the demand is not too great. At other times when the rush of the holiday season is on, little attention beyond the filling out of the application blank and the personal interview is given to the selection of workers. Some stores do not use the application blank, so have no record of the employees' home addresses, previous employment, experience, and education. This haphazard method is occasionally the boast of the one who does the employing, for he says, "I can tell when a girl walks into my office whether she is worth anything to the store or not." Inquiry into how he knows her value elicits such answers as: "I can tell by the way she walks, by the way she carries herself"; "I can tell by the way she speaks to me and answers my questions"; "I can tell by her bearing; if she looks well and strong and rosy, I know she can stand the work." All this in spite of the fact that the first and loudest complaint against her later on may be that she makes mistakes daily, though in the interview nothing was done to test the girl's accuracy or ability to meet the details of her work.

There is practically no doubt that the way in which the younger people are selected for the work could and should be greatly

---

[1] See Table 77, p. 240, for further details as to entrance age.

improved and more study and attention given to placing them in suitable work or shifting to another line if not successful in the first.

Conditions under which work is done.—Although chairs or stools are provided for employees, many of the occupations of the store require much and often constant standing, and in small departments where there is practically no opportunity to walk back and forth the restriction of movement and position causes fatigue, which amounts in some cases to nervous strain, backache, aching feet, and fallen arches. Reaching for stock boxes or the cash carrier, when a little above the ordinary reach, also causes some physical strain, though to what extent could not be determined. Poor ventilation in some departments, notably the basement departments, also causes discomfort, if not real harm. The general ventilation of the stores, however, seemed good. Where buildings have, as they do in many instances, windows on two or more sides and many doors to the streets, also on one or more sides, fresh air is admitted freely. Artificial ventilation is used in several stores for departments not otherwise ventilated.

Promotion.—Promotion in store work is largely a matter of increased wages or rate of commission based on the amount of sales. Practically all stores recognize selling ability in this way. In the department stores promotion on this basis exists in all departments, and to some extent workers are transferred from one department to another. To be a promotion, however, change from one department to another must be to a line for which higher wages are paid, or higher commission returns certain. Practically no attempt has been made to put interdepartmental promotion on more than an incidental and somewhat accidental basis. "A faithful worker," "a clever sales person," "the biggest sales," and "the right personality for the new work" are among the chief points reported as determining promotions.

This does not mean that merchants are indifferent to promotion or desire to keep their workers in one place without change, but it does mean that no plan for interdepartmental promotion has been worked out. The necessity for providing for it is coming to be recognized.

How the workers are trained.—With the exception of the bookkeepers, stenographers, auditors, and to some extent cashiers, the workers acquire their training "on the job." One store has classes for the training of junior sales girls, cash and bundle girls, but no other training is given except what is gained in the department. Under a good buyer and associated with capable, successful sales persons, a young person can pick up a good deal of information, knowledge of stock, and many points on handling customers. While this method works fairly well with the brighter young people, it is at best an uncertain method. There is no list of things to be learned, no sure means of knowing what things have been learned or not learned. The person in charge of the department or other workers show the newcomer where the stock is to be found; suggestions about the work are given from time to time. This introduction and the incidental suggestions constitute in the main the training for the work.

Analysis of the occupations in the store (see Appendix E) shows as far as possible from the data obtained the extent to which training for the various occupations could and should be carried. The proposed organization of courses for sales people, stock girls, and bundle girls, and the courses of study [1] indicate some of the methods and the subject matter which may be incorporated into vocational courses in salesmanship and allied occupations.

ANALYSIS OF FINDINGS ABOUT THE TOBACCO INDUSTRY.

Size and importance of the industry.—The tobacco industry is the largest industry employing women in the city of Richmond. There are relatively few workers under 16 years of age employed. Many of the workers are native-born Americans and country bred. They compare favorably in general intelligence and health with operatives in other factory industries. Younger workers are mostly city children, some of them working in the factory during the summer and going to school in the winter.

Not a skilled industry.—The industry is made up of a number of semiskilled and unskilled operations which can be learned in periods ranging from two or three days to six or eight weeks. There is, therefore, no apprenticeship for women in the industry. This is also true of men, except in a few shops where cigars are made by hand.

Wages.—Much of the work is done as piecework, which naturally makes the earnings variable. Some of the shops pay on an hourly basis. This study did not attempt to go into the actual earnings in detail.

Hours.—The hours for work are 8½ to 9½ hours per day and 5½ hours on Saturday, making a total of 48 to 53 hours per week.

Work not seasonal.—The work is practically constant, there being no rush except for the Christmas trade and no period without work, as stock is accumulated during the time when merchants make less demand upon the factories' output.

Overtime and nonemployment.—Overtime is rare; "lay offs" are unusual, though in a few cases brief vacations are voluntarily taken in the summer because of the heat. It is reported that little time is lost through illness and accident; machinery for the most part is reported as of the nondangerous type and sufficiently guarded to

---

[1] Organization of classes and courses of study for store employees, page 290 et seq.

insure safety. In some of the factories a doctor inspects against illness and infectious disease.

Shifting of workers.—The study shows some shifting of workers, but with few exceptions the shifting is from factory to factory within the industry and not from one trade to another. Shifting seems to be due to the quality of the skill—the less skilled workers finding their way into the less skilled operations and vice versa.

No recognized line of promotion within the industry.—Operations in the tobacco industry vary little in their demands upon general intelligence and skill, the two exceptions to the general rule being rolling and packing. Since packing is largely a matter of color sense, which is inherent rather than acquired, the opportunities for promotion to this position are few.

Education of tobacco workers.—The education of women in the tobacco industry is, except for very few workers, a little below grammar grade, the amount and quality being difficult to measure because of country schooling which lacked uniformity and standardization. Little illiteracy is found among white workers, except among the older women who went to work when rural schools were scattered and few in number and child labor the accepted custom.

Extra schooling of the tobacco workers.—Although it is difficult to obtain complete data upon the extra schooling of the entire body of tobacco workers, records from the night high school show 98 women in attendance in the past year, fully 75 per cent of whom were taking commercial courses, the remainder being students in the general academic and household arts departments. Workers themselves reported that general education was not demanded by their work in the industry, though many expressed a desire for academic subjects which would broaden their minds and advance their social standing.

Training tobacco operatives not a school problem.—All operations in the tobacco industry are learned in the factory. The amount of specific trade information and technical training demanded of the worker is too meager to warrant the establishment of classes for their training in the public schools.

Workers engaged in the industry need and desire additional education, some along the lines of general education, others in cooking, sewing, and household management. The forewomen and so-called teachers, whose duty it is to look after the efficiency of the departments, need some training in industrial relationships. Their ideas about what they need in this direction are rather unformed.

The industry sees to it that its workers produce the standard quality and quantity of product; it does not concern itself, however, with any form of general or specific education that contributes to raising the standard and efficiency of its workers beyond the requirements of the job.

What the schools can do for the tobacco workers.—No direct vocational training can be given tobacco workers in schools, and owing to the specialized type of factory organization and division of labor, part-time instruction is practically out of the question. Night classes, however, can and should provide: (1) General education for workers who desire to extend their academic training; (2) household arts courses, carefully planned so as to insure effective practical training; and (3) recreational and physically reactive gymnastics, folk dancing, etc., designed to meet the needs of women engaged in monotonous and restricted occupations. Of these the last is of greatest importance for the tobacco worker. Her work is debilitating because it is monotonous, hence to keep herself in the best condition she must have proper physical training and recreation. This will make her a more efficient worker.

6071°—Bull. 162—16——4

RECOMMENDATIONS OF THE GENERAL SURVEY COMMITTEE.

INTRODUCTION.

Vocational education is a local not a general issue. It must be adapted in its content and method as well as in its organization and administration to the social, industrial, and educational conditions of the community. Hence the need of a survey making a careful analysis of these conditions before any system of vocational training is undertaken. The survey upon which these recommendations are based has made this analysis for Richmond. These recommendations represent the effort of the committee to suggest the best remedy, the best program of which it is capable for the development of vocational training under the given conditions as shown by the findings of the survey.

They are in no sense the opinions or theories of the individual members of the committee, of the organizations they represent, or of the National Society for the Promotion of Industrial Education as to abstract principles and policies, but an attempt to deal in a constructive way with a local situation by suggesting the things that need to be done, which Richmond can accomplish.

The recommendations are presented under the six following heads:

I. The problem of financing vocational education in Richmond.

II. Compulsory attendance as a factor in a program of industrial education.

III. The types of schools and courses of study for boys and men as determined by the findings of the industrial survey.

IV. Types of schools and courses of study for girls and women as determined by the findings of the industrial survey.

V. Prevocational education for boys.

VI. The place of private institutions receiving city moneys in the general plan.

At the annual convention of the National Society in the city of Richmond, one day of the proceedings was given to a discussion of the findings and recommendations of the survey. The morning session considered the findings under three topics: The organization of the survey, led by C. A. Prosser, secretary of the society; the scope and method of the survey, led by Charles H. Winslow, director of the Richmond survey; the method and findings of the school survey, led by Dr. Leonard P. Ayres, of the Russell Sage Foundation.

The afternoon session took up the recommendations proposed by the general survey committee under the heads which are given above and which were discussed at the convention by different members of the committee as follows: No. I, Mr. M. P. Shawkey, State superintendent of public instruction, West Virginia; No. II, Dr. P. P. Claxton, United States Commissioner of Education; No. III, Mr. Arthur D. Dean, chief of the division of vocational schools for New York; No. IV, Mrs. Mary Schenck Woolman, formerly president of the Boston Women's Educational and Industrial Union; No. V, Prof. R. W. Selvidge, professor of manual training and industrial education, Peabody College, Nashville, Tenn.; No. VI, Dr. William M. Davidson, superintendent of schools, Pittsburgh, Pa.

All the foregoing discussions are printed in full in the proceedings of the annual convention of the society for 1914, copies of which can be secured by writing to the office of the National Society for the Promotion of Industrial Education, No. 140 West Forty-second Street, New York City.

Preliminary to the convention, two pamphlets were distributed among its members, the first being a synopsis of the findings of the survey and the second a statement of the recommendations proposed by the general survey committee. Only very slight changes were necessary to bring these two documents from a preliminary status when printed for the Richmond meeting to their permanent status as part of this final report. These preliminary reports constitute the body of this final report.

I. THE PROBLEM OF FINANCING VOCATIONAL EDUCATION IN RICHMOND.

Richmond is a wealthy and prosperous city growing at a rapid rate and therefore is able to support a more extensive educational system.

Because of her rapidly expanding mercantile and manufacturing interests, Richmond especially needs to begin now the development of a system of vocational education fitting young people for efficient service in commercial and industrial pursuits. The survey has shown that this opinion is held almost universally, not only by the employing and employed interests of the city but by its citizenship generally.

Any effective program of vocational education for the city of Richmond must require an increase in the expenditures of public moneys for school purposes. This added revenue can easily be provided by a redistribution of the city's revenues so as to give to its schools as large a proportion of public funds as is given on the average by cities of the same class for the support of their schools. Of the 40 cities having a population from 100,000 to 300,000, according to the statistics of the United States census, the city of Richmond gives for school purposes the smallest per cent of total revenue.

While the larger part of the expense of providing vocational training for the workers of Richmond should, as in the case of every other locality in the Commonwealth, be met by the community, the State should, for a time at least, pay a part of the cost of the new and important work of developing industrial and commercial education. The State of Virginia has already recognized this principle in grants for agricultural education in rural high schools, but thus far the policy has not been extended to the work of fitting young people for the office and the shop in the cities and towns. Many States have already made grants for commercial and industrial training, in addition to agricultural education. These grants for vocational education have been made to accomplish five ends, which your committee believes apply to Virginia as well: (1) To encourage local communities to give vocational education as a new and needed kind of training, beneficial and desirable in the interest of the State as a whole; (2) to aid local communities with their varying resources to provide effective vocational training; (3) to secure for the State the right to a reasonable participation or voice in the development of vocational education in the State; (4) to make it possible to secure a "State minimum of efficiency" in the conduct of vocational education; (5) to pay the just share of the State in a kind of education which, comparatively speaking, must be expensive but which is of State-wide benefit.

The committee does not believe that the present system of annual appropriations, more or less variable and uncertain, made by the city government to the school board for the public schools of Richmond is conducive to the best results, either in the adequate support or in the effective administration of the school system. Every consideration seems to make desirable the plan generally followed in this country of a special levy for public school purposes in the annual tax budget—the resulting revenue to be expended by the school board for such education as the community demands. The present State law permits the city government to set aside 5 mills of its annual tax rate for school purposes. If this were done by the Richmond authorities the school system would secure support more nearly equal to that of other cities of the same class in the country.

Should the Richmond authorities deem it wise on the other hand to continue the present system of annual appropriations, the committee recommends that, beginning with the next school year, a special appropriation be made for vocational education; that this appropriation be in addition to the amount given for general education; and that it be increased from year to year in proportion as the demand for practical training makes it necessary.

The committee recommends that the cooperation of the State board of education be enlisted in an effort to secure from the General Assembly of Virginia a special appropriation for commercial and industrial education to be used by the State board of education in the cities and towns of the Commonwealth. This appropriation should be made with the understanding that the State board of education shall not use any moneys for the building or equipment of schools or classes but only for the salaries of teachers of commercial or industrial subjects, and that for every dollar distributed to any community for vocational education the State board shall require at least another dollar to be spent by the community.

The committee most heartily advocates the continuance of the appropriation for agricultural schools, but believes that Virginia has now reached the stage where, like other States, it will wish to develop simultaneously agricultural, commercial, and industrial education. The laws of Virginia already provide for the development through the State board of education of all of these forms of vocational training, but thus far the general assembly has made grants for the encouragement only of one. State grants for commercial and industrial education by which Richmond would benefit in part seem particularly equitable in this hour of the city's need, in view of the fact that for every $5 of State school tax raised in the city of Richmond not more than $2 is returned to the city to be spent for school purposes.

When the State makes a distinct appropriation for any form of vocational education, it ought also to provide grants for State supervision of such work. Pending action by the General Assembly of Virginia for the benefit of commercial and industrial education, we respectfully urge the State board of education to appoint such an assistant or assistants to the State superintendent of public instruction as may be necessary in order that the board may, under the authority and responsibility already conferred upon it by law, investigate and aid in the introduction of these forms of practical education and aid local authorities to initiate schools and departments for such education.

II. COMPULSORY ATTENDANCE AS A FACTOR IN A PROGRAM OF INDUSTRIAL EDUCATION.

General intelligence lies at the base of all efficiency in work as well as citizenship. Mere literacy is no longer an adequate preparation for life or for labor. Therefore a program of vocational education for any State must include such legislation as may be necessary in order to insure to each child at least the minimum general education which common experience shows is necessary for his success and happiness.

The best economic, social, and educational thought of our day agrees that no child should be employed as a wage earner under 14, and that all children should be required to attend school continuously until they are at least 14.

The present constitution of Virginia, adopted in an earlier day before the present growth of the free public-school system was anticipated, makes it impossible to require children under 8 or over 12 years of age to attend school. The legislature is permitted by the constitution to require all children between these ages to attend school except those who are weak in body or mind, or who can read and write, or are excused for cause by the district school trustees. Under this authorization, the legislature has in turn permitted the local communities of the State to vote as to whether they will require such children to attend school at least 12 weeks in each school year, 6 of which must be consecutive. The city of Richmond is to be congratulated, because last November by an overwhelming vote her citizens decided to adopt compulsory education for children between 8 and 12 years of age, thus making Richmond the fifth city in the State so to vote.

The Virginia child-labor law which has just gone into effect prohibits the employment of children under 14 in industrial and mercantile establishments. The constitutional restriction just described made it impossible to accompany this prohibition of employment of children under 14 with any law requiring them to attend school up to that age. To permit children under 14 who are barred from the factories to roam the streets in idleness and ignorance is to open up possibilities of injury and evil to the child and society fully as great at least as that resulting from premature employment. With the exception of five communities, including Richmond, no child in Virginia, whatever may be his age, is required to attend the schools, and any child may remain out of them altogether. In these five communities most children 8 to 11 years of age, inclusive, must attend school for about one-third the term. Children over 12 and under 14, while they can no longer go to work, may remain out of school. This situation is a most unfortunate one.

There are two large steps to be taken in remedying this situation. The first is to secure from the legislature the largest possible school attendance which the constitution permits. What is needed here and now is a vigorous campaign which will result in a State-wide compulsory attendance act requiring children from 8 to 12 years of age to attend school for the full term.

The second step is to press forward an amendment of the Virginia constitution (at the earliest possible date), so as to remove all restriction upon the legislature in dealing with the subject of compulsory school attendance.

The constitution (sec. 138) provides that the general assembly may "provide for the compulsory education of children between the ages of 8 and 12 years, except such as are weak in body or mind, or can read and write, or are attending private schools, or are excused for cause by the district school trustees." Necessary or advisable as this section may have appeared in a simpler day, the educational and social conditions have so changed as to make it at the present time an insurmountable barrier across the path of the State in dealing with the problems of compulsory attendance and of vocational education.

A constitutional amendment to remove these difficulties could well strike out the present section and substitute in its place some such simple clause as this: "The general assembly may enact such compulsory education regulations from time to time as may be deemed advisable."

It will probably require at the best five years to secure constitutional permission for the legislature to deal freely with compulsory education. Should this be granted by the people of the State, the first step should be of course to pass a law, State-wide in its scope, requiring children over 7 and under 14 years of age to attend school each year for the full term.

Following the trend of similar legislation in other States, the general assembly in obedience to the will of the people of Virginia would, in course of time, find it advisable to add to the age requirement of 14 years such further requirements as the attainment of a certain grade standing before leaving school and compulsory continuation classes for young wage earners over 14 and under 16 years of age, who leave the regular schools without the general or the vocational preparation they need for citizenship and for industry.

III. THE TYPES OF SCHOOLS AND COURSES OF STUDY FOR BOYS AND MEN AS DETERMINED BY THE FINDINGS IN THE INDUSTRIAL SURVEY.

Richmond, as the capital of Virginia, has the opportunity of setting the pace for vocational education and may serve as an experimental station and practical demonstration for other cities in the State in the proposed development of courses for industrial workers.

Preparation for the industrial efficiency of her workers means a lead over other cities now negligent when, after this European conflict, material prosperity comes overwhelmingly upon us.

Richmond has stable vocational habits. The findings of the survey show that a majority of her workers learned their trade in the city or in the immediate environment. Evidence points that Richmond may safely train a larger proportion of her children for future participation in the local industries than might be wise for an average city. Richmond is not confronted with the task of assimilating a large foreign element, but rather with that of training a native population for efficiency.

Any plan for educating industrial workers in Richmond must be moderate, at least at present, for the reason that the city takes, comparatively speaking, a low rank in educational expenditure as compared with other cities of a similar size.

The findings of the survey show a definite need for the offering of educational facilities for men and boys already employed. It is evident that the supply of efficient journeymen is inadequate, that the amount of systematic instruction in the shops is small, and that the amount of apprenticeship training is limited.

The findings indicate that the men themselves seek further educational advantages and that they are personally interested in trade education. Many workers have taken courses at their own expense since leaving the regular school. The facts show that the majority of these workers have taken courses bearing directly upon their trade. The minority have taken day, evening, or correspondence work unrelated to their trade.

A study of the individual schedules points out that the typical Richmond worker is handicapped by lack of the elements of general education. The men and their employers agree with this finding and have expressed a desire that many of the trade-extension classes to be organized shall take this element into full consideration.

It is deemed inadvisable to offer the trade extension work—a type of work which includes technical knowledge relating to the trade—without first giving facility in the ordinary tools of expression. The trade extension classes already started have demonstrated that the students in these classes are not able to deal easily and intelligently with technical processes and their related knowledge without having the basic elements of a general education.

While, in general, manipulative skill is best developed under actual practice, it is noted that the development of dexterity will be promoted through the manual training courses now given in the early grades of the elementary school as well as by the scheme for prevocational training herein recommended.

The question of health training appears to be of fundamental mportance. Everything possible should be done before these workers leave school to develop healthy young people in order that they may successfully combat diseases incident to certain occupations. The trade extension courses and other continuation courses should include a study of the relationship of physical health to occupational diseases.

It is recommended that schools and courses for boys and men already employed should find expression in two great groups: (1) Evening schools, (*a*) of the industrial order and (*b*) of the general order; (2) part-time schools, (*a*) of the industrial order, (*b*) of the general order. Schools of the industrial order should take most decidedly the trade extension aspect. The work which the men and boys elect in the school, whether it be of the part-time or evening order, should supplement the day employment, and the courses of study should be built upon the shop experience of the employed boys and men who attend.

Schools or courses of the general order should take varying forms. Some will give merely further general education to those whose daily experience offers no basis upon which to build trade extension courses. Others will give shop or drawing or laboratory experiences of various types and to a varying degree to those who hope through such work to find an occupational purpose in life more satisfying than their present employment. Evidence points clearly to the fact that while there is a need for evening school work both of the general order and of the trade extension order, at the same time these two fields of educational effort are to be kept distinct and the purposes and methods are not to be confused.

The committee sets aside consideration at this time of the all-day trade school not only because of its initial expense to the city, but also because the participants in such instruction must sacrifice time and wages, and this sacrifice will be less as the prevocational training develops and helps young people to know what particular trade they care to study. Furthermore, the industries of Richmond do not require a long training as a requisite to entrance to the industries, and the trade training that can not be obtained in industry can be split up into relatively short units which can be given progressively either in the evening school or the day part-time school. These units may be given in the order of their need and at the time most necessary.

The evidence points out that the evening trade extension courses constitute the best approach to the full program of schools and courses which may finally be established for men and boys. The employers favor evening work in preference to part-time work for their apprentices. The workers themselves have indicated a desire for evening instruction which will supplement their daily shop experience. Both state that promotion will result from these evening supplementary courses.

The committee urgently recommends that steps be taken at once by the Richmond school authorities to establish the part-time day school or classes for those industries and plants where employers have expressed a willingness to cooperate in this way. In some instances these employers have expressed a willingness to enter at a later date into an agreement providing for a definite period of attendance of apprentices at the part-time school for a definite number of hours, and to pay these apprentices the usual wage while in school. The committee believes that this plan furnishes the only satisfactory method of dealing with the proper training of apprentices in the city of Richmond.

The committee is clear in its own mind that cooperation between school and shop is a condition which must be met and satisfied. The outgrowth of this relationship must be an agreement that will clearly define certain conditions surrounding the work of the school, the length of apprenticeship training, credit for work done in school, and rate of pay during such apprenticeship. At present no written records of individual efficiency of workers are reported as being used in the shop. There are no entrance tests of the worth of the applicants except the actual trial on the job. There is at present little organization of shop practice which might fit in with the proposed plan for trade extension classes. It is evident that the basis of all successful vocational teaching whether in evening school or in part-time day school must rest upon a close cooperation between the school, the employee, and the employer.

Account must be taken of seasonal fluctuations when the part-time day school plan is established. Obviously it would be unwise to establish such instruction in the building trades during the busy season. The class for molders which has already been established is now meeting on Saturday mornings as well as two evenings a week, in view of the fact that these men practically never work on Saturday. The committee recommends that the teachers be practical men to carry out the recommendations of the findings. The findings show clearly that practical teachers are desired. The trade instructors require knowledge of the craft and a general experience which equips them to teach. The teachers of related subjects require knowledge of the crafts and adequate academic training, while the teachers of general or nonvocational subjects require adequate academic training and contact with life.

The committee wishes to emphasize particularly the type of evening instruction which will make a direct appeal to employed men and boys. The following points need special consideration: (1) Instruction must deal with two rather distinct classes: (*a*) Students proper—consisting of the small minority who seek both general and specific education with a definite student purpose, but often under rather unusual personal conditions; (*b*) the nonstudent class consisting of the large majority, who by suggestion and counsel need educational help in the solution of some present problems which will fit them for special service. (2) The scheme of work offered must make various features of the course of study elective to a maximum degree. (3) The work must be flexible enough in its adaptation to meet individ ual, special, and even transient needs and conditions. (4) The subjects must be presented in small and varying units. (5) The various-units of work must be so scheduled that sequential arrangement of courses is possible when it is desired. (6) All forms of work must glow with the socialized element. (7) The work must seek to increase the student's capacity to live efficiently and largely as well as to promote the accumulation of technical knowledge and the development of manipulative skill. (8) Much stress must be laid on the teaching itself. By suggestion and personal cooperation the teachers can awaken and develop to a wonderful degree the mind rendered mentally inactive by former disassociation with educational forces.

(9) The work must have its own distinct ideals, methods, and estimates of value. It must be based upon the current conditions and individual needs of the nonstudent class rather than on regular school standards which are primarily applicable to the student class.

Recommendation as to courses for specific trades: The findings indicate that the number of workers employed, their desire, and their need for instruction, warrant the establishment of courses of study covering the subject matter listed under the following occupations.

In cases where two or more similar occupations call for practically the same range of instruction the occupations are grouped.

Printing Trades.

Compositors, linotype and monotype.

Evening courses in English, with special reference to spelling, punctuation, and syllabication; page arrangement of words; principles of design as related to typography; color harmony.

For the linotype and monotype operators special instruction in the construction and mechanism of linotype and monotype machines.

The course in English should be open to all in the printing trades, whether occupied in the groups mentioned or not, and for all those engaged in the printing trades courses offering instruction in the history of the printing trade, modern methods of printing, and trade news should be organized.

Cylinder pressmen and press feeders.

Evening courses in the mechanism and operation of presses; composition of inks, rollers, and paper; elements of the reproductive processes; modern methods of presswork.

Metal Trades.

Molders, including brass molders.

Evening courses in shop mathematics; properties and composition of irons and alloys, with special reference to furnace fixtures; outlines of history of iron making; first aid for burns and care of health in foundry conditions.

Machinists.

Evening courses in shop mathematics, with special reference to calculations of working speeds, feeds, and measuring instruments; mechanical drawing, with special reference to machine parts; elements of mechanism; properties of metals, with special reference to high and low carbon steels; design of jigs and shop appliances; theory and practice of cutting tools; construction of various specialized machine tools.

If the demand proves sufficient and the resources can be provided, it is further recommended that evening classes in practical work be established in order to give breadth of experience.

Blacksmiths.

Evening courses in mechanical drawing; shop mathematics; theory and practice of hardening, tempering and annealing of metals; outline history of metallurgy of iron making; first aid for burns.

In case there proves to be a sufficient number of horseshoers in this group, a course might be organized offering instruction in anatomy and ailments of the hoof.

Boiler makers.

Evening courses in mechanical drawing, with special reference to pattern development and different types of boilers; shop mathematics, with reference to the more simple calculations involved in computing strength of boiler shells and riveted joints; physical principles involved in steam boiler operation.

It is recommended that mechanical drawing courses which give at first the common elements of the working drawing and which differentiate later into instruction fitting the special needs of each group, should be offered to all workers in the metal trades.

Building Trades.

Carpenters, including bench and machine woodworkers and cabinet-makers.

Evening courses in architectural drawing covering detail drawing and sketching, frame and trim construction; shop arithmetic, covering fractions in 2-foot rule and as related to mensuration and to simple geometric problems involved in mitering and beveling; qualities of wood; modern methods of construction and the construction and operation of woodworking machines.

Bricklayers.

Evening courses in architectural drawing covering methods of brick construction, plans, and elevations; figuring of drawings; courses in trade mathematics and specification making and estimating.

Sheet-metal workers and tinsmiths, with which are combined tinsmiths and sheet-metal workers in the metal trades.

Evening courses in mechanical drawing dealing with the development and intersections (pattern drafting) comprising geometric and architectural forms and those used in tinware.

If the demand is sufficient, practical classes giving experience in construction of the more complex forms might be offered.

Plumbers.

Evening course in blue-print and specification reading; physical and sanitary principles underlying plumbing practice; legal regulations concerning plumbing installations.

Inside wiremen.

Evening courses in the elements of electrical theory with particular relation to Ohm's law, calculations of wire capacity and testing of circuits; provisions of underwriters' code as to details of electrical installations; blue-print and specification reading.

Plasterers.

Evening courses for blue-print and specification reading; properties of materials used; arithmetic as related to measurements and estimating of quantities.

In the building trades, one of the distinct possibilities presented is the development at some future time of classes in which workers attend for part time or all day during the slack season.

The numbers and demand in several of the occupations indicate that in many of these classes it may be possible to form divisions between the younger and more advanced workers.

It is further recommended, if future resources permit and the numbers applying are sufficient, that a second group of courses be organized—

In the printing trades for:

(*a*) Group of workers in steel and copper photo-engraving.
(*b*) Group of workers in lithographic processes.
(*c*) Group of workers in photo-reproduction processes.

In the metal trades for:

Pattern makers.

In the building trades for:

(*a*) Stonecutters.
(*b*) Cement finishers.
(*c*) Steam fitters.

IV. TYPES OF SCHOOLS AND COURSES OF STUDY FOR GIRLS AND WOMEN AS DETERMINED BY THE FINDINGS OF THE INDUSTRIAL SURVEY.

The large effort of vocational education for the girls and women of any community should be to prepare them as far as possible for economic independence. Instruction in home economics, except in specialized courses planned and followed for the purpose of earning a livelihood, should not be regarded as vocational education for wage earning, but as a necessary and valuable part of general education to which every girl is entitled as a part of her adequate preparation for living.

With the exception of the offices and department stores the white girls and women of Richmond are, on the whole, employed in manufacturing and mechanical pursuits in which the operations can be learned more quickly and more satisfactorily in the factory than in the school, largely because the amount of technical training and trade information is too meager to warrant the expenditure of public money for the equipment and instruction.

Colored girls and women are for the most part employed in domestic and personal service as cooks, housemaids, nursemaids, home laundresses, laundry operatives, manicurists, hairdressers, to some extent as factory operatives and laborers, and as dressmakers and seamstresses.

The high school already offers opportunities for girls to secure training in stenography, filing, bookkeeping, and clerical work. The limitation of this survey prevented any study of this feature of the work of the Richmond schools similar to the study made of the industries and of the industrial training undertaken by the schools. The committee is under the impression, however, that the commercial training of the John Marshall High School compares favorably with such work in other high schools in large cities, and is probably open to the same improvements, not the least of which might be the introduction of part-time cooperative classes for young people who are employed in commercial pursuits in Richmond.

There is a need in Richmond, as shown by the proposal of the Retail Merchants' Association and the reports of the workers through interviews, for evening classes in salesmanship which shall very largely give their attention to training mature young people who are already employed during the day in the stores. There is also a great need for department store and salesmanship training, through part-time and continuation classes.

Some steps have already been taken in this direction. There are, in a number of cities, some beginnings in department store education which not only differ widely from each other in their organization and method, but in their necessary adaptation to local conditions. The work everywhere is in its beginning stages, and the committee believes that the best way to handle it is for local people to engage a competent trained person to take charge of the problem who will be able to study the needs of the local stores and their employees; to take the best points from the schemes in force elsewhere and adapt them to the conditions and problems of department stores which must be met in Richmond.

There is at the present time no need or possibility of a girls' trade school for Richmond. There does exist, however, a need or a demand for courses of training in the practical arts as a part of the general education of girls over 13 years of age. This training should begin with prevocational courses in the upper grades of the elementary school. Should the plan of a junior high school for pupils 13 to 16 years of age be adopted, this prevocational training for girls should be made a large feature of the work of this school.

Practical arts courses of a more advanced and specialized character should be offered in the regular high school for girls who have graduated from the elementary school or the junior high school and entered the high school for the purpose of getting some more general training together with the instruction in the ordinary home trades which they may be able to use to advantage either commercially or in their own homes.

It is recommended that there be established schools or classes in prevocational work for girls, covering the period corresponding to the last two years of the elementary school. These courses should be operated with the following purposes in mind: (*a*) To serve as a self-discovery and vocational guiding course, giving to the girl who must leave school early a better basis for selecting the vocation which she may enter; (*b*) To give those girls who go on to the high school an opportunity to choose in the high school the more intensive practical course for which they are best fitted. Should a junior high school be established, as seems probable, the third year of the course in the school might well be given to a more intensive pursuit of some one line of practical work. The prevocational training of the first two years would prepare her to make an intelligent choice of this course. (*c*) To offer a course of study which will make a strong appeal to the interest of the pupil, thus tending to hold her longer in school.

The course of study must be a varied one if it is to help the girls to find themselves, enable them to make an intelligent choice of work in the future, and appeal to the interests of all in such a way as to keep them longer in school. The committee recognizes that there are few precedents to guide it in making recommendations for prevocational courses for girls. The suggestions herein made represent some of the possibilities.

What is needed is not longer courses in cooking, sewing, or typewriting, but an organized training which will include a variety of experiences drawn from the occupations which are open or should be open to the girls in the life of the community.

The course of study should give the girl an opportunity to try herself out in such activities as cooking, serving, first aid to the injured, household decoration, plain and machine sewing, simple garment making, printing, bookbinding, novelty work, typewriting, elementary stenography, and the keeping of simple accounts.

The experiences taken from these activities must be real and not imitative, and offer actual practice in assuming responsibility. For example: Cooking and serving should center about the preparation of the school lunch for pupils and teachers; sewing should be done on marketable garments and vary in style and fabric sufficiently to give a general knowledge of materials as well as of processes in sewing and garment construction.

All practical courses should be made intensive enough to insure serious, purposeful work on the part of the pupil and discourage the dawdling and waste of time which is so often seen in handwork courses.

One-half of the time in school should be given to the so-called academic branches which should be made of direct application to the practical work and every-day problems of the girl. Among the subjects which should be taught are English, arithmetic, history, civics, commercial geography, and an elementary treatment of the personal, social, and economic problems of the girl which would include such topics as personal hygiene and health, conduct in social and business relations, wages, hours of employment, use of leisure time, personal and family budgets, savings, insurance, and efficiency. The study of art and design should be taught so as to develop the artistic sense often called "good taste," which is so essential in women's activities, in order that special abilities along the lines of industrial arts may be discovered.

The school day for the prevocational classes should be lengthened from the present five-hour day of the elementary school to six or more hours per day, and one session of three or more hours should be devoted to academic work, and one session of three or more hours to the practical courses recommended. The proposed plan herein outlined for the prevocational work is adapted to fit in with the reorganization of the Richmond schools, which looks forward to the establishment of a junior high school.

In the high school the training in practical arts which has already been started to some extent in sewing, cooking, serving, applied design for embroidery and stencils, needs to be extended to cover more advanced specialized work in all the branches named, as well as other lines of practical training. Sewing should include courses in the making of plain blouses and waists, plain cotton dresses, plain woolen dresses and to a limited extent lingerie; remodeling and alteration; embroidery should be related to both art and garment making. Each course should deal with a definite problem and not attempt to include all kinds of garments and materials in one course.

Cooking and serving should center about the preparation of meals for the teachers and pupils, and cookery classes should contribute, as far as possible, the foods that are served. A number of small kitchens, built in a row like booths, open on one side, with the usual stove and cooking utensils of the home, and accommodating from three to five girls, should replace the individual laboratory equipment. This arrangement facilitates the preparation of foods, and gives the pupils an opportunity to cook in family or standard quantities under conditions which very largely duplicate the home surroundings.

Individual or fractional recipes should not be used except for laboratory experimentation in chemistry courses. The school luncheon used as an outlet for foods reduces the cost of raw materials and guards against waste of product.

Opportunities are opening up in Richmond, as in other large cities, for numerous wage-earning and salaried callings, which are based upon a very practical as well as scientific knowledge of home economics, such as invalid cookery, special cookery, catering to a special demand for such things as cakes, candy, pickles, preserves, etc.—caterers, heads of tea rooms, lunch rooms and gift shops, dietitians and boarding-house and institutional managers. This opens a field for promising and talented girls to put to commercial use the training which might be given in a good practical arts department of the regular high school.

The practical courses in high school should be given in a separate department of the school, to be known by some such title as the department of practical arts. This department should have for its controlling purpose the preparation of girls for the commercial as well as the home pursuit of these arts and should consist of a separate organization of courses, pupils, and teachers, under a distinct head for this purpose. Nothing short of a departmental organization of this character will insure to these girls the proper correlation of their shopwork and related subject matter. Those taking the work in this department might well pursue some of their studies, such as English, history, and civics, in the same classes with pupils of other departments, but their shopwork, their art, and their science should be specially adapted to their needs in the practical courses they are taking. Fundamental to the efficiency of the shopwork of such a department is the use of commercial methods, that greater thrift and energy may result, that the expense of materials to school or student body may be reduced, and that the judgment of the product may come from outside the school rather than from the teacher.

The regular high school of Richmond should recognize the prevocational training of the kind herein recommended, whether given in a junior high school or in the upper grades of the regular grammar school, as full and satisfactory preparation for its work. They should also fully recognize the work in the practical arts done by the girls in the regular high school. These girls should be regarded as taking a special or separate course known as the practical arts course. Four years' work in this course should entitle them to graduation and to a diploma for the completion of the practical arts course of the institution. The work in the practical arts department should be standardized and credits should be given for the work to count for graduation just as credits are given for any of the regular academic subjects of the school.

As has already been pointed out, it is impossible under the present Virginia constitution to require children over 12 years of age to attend any kind of school. Because of the great need of further training for the large army of girls under 16 years of age who become wage-earners before completing the elementary schools, the school authorities should make a special effort to induce employers to cooperate voluntarily by giving their young workers time to attend a part-time or continuation school or class for at least four hours per week during the regular school term. Such a school or class should take these girls where it finds them and give them whatever will help them to efficiency and happiness.

Among the possibilities of service to girls by such classes are these: Regular school studies vitalized by their adaptation to the interests and needs of the pupils, elementary civics and economics, problems in health, dress, and social conduct and responsibility, elementary training in the practical arts growing out of the home life of the girl, and, whenever possible, industrial or trade training supplementary to the daily work.

There is a pronounced demand for special classes in the regular branches and in practical courses for the colored girls and women of the city. These practical courses, some of which have already been started, should lay the larger emphasis upon the practical side of the work rather than the purely scientific. The instruction should be given by teachers who have themselves had actual home or commercial experience in the branches to be taught. The training offered should give an opportunity to choose from among such courses as the following: Sewing, garment making, simple dressmaking, cooking, first aid to the injured, care of the sick, care of children, personal hygiene, home sanitation, problems of marketing, nursing, manicuring, and hairdressing.

The evening classes for colored girls and women have a splendid chance to give, through trade extension courses, supplementary instruction improving the efficiency of those who are engaged as wage earners during the day in such practical arts as cookery, serving, garment making, dressmaking, care of children, nursing, manicuring, and hairdressing. These evening courses should be given in the form of a series of short units, each of which is designed to meet a specific need of the class. The pupils should, as far as possible, be so grouped as to bring together in the same class those having similar previous experience in the work undertaken.

V. PREVOCATIONAL EDUCATION FOR BOYS.

The findings of the survey show Richmond to be a city of widely diversified industries, employing people most of whom were born and reared in Richmond or elsewhere in Virginia. The children of Richmond who enter the industries, therefore, have an opportunity to choose a calling from among a large number of possible occupations of many different kinds.

In the schools of Richmond the children of 13 and 14 years of age are found scattered through the grades from the first elementary to the third year in the high school, more than half the children of these ages being in or below the sixth grade. These children will soon leave school to go to work, although the findings show that the low wages paid to those under 16 indicate that employers do not regard the services of immature workers as desirable.

The survey shows that there is a demand in Richmond for prevocational training for children over 13 years of age and no demand at present for any type of all-day industrial or trade school, preparing relatively few for special occupations or trades. In view of the comparatively small cost of prevocational work and the limited resources which at the present time seem available, the prevocational school will reach and serve the needs of a much greater number of boys and girls than will the special industrial or trade school.

The committee, therefore, recommends that the Richmond schools develop, as rapidly as possible, schools or classes in prevocational training, admitting boys who have completed the work of the 5B grade and who look forward to leaving school at a relatively early age in order to go to work, and who need the help of the school in reaching a decision as to what line of work they may enter with the greatest prospect of success. In no sense is this school to be considered as a provision for defective, delinquent, or incorrigible boys. The rank of the proposed school should correspond to the last two years of the regular elementary school course, and should require the same amount of time for the completion of its work.

If at any time in the future the public-school system of Richmond should be reorganized so as to provide for intermediate or junior high schools, covering the last two years of the elementary-school period and the first year of the present high-school period, the plan proposed herein for the prevocational school is adapted to fit in with such an organization admirably.

Prevocational training for Richmond should present a course of study that will appeal to boys who have lost interest in the work of the regular graded school, and who have either left school because of such dissatisfaction or who are contemplating early withdrawal.

Prevocational training should provide vocational direction and guidance for children who are likely early to face the complexities of our modern industrial and commercial life. It must give them an experience and a knowledge which will serve as a basis upon which an intelligent choice of a life career may be made.

Results of experiments in prevocational training made in Richmond last year suggest what may be accomplished in these directions. The results duplicate the experience of other cities in which similar work has been undertaken.

The course of study must be a varied one if it is to help boys to find themselves and enable them to make an intelligent choice of work in the future. What is needed is not a course in woodworking or a course in metal work, but rather an organized training in practical arts which will include a variety of experience in the industries fundamental to the life of the community. Woodworking, metal work, printing and bookbinding, and electrical construction are some of the industries in Richmond which give an opportunity for experience in certain fundamental processes which are most valuable to boys, without respect to the occupation in which they may later engage. A plan for such industrial work should consist of a series of jobs, projects, or enterprises which in their accomplishment will give the boy an appreciative understanding of the more important industries.

One-half of the time in school should be given to related work in language, mathematics, industrial geography, industrial history, and, in general, to preparation for active and intelligent understanding of civic and social responsibilities. If the interests and capacities of the boys are to be properly tested, the experience in the shops must be as real as possible. In this connection it is important that they have an opportunity to become acquainted to as great an extent as possible with the actual operations of the industry.

Instructors must be men who not only possess a general acquaintanceship with and knowledge of the industries represented in the courses of study, but also give evidence of ability to make intelligent research into and study of the progress in methods and processes of work in the industries.

The committee feels that while the desire to make these recommendations brief prevents any detailed discussion of a program for prevocational training for Richmond, the best way in which to set forth in concrete form the above statement of principles is through brief suggestions as to the course of study and the program of classes which might be put into effect with profit in Richmond. These suggestions are in line with the prevocational work which has just been established in the city.

Proposed Course of Study.

A. Academic work—approximately half-time.

1. *English.*—Language work based on reading, much of the reading to bear upon the industries. Composition, dealing with the occupational work of the school, business correspondence, business forms; spelling and penmanship. Aim to cultivate a love for reading.
2. *Arithmetic.*—To be of a very practical nature, including fundamental processes, short methods used in business, business and trade arithmetic, with emphasis on immediate application to the industrial work of the school.
3. *Geography.*—Chiefly industrial, and closely related to history.
4. *History.*—Closely related to geography and dealing with the industrial and commercial development of the city, State, and country.
5. *Civic and social duties.*—Relation of the individual to the community, State, and country; relation of the worker to his work, to his employer, and to his fellow workmen; duties and responsibilities, both civic and social, with special reference to sanitation, personal hygiene, etc.

B. Industrial work—approximately half-time.

1. *Woodworking.*—To consist principally of carpentry, including such other forms of work as may be called for by the projects undertaken. Study of tools; machines, and structures, such as garages, poultry houses; problems in framing, truss construction, and repair work, with emphasis on the latter.
2. *Metal working.*—To consist of work in hot and cold bar metal and sheet metal. Practical problems in repairs and construction which develop in the equipping of the school will supply work for some time to come. This will include such work as the making of brace and angle irons, bolts, machine and bolt guards, simple tools, pipe cutting and threading, metal parts of electrical and other apparatus.

   In addition to this the students should take apart and assemble the old machines, endeavoring to find out how they work and why they work. Study carefully the principles of the automatic machines and the method of conveying power through machines to the point of doing the work, the intention of this work being to familiarize the students with the general principles of machine construction.
3. *Printing and binding.*—To consist of the simpler forms, mainly the printing of forms, cards, announcements, etc., required for the school; this work to be supplemented by special work in English, proof reading, design, and color harmony.
4. *Electrical construction.*—To consist of elementary work in battery construction, magnetism, induction, small motor and dynamo construction, wiring, electrical measurements, and testing. Experiments with batteries, induction coils, and the wiring of bell, telegraph, telephone, and other circuits will be worked out on specially constructed frames.
5. *Drawing.*—To be elementary in character, but practical and related directly to the projects undertaken by the pupils in the various shop courses.

VI. THE PLACE OF PRIVATE INSTITUTIONS RECEIVING CITY MONEYS IN THE GENERAL PLAN.

After a full consideration of the facts presented by your committee concerning the status of the Virginia Mechanics' Institute, the committee recommends that the institute be merged with the public-school system of Richmond in accordance with the following plan:

That the corporate name of the Virginia Mechanics' Institute shall be preserved, but that the ownership of its property shall be vested in the city of Richmond.

That an ordinance be passed by the city council of Richmond which shall provide that the immediate direction of the affairs of the Virginia Mechanics' Institute shall be under an advisory board of five members, one member from each city school district, and two members at large; and that the management of the institute shall be under the general direction of the city school board, to be used for public-school purposes in connection with both the day and evening school work.

That the city school board of Richmond shall agree to make this plant the vocational center of the public-school system and open the institute in the daytime as soon as practical after this merger shall have been accomplished.

In the event that this merger can be brought about in accordance with the above plan, it will be possible to make the Virginia Mechanics Institute serve the public-school system of the entire city for both day and night school classes for practically the whole year, and the institute would be eligible, as an institution supported and controlled by the public, to participate in the distribution of the funds which will be available in the event of the granting of State moneys for industrial or commercial education to the local communities of Virginia, or in the event of the passage of the industrial education bill now pending before the Congress of the United States.

APPENDIX A.—STATISTICAL SUMMARY OF INFORMATION SECURED FROM EMPLOYERS AND EMPLOYEES IN PRINTING, BUILDING, AND METAL TRADES IN RICHMOND.

TABLE 18.—PLACE OF BIRTH OF WORKERS IN PRINTING, BUILDING, AND METAL TRADES.

Place of birth.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Richmond	82	66.7	111	56.3	155	82.0	348	68.4
Virginia, outside of Richmond	19	15.4	50	25.4	6	3.2	75	14.7
United States, outside of Virginia	19	15.4	30	15.2	22	11.6	71	13.9
Foreign countries	3	2.4	6	3.0	6	3.2	15	2.9
Total	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 19.—AGE OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS, BY TRADE GROUPS.

Number.

Age groups, years.	Printing trades.				Building trades.			
	Journeymen.	Apprentices.	Semiskilled.	Total.	Journeymen.	Apprentices.	Semiskilled.	Total.
14 to 15		1		1				
16 to 17		7		7		2		2
18 to 20	4	12	4	20	6	10	1	17
Total, under 21	4	20	4	28	6	12	1	19
21 to 25	20	2	4	26	34		1	35
26 to 30	20			20	39			39
31 to 35	15			15	31			31
36 to 40	9		1	10	19			19
41 to 45	12			12	25			25
Total, 21 to 45	76	2	5	83	148		1	149
46 to 50	5			5	7			7
51 to 55	5			5	8			8
56 to 60	2			2	8			8
61 to 65					4			4
Total, 46 to 65	12			12	27			27
66 to 70					1			1
81 and over					1			1
Total, 66 and over					2			2
Total, all ages	92	22	9	123	183	12	2	197

Per cent.

Under 21	4.3	90.9	44.4	22.8	3.3	100.0	50.0	9.6
21 to 45	82.6	9.1	55.6	67.4	80.9		50.0	75.6
46 to 65	13.0			9.8	14.8			13.7
66 and over					1.1			1.0
Total, all ages	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 19.—AGE OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS, BY TRADE GROUPS—Concluded.

Number.

Age groups, years.	Metal trades.				All trades.			
	Journeymen.	Apprentices.	Semiskilled.	Total.	Journeymen.	Apprentices.	Semiskilled.	Total.
14 to 15						1		1
16 to 17		5	2	7		14	2	16
18 to 20	4	14	2	20	14	36	7	57
Total, under 21	4	19	4	27	14	51	9	74
21 to 25	22		2	24	76	2	7	85
26 to 30	35	1	5	41	94	1	5	100
31 to 35	36		1	37	82		1	83
36 to 40	17			17	45		1	46
41 to 45	11			11	48			48
Total, 21 to 45	121	1	8	130	345	3	14	362
46 to 50	15		1	16	27		1	28
51 to 55	7			7	20			20
56 to 60	2			2	12			12
61 to 65	2			2	6			6
Total, 46 to 65	26		1	27	65		1	66
66 to 70	2			2	3			3
76 to 80	2			2	2			2
81 and over	1			1	2			2
Total, 66 and over	5			5	7			7
Total, all ages	156	20	13	189	431	54	24	509

Per cent.

Age groups, years.	Metal trades: Journeymen.	Apprentices.	Semiskilled.	Total.	All trades: Journeymen.	Apprentices.	Semiskilled.	Total.
Under 21	2.6	95.0	30.8	14.3	3.2	94.4	37.5	14.5
21 to 45	77.6	5.0	61.5	68.8	80.0	5.6	58.3	71.1
46 to 65	16.7		7.7	14.3	15.1		4.2	13.0
66 and over	3.2			2.6	1.6			1.4
Total, all ages	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 20.—REGULAR HOURS OF LABOR PER DAY IN PRINTING, BUILDING, AND METAL TRADES.

Full-time working day.	Workers reporting specified working day.							
	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Under 8 hours					1	0.5	1	0.2
8 or 8¼ hours	17	13.8	39	19.8	60	31.7	116	22.8
8½ or 8¾ hours	52	42.3	79	40.1	16	8.5	147	28.9
Total, 8 and under 9 hours	69	56.1	118	59.9	77	40.7	264	51.9
9 or 9¼ hours	29	23.6	17	8.6	67	35.4	113	22.2
9½ or 9¾ hours	24	19.5	42	21.3	6	3.2	72	14.1
Total, 9 and under 10 hours	53	43.1	59	29.9	73	38.6	185	36.3
10 hours and over	1	.8	19	9.6	38	20.1	58	11.4
Hours not reported			1	.5	1	.5	2	.4
Grand total	123	100.0	197	100.0	189	100.0	509	100.0
Saturday:								
Short time	67	54.5	175	88.8	84	44.4	326	64.0
Full time	56	45.5	22	11.2	105	55.6	183	36.0

TABLE 21.—REGULAR HOURS OF LABOR PER WEEK IN PRINTING, BUILDING, AND METAL TRADES.

Full-time week.	Workers whose full-time week was specified number of hours.							
	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Under 48 hours	......	......	34	17.3	36	19.0	70	13.8
48 hours	62	50.4	86	43.7	46	24.3	194	38.1
48½ to 50½ hours	3	2.4	4	2.0	10	5.3	17	3.3
51 to 53½ hours	8	6.5	3	1.5	8	4.2	19	3.7
54 hours	50	40.7	52	26.4	49	25.9	151	29.7
54½ to 59½ hours	......	......	14	7.1	29	15.3	43	8.4
60 hours	......	......	3	1.5	10	5.3	13	2.6
Hours not reported	......	......	1	.5	1	.5	2	.4
Total	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 22.—TIME LOST DURING THE YEAR ENDING JUNE 1, 1914, BY JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS, BY TRADE GROUPS.

Trade groups.	Time lost.											Total.
	None.	1 wk.	2 wks.	3 wks.	4 wks.	Total 1 to 4 wks.	5 to 9 wks.	10 to 14 wks.	15 to 19 wks.	20 to 24 wks.	25 wks. and over.	
Journeymen:												
Printing trades	79	2	3	2	2	9	1	2	......	1	......	92
Building trades	66	6	8	4	15	33	35	27	14	4	4	183
Metal trades	72	6	11	10	3	30	18	14	9	7	6	156
Total	217	14	22	16	20	72	54	43	23	12	10	431
Apprentices:												
Printing trades	16	2	1	......	......	3	1	2	......	......	......	22
Building trades	8	1	......	......	1	2	......	1	1	......	......	12
Metal trades	13	4	2	......	1	7	......	......	......	......	......	20
Total	37	7	3	......	2	12	1	3	1	......	......	54
Semiskilled workers:												
Printing trades	6	......	......	2	......	2	1	......	......	......	......	9
Building trades	2	......	......	......	......	......	......	......	......	......	......	2
Metal trades	7	1	2	......	......	3	......	1	1	......	1	13
Total	15	1	2	2	......	5	1	1	1	......	1	24
Grand total	269	22	27	18	22	89	56	47	25	12	11	509

TABLE 23.—NUMBER AND PER CENT OF WORKERS REPORTING SPECIFIED TIME LOST DURING THE YEAR ENDING JUNE 1, 1914, BY TRADE GROUPS.

Number.

Time lost.	Workers reporting specified time lost. Printing trades.	Building trades.	Metal trades.	Total.
No time	101	76	92	269
1 week	4	7	11	22
2 weeks	4	8	15	27
3 weeks	4	4	10	18
4 weeks	2	16	4	22
Total, 1 to 4 weeks	14	35	40	89
5 to 9 weeks	3	35	18	56
10 to 14 weeks	4	28	15	47
15 to 19 weeks	....	15	10	25
20 to 24 weeks	1	4	7	12
25 weeks and over	....	4	7	11
Grand total	123	197	189	509

Per cent.

Time lost.	Printing trades.	Building trades.	Metal trades.	Total.
No time	82.1	38.6	48.7	52.8
1 to 4 weeks	11.4	17.8	21.2	17.5
5 to 9 weeks	2.4	17.8	9.5	11.0
10 weeks and over	4.1	25.9	20.6	18.7
Total	100.0	100.0	100.0	100.0

TABLE 24.—CAUSES OF LOST TIME DURING THE YEAR ENDING JUNE 1, 1914, BY TRADE GROUPS.

	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Workers losing time on account of—								
Sickness	7	....	21	....	27	....	55	....
Accident	2	....	1	....	5	....	8	....
Factory shut down	3	....	19	....	36	....	58	....
Temporarily laid off	8	....	60	....	33	....	101	....
Other causes	5	....	43	....	15	....	63	....
All causes	[1] 22	17.9	[1] 121	61.4	[1] 97	51.3	[1] 240	47.2
Number reporting two causes	3	....	21	....	17	....	41	....
Number reporting three causes	....	....	1	....	1	....	2	....
Workers who lost no time	101	82.1	76	38.6	92	48.7	269	52.8
Total number reporting	123	....	197	....	189	....	509	....

[1] Some workers are reported as losing time for more than 1 cause, therefore this total is not the sum of the items in the 5 causes above.

TABLE 25.—NUMBER OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS WHO WORKED PART TIME DURING THE YEAR ENDING JUNE 1, 1914, BY TRADE GROUPS.

Trade groups.	Weeks during which part time was worked.								Total.
	None.	1 to 4 weeks.	5 to 9 weeks.	10 to 14 weeks.	15 to 19 weeks.	20 to 24 weeks.	25 weeks and over.	Not reported.	
Journeymen:									
Printing trades	57	3	....	....	....	....	....	32	92
Building trades	93	2	2	1	....	1	2	82	183
Metal trades	88	3	8	2	5	2	48	....	156
Total	238	8	10	3	5	3	50	114	431
Apprentices:									
Printing trades	12	1	....	....	....	....	....	9	22
Building trades	6	....	....	....	....	....	....	6	12
Metal trades	11	1	1	....	....	1	6	....	20
Total	29	2	1	....	....	1	6	15	54
Semiskilled:									
Printing trades	6	....	....	....	....	....	....	3	9
Building trades	2	....	....	....	....	....	....	....	2
Metal trades	7	....	1	....	....	....	5	....	13
Total	15	....	1	....	....	....	5	3	24
Grand total	282	10	12	3	5	4	61	132	509

TABLE 26.—NUMBER AND PER CENT OF WORKERS WORKING PART TIME DURING YEAR ENDING JUNE 1, 1914, BY TRADE GROUPS.

	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Weeks during which part time was worked:								
None	75	61.0	101	51.3	106	56.1	282	55.4
1 to 4 weeks	4	3.3	2	1.0	4	2.1	10	2.0
5 to 9 weeks	....	....	2	1.0	10	5.3	12	2.4
10 to 24 weeks	....	....	2	1.0	10	5.3	12	2.4
25 weeks and over	....	....	2	1.0	59	31.2	61	12.0
Not reported	44	35.8	88	44.7	....	....	132	25.9
Total workers	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 27.—NUMBER AND PER CENT OF WORKERS WORKING OVERTIME DURING THE YEAR ENDING JUNE 1, 1914, BY TRADE GROUPS.

	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Weeks during which overtime was worked:								
None	83	67.5	159	80.7	167	88.4	409	80.4
1 to 4 weeks	10	8.1	26	13.2	13	6.9	49	9.6
5 to 9 weeks	2	1.6	6	3.0	7	3.7	15	2.9
10 weeks and over	6	4.9	2	1.0	2	1.1	10	2.0
Not reported	22	17.9	4	2.0	....	....	26	5.1
Total workers	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 28.—NUMBER AND PER CENT OF WORKERS HAVING SPECIFIED YEARS OF EXPERIENCE AS WAGE EARNERS, BY TRADE GROUPS.

Number.

Years of experience as wage earners.	Printing trades.	Building trades.	Metal trades.	Total.
1 year	4	2	6	12
2 years	3	5	3	11
3 years	10	3	8	21
4 years	5	5	4	14
5 years	7	9	11	27
Total, 1 to 5 years	29	24	32	85
6 to 10 years	29	43	28	100
11 to 15 years	19	35	42	96
16 to 20 years	14	31	28	73
21 to 25 years	16	15	18	49
26 to 30 years	6	23	13	42
31 to 35 years	4	10	11	25
36 to 40 years	3	2	6	11
41 to 45 years	3	7	4	14
46 years and over	....	7	7	14
Total	123	197	189	509

Per cent.

Years of experience as wage earners.	Printing trades.	Building trades.	Metal trades.	Total.
1 to 5 years	23.6	12.2	17.0	16.7
6 to 10 years	23.6	21.8	14.8	19.6
11 to 15 years	15.4	17.8	22.2	18.9
16 to 20 years	11.4	15.7	14.8	14.3
21 to 25 years	13.0	7.6	9.5	9.6
26 years and over	13.0	24.9	21.7	20.8

TABLE 29.—NUMBER AND PER CENT OF WORKERS HAVING SPECIFIED YEARS OF EXPERIENCE IN PRESENT OCCUPATION, BY TRADE GROUPS.

Number.

Years of experience in present occupation.	Printing trades.	Building trades.	Metal trades.	Total.
1 year	6	6	9	21
2 years	3	7	11	21
3 years	10	5	8	23
4 years	7	7	3	17
5 years	7	8	12	27
Total, 1 to 5 years	33	33	43	109
6 to 10 years	28	44	31	103
11 to 15 years	18	46	44	108
16 to 20 years	13	18	26	57
21 to 25 years	17	15	12	44
26 years and over	14	41	33	88
Grand total	123	197	189	509

Per cent.

Years of experience in present occupation.	Printing trades.	Building trades.	Metal trades.	Total.
1 to 5 years	26.8	16.8	22.8	21.4
6 to 10 years	22.8	22.3	16.4	20.2
11 to 15 years	14.6	23.4	23.3	21.2
16 to 20 years	10.6	9.1	13.8	11.2
21 to 25 years	13.8	7.6	6.3	8.6
26 years and over	11.4	20.8	17.5	17.3

TABLE 30.—YEARS OF EXPERIENCE IN SOME OCCUPATION OTHER THAN THEIR PRESENT ONE FOR WORKERS IN PRINTING, BUILDING, AND METAL TRADES, BY YEARS OF EXPERIENCE AS WAGE EARNERS.

Experience as wage earners (in years).	Total number.	Workers employed at—							
		No occupation other than their present one.	Some occupation other than their present one.						
			1 year.	2 years.	3 years.	4 years.	5 years.	6 years.	Total.
1	12	12							
2	11	10	1						1
3	21	13	3	5					8
4	14	10	3	1					4
5	27	22	1	1	2	1			5
Total, 1 to 5 years	85	67	8	7	2	1			18
6 to 10	100	69	7	10	5	3	3	3	31
11 to 15	96	63	11	8	4	3	2	5	33
16 to 20	73	39	1	3	5	4	3	18	34
21 to 25	49	28	3	2	2	3	3	8	21
26 to 30	42	26	2	3	1	2	2	6	16
31 to 35	25	15		1		2	1	6	10
36 to 40	11	6			1	1	2	1	5
41 to 45	14	9		1		1		3	5
46 and over	14	8	1					5	6
Grand total	509	330	33	35	20	20	16	55	179

TABLE 31.—AVERAGE WAGES PER HOUR, BY YEARS OF EXPERIENCE IN PRESENT OCCUPATION AND BY TRADE GROUPS.

Experience in present occupation (in years).	Number.				Average wages per hour.			
	Printing trades.	Building trades.	Metal trades.	Total.	Printing trades.	Building trades.	Metal trades.	Total.
					Cents.	*Cents.*	*Cents.*	*Cents.*
1 to 5	33	33	43	109	18.2	26.2	22.6	22.3
6 to 10	28	44	31	103	33.1	39.5	39.5	37.7
11 to 15	18	46	43	107	43.1	41.9	44.3	43.1
16 to 20	12	18	26	56	45.1	41.8	41.4	42.3
21 to 25	16	15	12	43	40.3	44.1	39.6	41.4
26 and over	13	40	32	85	43.3	40.3	41.8	41.7
No report of wage	3	1	2	6				
Total	123	197	189	509				

TABLE 32.—AGE AT ENTRANCE UPON WAGE-EARNING OCCUPATION, BY TRADE GROUPS.

Number.

Age at entrance upon wage-earning occupation.	Workers who entered upon a wage-earning occupation at age specified. Printing trades.	Building trades.	Metal trades.	Total.
11 years		2	1	3
12 years	3	4		7
13 years	7	3	3	13
14 years	19	17	7	43
15 years	32	26	28	86
16 years	21	39	42	102
17 years	13	49	39	101
18 years	11	21	23	55
19 years	4	16	17	37
20 years	5	5	6	16
21 to 30 years	7	13	20	40
31 years and over	1	2	3	6
Total	123	197	189	509

Per cent.

Age at entrance upon wage-earning occupation.	Printing trades.	Building trades.	Metal trades.	Total.
14 years and under	23.6	13.2	5.8	13.0
15 to 19 years	65.9	76.6	78.8	74.9
15 years	26.0	13.2	14.8	16.9
16 years	17.1	19.8	22.2	20.0
17 years	10.6	24.9	20.6	19.8
18 years	8.9	10.7	12.2	10.9
19 years	3.3	8.1	9.0	7.3
20 years and over	10.6	10.2	15.3	12.2

TABLE 33.—YEARS OF APPRENTICESHIP OF WORKERS, BY TRADE GROUPS.

Length of apprenticeship.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Workers who had served an apprenticeship of—								
Less than 3 years	14	11.4	13	6.6	23	12.2	50	9.8
3 years	10	8.1	56	28.4	20	10.6	86	16.9
4 years	31	25.2	91	46.2	114	60.3	236	46.4
5 years	53	43.1	21	10.7	15	7.9	89	17.5
6 years	5	4.1	1	.5			6	1.2
7 years	2	1.6	2	1.0			4	.8
8 years			1	.5			1	.2
Total	115	93.5	185	93.9	172	91.0	472	92.8
Workers who had served no apprenticeship	8	6.5	12	6.1	17	9.0	37	7.2
Total workers	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 34.—NUMBER AND PER CENT OF WORKERS WHO WORKED IN TWO OR MORE SHOPS OR COMMUNITIES WHILE LEARNING THEIR TRADE, BY TRADE GROUPS.

Number of shops or communities.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.
Workers who worked in—								
1 shop only	73	59.3	130	66.0	144	76.2	347	68.2
2 or more shops:								
2 shops	29	23.6	38	19.3	31	16.4	98	19.2
3 shops	11	8.9	14	7.1	8	4.2	33	6.5
4 shops	1	.8	4	2.0	2	1.1	7	1.4
5 or more shops	5	4.1	6	3.1	2	1.1	13	2.6
Total, 2 or more shops	46	37.4	62	31.5	43	22.8	151	29.7
Workers not reporting number of shops	4	3.3	5	2.5	2	1.1	11	2.1
Total workers	123	100.0	197	100.0	189	100.0	509	100.0
Workers who worked in 2 or more communities	1	....	3	....	9	....	13	....

TABLE 35.—REASONS FOR CHANGING PLACE OF EMPLOYMENT WHILE LEARNING TRADE, BY TRADE GROUPS.

Reasons for changing place of employment.	Printing trades.	Building trades.	Metal trades.	Total.
Total number of workers	123	197	189	509
Workers who changed place of employment while learning trade—				
To get wider experience	18	13	14	45
To get more money	20	15	7	42
Shop closed; employer failed, moved away, went out of business, or died	3	13	14	30
Laid off, work slack, or to get employment	3	14	5	22
Dislike of employer, or because not well treated	2	6	2	10
Family moved or apprentice went to another town	....	2	4	6
Discharged	2	1	3	6
Strike	1	....	2	3
Miscellaneous	1	5	1	7
Number of workers who changed place of employment	[1] 46	[1] 62	[1] 43	[1] 151
No report as to change of place of employment	4	5	2	11

[1] Since a number of workers changed their place of employment 2 or more times the sum of the number of workers who changed for reasons specified exceeds the total number of workers who reported changes.

TABLE 36.—NUMBER OF WORKERS WHO REPORTED THAT THEY RECEIVED, OR DID NOT RECEIVE, PROPER HELP AND INSTRUCTION, BY TRADE GROUPS.

Items.	Printing trades.	Building trades.	Metal trades.	Total.
Workers who—				
Received proper help and instruction while learning their trade	89	142	117	348
Did not receive proper help and instruction while learning their trade	20	44	55	119
Made no report as to instruction	14	11	17	42
Total number of workers	123	197	189	509

TABLE 37.—LOWEST, HIGHEST, AND AVERAGE WAGES PER HOUR AND PER WEEK, BY TRADE GROUPS AND OCCUPATIONS.

PRINTING TRADES.

Occupations.	Workers.	Wages— Per hour. Lowest.	Per hour. Highest.	Per hour. Average.	Per week. Lowest.	Per week. Highest.	Per week. Average.
Printing:							
Printers, foremen	3	$0.37	$0.65	$0.49	$20.00	$35.00	$26.60
Compositors	[1] 16	.27	.45	.35	15.00	22.00	18.24
Linotype operators	4	.45	.52	.49	24.00	27.50	26.00
Printers' apprentices	9	.07	.19	.13	4.00	9.00	7.27
Proof reading:							
Proof readers	1	.35	.35	.35	19.00	19.00	19.00
Presswork:							
Pressmen	[1] 25	.19	.50	.37	10.50	24.00	17.57
Press feeders	4	.14	.20	.18	8.00	11.00	9.75
Pressmen's apprentices	9	.06	.31	.17	3.50	15.00	9.21
Photo-engraving:							
Photo-engravers	8	.45	.65	.54	21.00	31.20	26.02
Halftone finishers	1	.52	.52	.52	25.00	25.00	25.00
Photographers	1	.52	.52	.52	25.00	25.00	25.00
Routers	1	.37	.37	.37	18.00	18.00	18.00
Steel and copper plate engraving:							
Engravers	2	.62	.62	.62	30.00	32.50	31.25
Plate printers	3	.28	.35	.30	14.00	17.00	15.33
Engravers' apprentices	2	.08	.10	.09	4.00	5.00	4.50
Stereotyping:							
Stereotypers	1	.28	.28	.28	20.00	20.00	20.00
Lithographing:							
Lithograph pressmen, foremen	1	.52	.52	.52	25.00	25.00	25.00
Designers	1	.48	.48	.48	23.40	23.40	23.40
Press feeders	1	.18	.18	.18	9.00	9.00	9.00
Transferrers	7	.31	.47	.42	15.00	23.97	20.80
Engravers	4	.30	.62	.42	14.40	30.00	20.22
Transferrers' apprentices	1	.13	.13	.13	6.63	6.63	6.63
Bookbinding:							
Bookbinders, foremen	1	.37	.37	.37	20.00	20.00	20.00
Bookbinders	[1] 8	.13	.35	.37	7.00	18.00	14.22
Finishers	2	.25	.46	.35	15.00	22.00	18.50
Gilders	1	.43	.43	.43	21.00	21.00	21.00
Paper rulers	2	.37	.40	.38	20.00	22.00	21.00
Paper cutters	3	.17	.31	.22	10.00	15.00	11.93
Bookbinders' apprentices	1	.14	.14	.14	7.00	7.00	7.00

BUILDING TRADES.

Occupations.	Workers.	Per hour. Lowest.	Per hour. Highest.	Per hour. Average.	Per week. Lowest.	Per week. Highest.	Per week. Average.
Carpentering:							
Carpenters	[1] 36	$0.22	$0.62	$0.38	$13.50	$30.00	$18.70
Bricklaying:							
Bricklayers	14	.25	.70	.64	11.25	31.20	29.07
Apprentices	1	.25	.25	.25	11.25	11.25	11.25
Plastering:							
Plasterers	18	.33	.40	.34	18.00	21.60	18.72
Plasterers' apprentices	4	.07	.29	.13	4.00	16.00	7.50
Granite cutting:							
Tool dressers	1	.45	.45	.45	19.80	19.80	19.83
Granite cutters	10	.31	.45	.44	13.64	20.25	19.20
Sheet-metal working:							
Sheet-metal workers	3	.27	.42	.31	15.00	20.10	15.53
Sheet-iron workers	2	.20	.30	.25	12.00	16.50	14.25
Tinners	4	.30	.42	.37	13.50	20.00	17.37
Steel erecting:							
Steel erectors (structural workers)	10	.22	.35	.31	12.37	19.15	16.90
Plumbing:							
Inspectors	1	.48	.48	.48	24.00	24.00	24.00
Plumbers	12	.29	.50	.48	16.00	24.00	23.21
Plumbers' apprentices	2	.10	.14	.12	5.00	6.50	5.75
Steam fitting:							
Steam fitters	13	.35	.50	.48	19.25	24.00	23.10
Pipe fitters	10	.32	.43	.35	16.00	22.50	18.80
Apprentices	1	.13	.13	.13	7.00	7.00	7.00

[1] Includes 1 who made no report of wages.

TABLE 37.—LOWEST, HIGHEST, AND AVERAGE WAGES PER HOUR AND PER WEEK, BY TRADE GROUPS AND OCCUPATIONS—Concluded.

BUILDING TRADES—Concluded.

Occupations.	Workers.	Wages— Per hour. Lowest.	Per hour. Highest.	Per hour. Average.	Per week. Lowest.	Per week. Highest.	Per week. Average.
Electrical work:							
Electrical engineers	1	$0.21	$0.21	$0.21	$11.24	$11.24	$11.24
Electrical wiremen	6	.29	.43	.38	15.00	21.00	18.45
Battery men	1	.20	.20	.20	14.35	14.35	14.35
Electricians' helpers	2	.13	.19	.16	7.50	9.00	8.25
Electricians' apprentices	4	.14	.21	.17	7.50	10.50	8.50
Painting:							
Sign painters	6	.28	.62	.44	15.00	30.00	23.05
House painters	17	.27	.37	.33	15.00	18.00	16.78
Paper hanging:							
Paper hangers	14	.35	.44	.42	18.00	21.00	20.57
Cabinetmaking:							
Cabinetmakers	4	.26	.35	.31	14.40	18.90	16.89

METAL TRADES.

Occupations.	Workers.	Per hour. Lowest.	Per hour. Highest.	Per hour. Average.	Per week. Lowest.	Per week. Highest.	Per week. Average.
Wood pattern making:							
Wood pattern makers	16	$0.38	$0.41	$0.38	$18.96	$29.24	$20.89
Wood pattern makers' apprentices	2	.16	.17	.16	7.50	9.18	8.34
Metal pattern making:							
Metal pattern makers	7	.28	.35	.31	11.00	21.00	17.96
Machine shop work:							
Machinists, foremen	1	.63	.63	.63	30.00	30.00	30.00
Machinists	47	.25	.45	.39	12.00	22.00	19.77
Machine hands	3	.23	.30	.27	12.42	15.93	13.92
Toolmakers	1	.28	.28	.28	15.12	15.12	15.12
Diesinkers	1	.37	.37	.37	20.38	20.38	20.38
Tool room boys	1	.11	.11	.11	5.94	5.94	5.94
Machine hands' helpers	4	.14	.19	.17	6.48	10.00	8.87
Machinists' apprentices	11	.13	.18	.16	5.85	11.00	8.32
Molding (iron):							
Molders, foremen	1	.45	.45	.45	25.00	25.00	25.00
Molders, machine castings	3	.36	.50	.43	17.85	25.00	22.28
Molders, stove castings	34	.35	.63	.52	13.75	32.40	25.07
Core makers	1	.30	.30	.30	16.50	16.50	16.50
Molders' helpers	1	.18	.18	.18	8.30	8.30	8.30
Molders' apprentices	2	.18	.18	.18	8.00	8.00	8.00
Stove mounting:							
Stove mounters	6	.17	.36	.28	9.00	20.00	15.12
Blacksmithing:							
Blacksmiths	14	.28	.70	.40	13.50	35.00	20.84
Boiler making:							
Boiler makers, foremen	1	.58	.58	.58	34.50	34.50	34.50
Boiler makers	7	.30	.41	.39	16.50	21.68	17.86
Boiler makers' helpers	1	.20	.20	.20	11.00	11.00	11.00
Car repairing:							
Car repairers, foremen	[1] 1	......	......	......	......	......	......
Passenger-car repairers	7	.26	.34	.30	14.04	18.36	16.17
Freight-car repairers	1	.31	.31	.31	13.95	13.95	13.95
Steel-car repairers	[1] 2	.40	.40	.40	18.00	18.00	18.00
Car repairer's apprentices	3	.11	.16	.13	5.94	8.37	6.94
Millwork, wood:							
Benchmen	2	.28	.33	.30	14.58	18.00	16.29
Machinemen	5	.27	.30	.28	12.96	16.03	15.01
Millworkers' apprentices	1	.10	.10	.10	5.50	5.50	5.50
Coach painting:							
Coach painters	1	.35	.35	.35	18.90	18.90	18.90
Coach painters' apprentices	1	.16	.16	.16	8.37	8.37	8.73

[1] Includes 1 who made no report of wages.

TABLE 38.—NUMBER AND PER CENT OF WORKERS WHO LEARNED THEIR TRADE IN RICHMOND AND IN OTHER COMMUNITIES, BY TRADE GROUPS.

Place in which trade was learned.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Richmond	92	74.8	120	60.9	152	80.4	364	71.5
Elsewhere in United States	26	21.1	65	33.0	31	16.4	122	24.0
Foreign country	1	.8	6	3.1	5	2.6	12	2.3
No report	4	3.3	6	3.1	1	.5	11	2.2
Total	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 39.—NUMBER AND PER CENT OF WORKERS WHO HAD WORKED AT ONE AND AT TWO OR MORE OCCUPATIONS, BY TRADE GROUPS.

Number of occupations.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Workers who had worked at—								
1 occupation only	105	85.4	125	63.5	100	52.9	330	64.8
2 or more occupations:								
2 occupations	9	7.3	48	24.4	69	36.5	126	24.8
3 occupations	5	4.1	15	7.6	15	7.9	35	6.9
4 occupations	2	1.6	8	4.0	3	1.6	13	2.5
5 occupations	1	.8	1	.5	2	1.1	4	.8
6 occupations	1	.8	....	....	....	....	1	.2
Total, 2 or more occupations:	18	14.6	72	36.5	89	47.1	179	35.2
Total workers	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 40.—NUMBER AND PER CENT OF WORKERS WORKING AT AN OCCUPATION FOR WHICH THEY ARE, OR ARE NOT, BEST FITTED BY TRAINING AND EXPERIENCE, BY TRADE GROUPS.

Items.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.
Workers reporting that their occupation—								
Is that for which they are best fitted by training and experience	68	84.0	97	90.7	165	90.7	330	89.2
Is not that for which they are best fitted by training and experience	13	16.0	10	9.3	17	9.3	40	10.8
Total reporting	81	100.0	107	100.0	182	100.0	370	100.0
Workers not reporting as to training and experience	42	[1] 34.1	90	[1] 45.7	7	[1] 3.7	139	[1] 27.3
Total workers	123	....	197	....	189	....	509	....

[1] Per cent of total workers.

TABLE 41.—NUMBER AND PER CENT OF WORKERS WORKING AT AN OCCUPATION FOR WHICH THEY ARE, OR ARE NOT, BEST FITTED BY NATURAL ABILITY, BY TRADE GROUPS.

Items.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.
Workers reporting that their occupation—								
Is that for which they are best fitted by natural ability	52	64.2	62	57.9	112	61.5	226	61.1
Is not that for which they are best fitted by natural ability	29	35.8	45	42.1	70	38.5	144	38.9
Total reporting	81	100.0	107	100.0	182	100.0	370	100.0
Workers not reporting as to natural ability	42	[1] 34.1	90	[1] 45.7	7	[1] 3.7	139	[1] 27.3
Total workers	123	....	197	....	189	....	509	....

[1] Per cent of total workers.

TABLE 42.—NUMBER AND PER CENT OF WORKERS WORKING UNDER CONDITIONS INVOLVING PECULIAR PHYSICAL OR NERVOUS STRAIN, OR THAT TEND TO IMPAIR HEALTH, BY TRADE GROUPS.[1]

Items.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.
Workers working under conditions that—								
Involve physical or nervous strain	42	35.6	72	38.3	69	35.8	183	36.7
Do not involve physical or nervous strain	76	64.4	116	61.7	124	64.2	316	63.3
Total reporting as to physical or nervous strain	118	100.0	188	100.0	193	100.0	499	100.0
Tend to impair health	45	38.1	51	27.4	43	23.0	139	28.3
Do not tend to impair health	73	61.9	135	72.6	144	77.0	352	71.7
Total reporting as to impairment of health	118	100.0	186	100.0	187	100.0	491	100.0

[1] For specifications in detail of the nature of these conditions that involve strain or that tend to impair health, see tabular analyses of trades, facing pp. 140, 182, and 226.

TABLE 43.—NUMBER AND PER CENT OF WORKERS WHO REPORTED THAT THEIR TRADE COULD BE, OR COULD NOT BE, LEARNED THOROUGHLY IN THE SHOP, BY TRADE GROUPS.

Items.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.	Number.	Per cent of total reporting.
Workers reporting that their trade—								
Could be learned thoroughly in the shop	59	74.7	32	29.6	75	39.9	166	44.3
Could not be learned thoroughly in the shop	20	25.3	76	70.4	113	60.1	209	55.7

TABLE 44.—NUMBER OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS WHO LEFT SCHOOL AT AGE SPECIFIED, BY TRADE GROUPS.

Age at leaving school.	Number of workers who left school at age specified.							
	Printing trades.				Building trades.			
	Journeymen.	Apprentices.	Semiskilled.	Total.	Journeymen.	Apprentices.	Semiskilled.	Total.
10 years	2			2	7			7
11 years	3			3	5			5
12 years	10		2	12	17			17
13 years	12	4	2	18	16	2		18
14 years	23	6	2	31	36	3	1	40
15 years	22	7	3	32	34	1		35
16 years	14	4		18	31	3	1	35
17 years	2	1		3	20	1		21
18 years	2			2	8			8
19 years	1			1				
20 years and over					2			2
Not reported	1			1	7	2		9
Total	92	22	9	123	183	12	2	197

Age at leaving school.	Number of workers who left school at age specified.							
	Metal trades.				Total.			
	Journeymen.	Apprentices.	Semiskilled.	Total.	Journeymen.	Apprentices.	Semiskilled.	Grand total.
10 years	7	1	1	9	16	1	1	18
11 years	8	1	1	10	16	1	1	18
12 years	12	1	1	14	39	1	3	43
13 years	16	3	2	21	44	9	4	57
14 years	30	4		34	89	13	3	105
15 years	29	5	1	35	85	13	4	102
16 years	33	3	2	38	78	10	3	91
17 years	10	1	2	13	32	3	2	37
18 years	6		2	8	16		2	18
19 years	2			2	3			3
20 years and over					2			2
Not reported	3	1	1	5	11	3	1	15
Total	156	20	13	189	431	54	24	509

TABLE 45.—NUMBER OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS WHO HAD TAKEN COURSES OF SPECIFIED CHARACTER SINCE LEAVING SCHOOL, BY TRADE GROUPS.

Trade group and class of workers.	Number who had taken courses.						Workers who had taken no courses.	Total workers.
	By correspondence.	By attendance at night school.	By attendance at day school.	Bearing on trade.	Not bearing on trade.	Total.		
Printing trades:								
Journeymen	4	26	3	18	15	33	59	92
Apprentices		9		6	3	9	13	22
Semiskilled		3		2	1	3	6	9
Total	4	38	3	26	19	45	78	123
Building trades:								
Journeymen	19	35	2	34	22	56	127	183
Apprentices		6		5	1	6	6	12
Semiskilled		1		1		1	1	2
Total	19	42	2	40	23	63	134	197
Metal trades:								
Journeymen	13	47	1	46	15	61	95	156
Apprentices	6	10		15	1	16	4	20
Semiskilled		2		1	1	2	11	13
Total	19	59	1	62	17	79	110	189
Total, 3 trade groups:								
Journeymen	36	108	6	98	52	150	281	431
Apprentices	6	25		26	5	31	23	54
Semiskilled		6		4	2	6	18	24
Grand total	42	139	6	128	59	187	322	509

TABLE 46.—NUMBER OF WORKERS REPORTING RESULT OF TAKING COURSES SINCE LEAVING SCHOOL, BY TRADE GROUPS.

Result of taking courses.	Printing trades.	Building trades.	Metal trades.	Total.
Workers who had taken courses since leaving school—				
Reporting results as to wages:				
Increased wages	8	22	18	48
No effect on wages	19	14	44	77
Not reporting results as to wages	18	27	17	62
Total	45	63	79	187
Reporting as to benefits other than increase in wages:				
Some benefit	13	22	38	73
No benefit	1	8	1	10
Not reporting benefit other than increase in wages	31	33	40	104
Total	45	63	79	187
Workers who had taken no courses since leaving school	78	134	110	322
Total workers	123	197	189	509

TABLE 47.—AVERAGE WAGE PER HOUR OF ADULT WORKERS WHO HAD, AND OF THOSE WHO HAD NOT, TAKEN COURSES OF INSTRUCTION SINCE LEAVING SCHOOL, BY TRADE GROUPS.

Items.	Printing trades.	Building trades.	Metal trades.	Total.
Average wages per hour of adult workers who—	*Cents.*	*Cents.*	*Cents.*	*Cents.*
Had taken courses of instruction since leaving school	38.8	40.0	39.3	39.5
Had not taken courses of instruction since leaving school	37.2	39.8	38.8	38.9

TABLE 48.—NUMBER OF WORKERS INDICATING SPECIFIED COURSES AS NEEDED TO MAKE THEM MORE EFFICIENT IN THEIR PRESENT OCCUPATION, BY TRADE GROUPS.

Subjects.	Number of workers who indicated specified subjects for evening courses.			
	Printing trades.	Building trades.	Metal trades.	Total.
Advertising	3	1		4
Agriculture			1	1
Air-brake instruction			2	2
Algebra		1	6	7
Arithmetic	15	41	29	85
Business courses		1	2	3
Carpentry			1	1
Chemistry of the trade	30	6	25	61
Color harmony	11	20	1	32
Design	11	21	4	36
Drawing:				
Free-hand	14	5	3	22
Mechanical	8	78	109	195
Architectural		50	1	51
Electricity		6	1	7
Emblems and heraldry	1			1
Engineering:				
Gas		1	1	2
Heating		5		5
Mechanical			1	1
Steam			2	2
English	15	7	8	30
Estimating	2	13	1	16
Foreign languages	1			1
General education	8	13	19	40
Geography	2	2	1	5
Geometry		6	5	11
Grammar	4	3	1	8
History	1	1		2
History of trade			3	3
Hydraulics		1		1
Ink mixing	5			5
Lettering	3	1		4
Machine-shop practice			2	2
Mechanics		1	4	5
Metallurgy			14	14
Modern methods	14	8	14	36
Pattern making			4	4
Physics		4	1	5
Plumbing and steam fitting		1		1
Reading	2		2	4
Salesmanship		2		2
Sanitation		2		2
Shop mathematics	6	65	82	153
Spelling	12	4	3	19
Theory of the trade	8	14	17	39
Trade news			1	1
Ventilation		2		2
Writing	2	4	4	10
No report	31	24	24	79

TABLE 49.—NUMBER OF WORKERS EARNING SPECIFIED WAGES PER HOUR, BY TRADE GROUPS.

Wages per hour.	Workers earning specified wage per hour.			
	Printing trades.	Building trades.	Metal trades.	Total.
Under 10 cents	3	2	....	5
10 to 14 cents	10	6	9	25
15 to 19 cents	13	4	15	32
20 to 24 cents	5	5	9	19
25 to 29 cents	15	17	13	45
30 to 34 cents	10	45	20	75
35 to 39 cents	23	36	38	97
40 to 44 cents	11	27	45	83
45 to 49 cents	12	16	4	32
50 to 54 cents	10	22	18	50
55 to 59 cents	3	1	2	6
60 to 64 cents	3	2	13	18
65 to 69 cents	2	8	....	10
70 to 74 cents	....	5	1	6
Not reported	3	1	2	6
Total	123	197	189	509

TABLE 50.—NUMBER AND PER CENT OF WORKERS EARNING SPECIFIED WAGE PER HOUR, BY TRADE GROUPS.

Wages per hour.	Workers earning specified wages per hour.							
	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
19 cents and under	26	21.1	12	6.1	24	12.7	62	12.2
20 to 29 cents	20	16.3	22	11.2	22	11.6	64	12.5
30 to 39 cents	33	26.8	81	41.1	58	30.7	172	33.8
40 to 49 cents	23	18.7	43	21.8	49	25.9	115	22.6
50 to 59 cents	13	10.6	23	11.7	20	10.6	56	11.0
60 to 69 cents	5	4.0	10	5.1	13	6.9	28	5.5
70 cents and over	....	....	5	2.5	1	.5	6	1.2
Not reported	3	2.4	1	.5	2	1.1	6	1.2
Total	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 51.—NUMBER AND AVERAGE WAGES PER HOUR OF WORKERS OF SPECIFIED AGE, BY TRADE GROUPS.

Age periods.	Number of workers.				Average wages per hour.			
	Printing trades.	Building trades.	Metal trades.	Total.	Printing trades.	Building trades.	Metal trades.	Printing, building, and metal trades.
					Cents.	*Cents.*	*Cents.*	*Cents.*
Under 21 years	27	19	27	73	16.5	19.1	17.1	17.4
21 to 25 years	26	35	24	85	30.2	39.4	38.8	36.4
26 to 30 years	20	39	41	100	40.2	40.7	39.3	40.0
31 to 35 years	14	31	36	81	45.6	41.4	43.0	42.8
36 to 40 years	10	19	17	46	39.6	41.9	39.0	40.3
41 to 45 years	12	25	11	48	41.6	43.7	39.2	41.2
Total, 21 to 45 years	82	149	129	360	38.0	41.2	40.2	40.1
46 to 50 years	4	7	15	26	39.0	37.7	39.8	39.1
51 to 55 years	5	8	7	20	47.2	39.0	36.7	40.8
56 to 60 years	2	8	2	12	41.0	32.9	33.0	35.1
61 to 65 years	....	4	2	6	....	32.2	37.5	34.8
Total, 46 to 65 years	11	27	26	64	43.1	35.8	38.2	38.0
66 years and over	....	1	5	6	....	36.0	34.8	....
No report of wages	3	1	2	6	....	....	....	....
Total, all ages	123	197	189	509	....	....	....	....

TABLE 52.—NUMBER AND PER CENT OF WORKERS EARNING SPECIFIED WAGES PER WEEK, BY TRADE GROUPS.

Wages per week.	Printing trades.		Building trades.		Metal trades.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Under $10	22	17.9	11	5.6	23	12.2	56	11.0
$10 to $14.99	18	14.6	14	7.1	20	10.6	52	10.2
$15 to $19.99	37	30.1	99	50.3	37	19.6	173	34.0
$20 to $24.99	27	22.0	56	28.4	83	43.9	166	32.6
$25 to $29.99	11	8.9	5	2.5	16	8.5	32	6.3
$30 to $34.99	4	3.3	11	5.6	7	3.7	22	4.3
$35 and over	1	.8	....	....	1	.5	2	.4
Not reported	3	2.4	1	.5	2	1.0	6	1.2
Total	123	100.0	197	100.0	189	100.0	509	100.0

TABLE 53.—NUMBER OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS WHO LEFT SCHOOL AT AGE PERIOD SPECIFIED, BY TRADE GROUPS.

Age at leaving school.	Workers who left school within age period specified.				
	Journeymen.	Apprentices.	Semiskilled.	All workers.	
				Number.	Per cent.
Printing trades:					
14 years and under	50	10	6	66	53.7
15 to 17 years	38	12	3	53	43.1
18 years and over	4	....	....	4	3.2
Total	92	22	9	123	100.0
Building trades:					
14 years and under	81	5	1	87	44.2
15 to 17 years	85	5	1	91	46.2
18 years and over	17	2	....	19	9.6
Total	183	12	2	197	100.0
Metal trades:					
14 years and under	73	10	5	88	46.6
15 to 17 years	72	9	5	86	45.5
18 years and over	11	1	3	15	7.9
Total	156	20	13	189	100.0
Total, printing, building, and metal trades:					
14 years and under	204	25	12	241	47.3
15 to 17 years	195	26	9	230	45.2
18 years and over	32	3	3	38	7.5
Grand total	431	54	24	509	100.0

TABLE 54.—NUMBER OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS WHO ATTENDED SCHOOL SPECIFIED PERIODS OF YEARS, BY TRADE GROUPS.

Years of schooling.	Journeymen.	Apprentices.	Semiskilled workers.	All workers.	
				Number.	Per cent.
Printing trades:					
3 years and under	3	....	....	3	2.4
4 to 7 years	65	19	9	93	75.6
8 to 11 years	16	3	....	19	15.5
Not reported	8	....	....	8	6.5
Total	92	22	9	123	100.0
Building trades:					
3 years and under	14	1	....	15	7.6
4 to 7 years	138	8	1	147	74.6
8 to 11 years	24	1	1	26	13.2
Not reported	7	2	....	9	4.6
Total	183	12	2	197	100.0
Metal trades:					
3 years and under	9	....	....	9	4.8
4 to 7 years	112	17	9	138	73.0
8 to 11 years	27	1	2	30	15.9
Not reported	8	2	2	12	6.3
Total	156	20	13	189	100.0
Total, printing, building, and metal trades:					
3 years and under	26	1	....	27	5.3
4 to 7 years	315	44	19	378	74.3
8 to 11 years	67	5	3	75	14.7
Not reported	23	4	2	29	5.7
Grand total	431	54	24	509	100.0

TABLE 55.—NUMBER OF JOURNEYMEN, APPRENTICES, AND SEMISKILLED WORKERS REPORTING LACK OF SCHOOL TRAINING AS A HINDRANCE TO PROGRESS, BY YEARS OF SCHOOLING AND BY TRADE GROUPS.

Years of schooling.	Journeymen.		Apprentices.		Semiskilled workers.		All workers.	
	Number.	Reporting themselves hampered by lack of schooling.	Number.	Reporting themselves hampered by lack of schooling.	Number.	Reporting themselves hampered by lack of schooling.	Number.	Reporting themselves hampered by lack of schooling.
Printing trades:								
3 years and under	3	2					3	2
4 to 7 years	65	27	19	5	9	1	93	33
8 to 11 years	16	5	3	2			19	7
Not reported	8	2					8	2
Total	92	36	22	7	9	1	123	44
Building trades:								
3 years and under	14	14	1	1			15	15
4 to 7 years	138	91	8	3	1		147	94
8 to 11 years	24	12	1	1	1		26	13
Not reported	7	7	2				9	7
Total	183	124	12	5	2		197	129
Metal trades:								
3 years and under	9	9					9	9
4 to 7 years	112	84	17	9	9	6	138	99
8 to 11 years	27	12	1		2	1	30	13
Not reported	8	5	2	1	2		12	6
Total	156	110	20	10	13	7	189	127
Total, printing, building, and metal trades:								
3 years and under	26	25	1	1			27	26
4 to 7 years	315	202	44	17	19	7	378	226
8 to 11 years	67	29	5	3	3	1	75	33
Not reported	23	14	4	1	2		29	15
Grand total	431	270	54	22	24	8	509	300

TABLE 56.—AVERAGE WAGES PER HOUR OF ADULT WORKERS WHO LEFT SCHOOL AT SPECIFIED AGE, AND OF ADULT WORKERS WHO ATTENDED SCHOOL SPECIFIED NUMBER OF YEARS, BY TRADE GROUPS.

Age.	Average wages per hour of adult workers who left school at age specified.				Years of schooling.	Average wages per hour of adult workers who attended school specified number of years.			
	Printing trades.	Building trades.	Metal trades.	Printing, building, and metal trades.		Printing trades.	Building trades.	Metal trades.	Printing, building, and metal trades.
	Cents.	*Cents.*	*Cents.*	*Cents.*		*Cents.*	*Cents.*	*Cents.*	*Cents.*
12 years and under	34.2	36.7	40.4	37.6	3 years and under	34.2	38.2	49.8	38.4
13 to 14 years	38.1	40.7	42.5	40.6	4 to 7 years	36.8	40.3	39.7	39.3
15 to 17 years	38.7	40.8	39.0	39.7	8 to 11 years	40.6	40.0	35.8	40.0
18 years and over	30.7	38.3	26.3	32.1					

TABLE 57.—AVERAGE WAGES OF ADULT WORKERS, BY YEARS OF SCHOOLING AND OF EXPERIENCE IN PRESENT OCCUPATION, BY TRADE GROUPS.

Years of schooling.	Workers of specified years of schooling and of experience as workers in their present occupation.											
	Number.						Average wages per hour.					
	5 years' experience or less.	6-10 years' experience.	11-15 years' experience.	16-20 years' experience.	21-25 years' experience.	26 years' experience or more.	5 years' experience or less.	6-10 years' experience.	11-15 years' experience.	16-20 years' experience.	21-25 years' experience.	26 years' experience or more.
Printing trades:							*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
3 years and under	......	1	2	1	1	......	......	51.0	37.5	42.0	27.0	......
4 to 7 years	10	21	13	8	11	6	23.3	31.6	43.8	48.6	38.2	42.3
8 to 11 years	1	5	3	1	4	2	31.0	35.2	42.7	36.0	48.2	42.5
Building trades:												
3 years and under	1	3	1	2	3	9	25.0	42.3	43.0	41.0	42.7	35.9
4 to 7 years	16	31	36	13	12	28	34.8	38.7	42.3	37.6	44.3	41.6
8 to 11 years	4	8	8	3	......	1	24.0	41.1	40.1	43.0	......	50.0
Metal trades:												
3 years and under	......	1	2	2	1	6	......	38.1	59.5	52.0	38.0	38.8
4 to 7 years	17	22	32	19	9	22	31.5	38.9	44.0	40.4	42.7	39.5
8 to 11 years	4	5	8	4	2	4	24.0	42.8	37.4	40.3	26.5	35.7
Total, printing, building, and metal trades:												
3 years and under	1	5	5	5	5	15	25.0	43.2	47.4	45.6	38.6	37.1
4 to 7 years	43	74	81	40	32	56	30.8	32.7	43.2	41.1	41.7	40.8
8 to 11 years	9	18	19	8	6	7	24.8	51.1	39.4	40.7	41.0	39.7

APPENDIX B.—ANALYSIS OF OCCUPATIONS IN THE PRINTING TRADES IN RICHMOND.

SUMMARY OF THE INDUSTRIAL SURVEY OF THE PRINTING TRADES.

The printing trades of Richmond form a very important part of the industrial life of the city. Both the number of shops and the value of the product are increasing steadily from year to year. According to the United States census, the capital invested in the printing trades was $1,596,000 in 1899, $1,802,000 in 1904, and $2,281,000 in 1909. The value of the product was $1,082,000 in 1899, $1,747,000 in 1904, and $2,786,000 in 1909. No figures are available to show the increase subsequent to 1909, although the printers all agree that the industry is still growing as rapidly as in previous years.

SCOPE OF THE INQUIRY.

Practically the entire field of the printing trades was covered by the schedules obtained from 50 plants employing white workmen in May and June, 1914. The printing trades embrace printing, bookbinding, steel and copper plate engraving, photo-engraving, and lithography. On the schedules of the survey 1,244 workers, of whom 860, or 69 per cent, were males, and 384, or 31 per cent, were females, were returned as employed in these plants, exclusive of office help, laborers, and all other help not directly concerned with the occupations peculiar to the printing trades. These workers are grouped in the different trades as shown in the following table:

TABLE 58.—EMPLOYEES IN THE PRINTING TRADES, CLASSIFIED ACCORDING TO CHARACTER OF THE ESTABLISHMENT IN WHICH EMPLOYED.

Character of work done.	Establishments.	Employees.			
		Males.	Females.	Total.	Per cent in each class.
Printing only	[1] 28	359	77	436	35.0
Bookbinding only	4	37	53	90	7.2
Printing and bookbinding [2]	11	359	202	561	45.1
Steel and copper plate engraving	3	15	12	27	2.2
Lithography and photo-engraving	4	90	40	130	10.5
Total	50	860	384	1,244	100.0

[1] Includes 1 establishment engaged in printing bags and wrapping paper which did not report number of employees.
[2] One printing and bookbinding firm does also steel and copper plate engraving and lithographing, printing and bookbinding being its most important line of business.

PRODUCT OR SPECIALTIES.

The answers to the question, "What are your specialties?" show that practically all kinds of printing, from the lowest grades to the highest, are done in Richmond. The specialties reported include the printing of books, labels, advertisements, pamphlets, catalogues, railroad time-tables, bank forms, daily papers, periodicals, and bags and wrapping paper; the making of calendars, plate and photo engraving, lithographing, and bookbinding. Some firms specialize on practically one kind of work, such as boxes, wrappers or labels for tobacco, railroad time-tables, druggist labels, book printing. One firm alone prints an average of 350,000 cigarette boxes per day for one brand of cigarettes, and another establishment makes weekly from 2,500,000 to 4,000,000 books of cigarette papers of one brand. Several firms do a large amount of three-color work. Thus the field in Richmond is rich with opportunities for trained workers in various branches of the trade.

SIZE OF ESTABLISHMENTS.

As regards the maximum number employed at any time during the year 1913, the 50 printing trades establishments varied in size from 3 to 150 employees. More than half of the plants reported as their maximum between 5 and 20 workers. In the following table the establishments are classified according to maximum number of employees reported. It will be seen that the trade is composed not of a few very large plants, but of a considerable number of small and medium size ones.

TABLE 59.—PRINTING TRADES ESTABLISHMENTS CLASSIFIED ACCORDING TO MAXIMUM NUMBER EMPLOYED.

Maximum number employed.	Establishments.	Employees.
Under 5	3	11
5 to 10	10	75
11 to 20	16	241
21 to 50	13	415
51 to 100	4	283
Over 100	3	382
Not reported	1	....
Total	50	1,407

The great variety of work done in Richmond shops, as well as the fact that the shops are mostly small, are conditions favorable to the development of competent journeymen, since these are conditions under which any considerable degree of specialization is impossible. In small shops generally the worker must shift frequently from one sort of work to another.

FLUCTUATION IN EMPLOYMENT.

The fluctuation in employment in the printing trades in Richmond is for all plants combined inconsiderable. While there is considerable fluctuation in the case of individual establishments, it happens that the sum of the numbers reported by 49 plants as being in each case the minimum number employed during the year 1913, exclusive of office help, is exactly equal to the aggregate number employed at the date of the investigation, i. e., May and June, 1914, this number being 1,244. The maximum number of employees reported by these plants was 1,407. These numbers represent approximately the extreme limits of fluctuation during the year according to the returns, assuming that all plants were employing their maximum and their minimum numbers coincidently. To the extent that this was not the case the amount of fluctuation would be less than is indicated by the figures. The total for the maximums exceeds the total for the minimums by 163, or 13.1 per cent.

The fluctuations in the printing trades are not markedly seasonal, although the summer months are generally considered the slackest of the year. It is thus seen that the trade is very stable as regards permanent employment the year round.[1]

[1] In answer to the question "To what extent did the total number of employees, other than office help, vary in 1913?" one establishment replied that it does not decrease the number of employees during the dull months of April and May, but shortens the hours of labor; another that it keeps practically all girl help in the dull season by having them mail circular letters and samples of the work done by the establishment; another that it employs its help by the year and keeps it regardless of conditions so long as it proves efficient.

The fluctuation by establishments is shown by the following table:

TABLE 60.—NUMBER OF EMPLOYEES IN 50 PRINTING TRADES ESTABLISHMENTS IN MAY AND JUNE, 1914, AND MAXIMUM AND MINIMUM NUMBER EMPLOYED IN 1913, BY ESTABLISHMENTS.

Establishment No.	Character of work done.	Number employed. May and June, 1914. Males.	Number employed. May and June, 1914. Females.	Number employed. May and June, 1914. Total.	Number employed. 1913. Maximum.	Number employed. 1913. Minimum.
1	Book and job printing	6		6	9	6
2	Commercial	4		4	4	4
3	Commercial advertising	9	2	11	14	9
4	Photo-engraving	12		12	12	10
5	Commercial pamphlets	7		7	15	5
6	Job and book printing	20		20	30	20
7	Steel engraving	5	7	12	12	9
8	Commercial	10		10	14	10
9	Photo-engraving	14		14	14	14
10	Commercial	13	3	16	20	20
11	Book and job printing	3		3	5	3
12	Newspaper publishing	25		25	25	25
13	Commercial	2	1	3	3	3
14	Bookbinding	8	12	20	20	20
15	Steel engraving	5	2	7	7	4
16	Lithograph work	14		14	14	14
17	Pamphlet and job work	5	1	6	10	4
18	Commercial and label	5	4	9	20	14
19	Newspaper publishing	28		28	31	31
20	Book and job printing	5		5	7	4
21	Church envelopes	24	53	77	80	80
22	Newspaper publishing	40		40	42	42
23	Printing on folding boxes	13	3	16	35	25
24	General work and periodicals	19	4	23	23	23
25	Commercial, label, and stationery	4		4	7	5
26	Bookbinding	13	25	38	51	40
27	....do	4	3	7	7	7
28	Printing and binding	47	20	67	70	65
29	Railroad printing	52	40	92	120	120
30	Printing on bags and wrapping paper				12	12
31	Bookbinding	12	13	25	23	20
32	Job printing and publishing	20		20	20	20
33	Commercial and office stationery	4		4	5	5
34	Steel engraving	5	3	8	8	8
35	General commercial work	3		3	4	2
36	Book and job printing	8		8	10	9
37	Druggists' labels	13		13	15	15
38	Lithograph work	50	40	90	112	112
39	Bookbinding and printing	58	52	110		
40	Calendars and druggists' labels	20	7	27	45	45
41	Commercial work	8	2	10	11	11
42	Printing, bookbinding, engraving, lithographing	59	37	96	137	115
43	Book and job printing	24	7	31	38	28
44	Commercial work	14	3	17	23	16
45	Pamphlet and job work	9	3	12	12	12
46	Publications and job work	31	12	43	47	44
47	Bookbinding and job printing	9	5	14	16	12
48	Tobacco labels and commercial work	38		38	38	38
49	Railroad printing	37	20	57	80	60
50	Newspaper publishing	22		22	30	24
	Total	860	384	1,244	1,407	1,244

SUPPLY OF EFFICIENT JOURNEYMEN.

About three-fourths of the firms interviewed experienced difficulty in obtaining efficient workers. This would seem to indicate one of two things: (1) That there is not a sufficient number of apprentices being trained from year to year, or (2) that the demand for skilled workers has suddenly gone above the normal condition.[1] Significant replies were received in answer to the question, "To what do you attribute

[1] Fifty answers were received to the question, "Is difficulty experienced in obtaining efficient workers?" 37 being "Yes" and 13 "No." The answers are divided as follows: Of those answering "Yes," 17 are printers, 13 bookbinders, 3 plate engravers, and 4 lithographers or photo-engravers. Of those answering

this difficulty?" Some of the reasons given are as follows: Scarcity of trained help; organized labor; shiftlessness, laziness, lack of ambition; tendency to float from shop to shop; lack of general education; lack of opportunity for beginners to learn trade; unwillingness to spend five years to learn trade; absence of cooperation between journeymen and apprentices.

One employer of a large number of workers gives intoxicating drinks as his reason for the difficulty in obtaining efficient workers, and another answers that it is his experience that most girls do not have to work because of economic reasons and are therefore more independent than they otherwise would be. In concluding the summary of this very important question, extracts may be quoted from the answers given by two printers. One replies as follows:

> The seeming antipathy of the native, with few exceptions, to manual labor, due, I suppose, to false training in home and school and the example of comrades who are supported by indulgent, misguided parents, and shun the boy who will and must work, practically ostracising him socially.
>
> Again, the average boy's lack of appreciation (due again in great measure to the aforementioned false training) of the fine future and the possibilities open to the master mechanic in this country; the shortness of vision evident in this section; the utter lack of idealism of almost every kind, every impulse of individualism being strangled by our ofttimes oversystematized systems.

Another employer replies:

> The high rent for homes for working people is a great drawback. The litho workman from the North expects a home to be heated with hot water, to have hot and cold water, electric lights, cellar, cupboard, and so forth, and to rent for $18 or $20 per month. We have lost many men because such homes could not be had at low rent.

CONDITIONS UNDER WHICH WORK IS PERFORMED.

The printing trades establishments of Richmond are generally well located, well lighted, and well ventilated. The men and women employed in them are of a high degree of intelligence, and are with few exceptions of American birth. Since, as has been shown in a preceding section, the work done in these establishments covers the whole field of printing and of such allied trades as, for example, engraving, lithographing, and bookbinding, the conditions in the city are exceptionally favorable for acquiring an all-round knowledge of the industry as a whole. In this respect the local conditions in the printing trades, as has been noted, provide good opportunity for the development of general efficiency and intelligence on the part of workers. The rapid growth of the industry in recent years gives assurance of future development, and is in itself an important condition favorable to the advancement of efficient workers in accordance with individual merit. Under the conditions obtaining in the shops it is not sufficient for the workman to know how to operate one machine, or how to perform some one simple process. To meet the conditions of the shop the workman must have a considerable degree of facility, enabling him to shift from one occupation to another. In other words, the conditions are favorable for advancement of those who know their trade as against those who know only one process. A further condition favorable to advancement of efficient workmen lies in the personal relationship which obtains between employers and workers, the employers in most cases knowing their men personally and their individual qualities as workmen to an extent that is impossible where the industry is concentrated in a few very large establishments.

"No," 11 are printers and 2 are bookbinders. It is thus seen that 74 per cent of the establishments report difficulty in obtaining efficient workers.

Of the 37 answers to the question, "In which occupation is difficulty experienced in obtaining efficient workers?" 10 specify compositors; 12, pressmen; 13, all occupations; 9, feeders; 3, girl help; 1, skilled man help; 1, stonehands; 1, machine hands; 1, all except girls; 2, engravers; 1, photo-engravers; 1, rulers. These answers indicate that more difficulty is experienced in getting compositors, pressmen, and feeders than any other kind of help. Of those who answered "all occupations," 7 are printers, 1 is a bookbinder, 2 do printing and bookbinding, 1 is a plate engraver, and 2 are lithographers or photo-engravers.

In order to reveal the conditions under which work is performed in the printing trades establishments of Richmond, five questions were included in the schedule, as follows: (1) "What conditions involve peculiar physical or nervous strain?" (2) "What conditions tend to impair health?" (3) "What conditions especially stimulate the intelligence of the workers?" (4) "What conditions, if any, narrow and restrict the mental development of the workers?" (5) "What conditions, if any, are to be guarded against as exerting morally unwholesome influences?"

In the following summary each of the principal allied printing trades—i. e., printing, bookbinding, stereotyping, photo-engraving, lithographing, and steel and copper plate engraving—is considered separately, and when the wide variety of occupations included in each of these trades is taken into account, the replies to the above inquiries are remarkably uniform. In any one establishment one or more of these trades may be carried on conjointly. The number of replies pertaining to any one trade does not, therefore, necessarily correspond with the number of establishments covered by the printing trades schedule.

Of 38 printers, 33 reply that no occupations involve peculiar physical or nervous strain; 1 that composition produces such strains; 2 that linotype operating should be so characterized, and 1 includes proof reading. The 15 firms engaged in bookbinding all reply that none of the occupations of bookbinding involves strains of this character, 1 stating, however, that there are some machines which girls of a nervous temperament are unable to learn to operate. Eight stereotypers reply "no strain." The 3 firms engaged in photo-engraving and the 3 engaged in lithographing reply in each case that their work involves no peculiar physical or nervous strain. Three out of the 4 steel and copper plate engravers state that their work does produce physical or nervous strain; 1 replies in the negative.

The replies to the question, "What conditions involve peculiar physical or nervous strain?" are therefore nearly unanimous, and are to the effect that, except in the case of steel and copper plate engravers, no serious strains of this character are produced by the various occupations in the printing trades, although hand composition and linotype work are reported as exacting in their demands, especially on the eyes. The steel and copper plate engravers, however, are subject to an unusual eyestrain, and any nervousness caused by weak eyes would undoubtedly react in the form of an unsteady hand.

In answer to the question, "What conditions tend to impair health?" 48 out of the 50 firms engaged in the printing trades state that there are no unhealthy conditions peculiar to their business. One printer states that bronzing is injurious to the health, and 1 photo-engraver that etching is injurious. It is doubtful if the small amount of hand bronzing done in an average Richmond printing establishment would be a factor of sufficient importance for special consideration, but the operation of the bronzing machines used by lithographers and by some printers involves conditions that are unhealthy. Opinion is divided as to whether an etcher in a photo-engraving plant is subject to peculiarly unhealthy conditions, but it would seem that when ordinary precautions for proper ventilation are taken there is no serious menace to health. It is also true that the printer is usually compelled to work in a somewhat higher temperature than is considered best for health owing to the fact that pressrooms must be warm enough for the ink to spread properly.

The printing trades shops of Richmond are generally well lighted and ventilated and, according to a number of printers, in much better condition than existed a few years ago. This is the reason the printing trades are not now considered unhealthy, as was the general opinion formerly. The shop located in a basement or in a dark and dingy room is fast passing, with the result that the ventilation, light and general sanitary conditions have all improved.

The workers in the printing trades are fairly well organized. This is especially true of photo-engravers, compositors, linotype and monotype operators, and stereotypers.

Some occupations in lithography and bookbinding are organized, but there is no organization at present in Richmond for steel engravers and press feeders.

In the replies to the question, "What conditions especially stimulate the intelligence of the workers?" there seems to be a greater variety of opinion. Twenty-nine out of the 38 printers reply that all occupations stimulate the intelligence of the worker. Three add that composition especially stimulates. Seven reply that only composition stimulates the intelligence. Three state that only composition and proof reading stimulate the intelligence. Eight of the 15 bookbinders reply that all branches of their work stimulate the worker's intelligence; 4 say that their work is not stimulative; 3 that only finishing and forwarding stimulate the intelligence. Five of the 8 stereotypers state that the work is such as to stimulate the intelligence of the worker; 3 do not think so. The 4 steel and copper plate engravers unite in saying that all occupations in their line are stimulative. Two out of the 3 photo-engravers answer that the work is stimulating to the intelligence; 1 does not think so. The 3 lithographers reply that all branches of their work stimulate.

From the foregoing it would appear that all occupations under the head of printing tend to stimulate the intelligence to some extent, that of hand typographer or compositor being easily in the lead. While a majority of the answers from the bookbinders would indicate that in the opinion of the employers all of the occupations of bookbinding are stimulative, such occupations as folding, pasting, gathering, collating, and sewing can not, it would seem, tend to stimulate mental development to any considerable extent. Forwarding and finishing, however, undoubtedly afford opportunity for development of the worker's intelligence. All of the occupations of lithographing, photo-engraving, and steel and copperplate engraving trades require a considerable degree of intelligence and are therefore stimulative to the worker.

Forty-seven out of the 50 firms reply that no occupations restrict mental development. Two answer that press feeding is restrictive and 1 makes no reply.

In answer to the question, "What conditions, if any, are to be guarded against as exerting morally unwholesome influences?" 49 of the 50 firms reply that there are not any, 1 making no reply. On the schedules no mention is made of lead poisoning, to which, it is generally conceded as a result of scientific investigations, hand and machine compositors are exposed.

HOW WORKERS ARE TRAINED.

Of the 50 firms reporting how their workers are trained, 45 reply that their workers do receive instruction in addition to what would ordinarily be picked up on the job; 3 reply that such special instruction is given to apprentices; 1 that press feeding is taught; and 1 states that no instruction is given. In the majority of cases, 36 out of 49, this special instruction is given by the foreman; in 5 establishments the employer instructs the workers; in 4 establishments the manager or superintendent gives instruction, and in 3 cases instruction is given by journeymen. One firm makes no reply. In 3 cases the employer is assisted by the foreman and in several cases old journeymen assist in giving instruction. One firm issues a monthly bulletin which gives shop news, items of general interest and general instruction. Another firm makes use of trade literature in instructing its employees.

The above replies seem to show (1) that the need of instruction other than that ordinarily received in the routine work of the shop is almost unanimously recognized, and (2) that in nearly all cases the foreman is called upon to give instruction. Owing to the many calls on his time and attention, the instruction given by the foreman must of necessity be limited in a majority of cases to the immediate needs of the workman. Under this system the possibilities for the growth and development of the apprentice along the line of his chosen vocation depend almost entirely on the trade knowledge, and the ability to impart the same, possessed by his foreman.

TRADES THAT CAN BE LEARNED IN THE SHOP.

To the question "What occupations in your shop can be learned in the shop with little or no instruction?" 36 out of 50 employers reply "none"; 6 firms specify press feeding and folding; 1, machine work; 1, collating envelopes; 1, straight composition and press feeding; 1, bookbinding. One replies "very little," and 2 make no reply.

APPRENTICESHIP.

The replies to the above question again emphasize the necessity of special instruction during apprenticeship. Twelve establishments out of 50 have no apprentices, 9 other establishments have no apprenticeship agreements of any kind, and 4 make no reply. The remaining 25 firms have some kind of understanding with their apprentices, either verbal or written. In the majority of cases the understanding is verbal only. A considerable number of apprentices are listed with the union. In only one case, however, is a regular recorded apprenticeship indenture reported.

Among those firms having written or verbal agreements the majority require a five-year apprenticeship, though several bookbinders require only a four-year apprenticeship. In general the beginning wage is from $3 to $4 per week. Five establishments increase the wages of the apprentices every six months. One firm gives, at the end of the apprenticeship period, a bonus of $100 to each apprentice who has worked 200 consecutive weeks without unexcused absence except sickness.

Because of the lack of definite apprenticeship system the replies to the question "Do you find that those who are apprenticed have a better attitude toward their work than those who are not?" are not so illuminating as might be expected. Thirty-one establishments make no reply; 10 employers reply that apprentices have a better attitude toward their work; 8 state that apprentices do not have a better attitude, and 1 employer says that they sometimes have a better attitude.

The lack of an organized system of apprenticeship is, to some extent at least, responsible for the floaters who go from shop to shop. A number of printers stated that this floating from shop to shop is one of the chief difficulties in training or keeping efficient help. This is especially true of apprentices or learners who, after working for one printer six months or a year, leave his employ to work for any other printer who will pay him more than he has been earning. Since an employer probably loses money on an apprentice the first year of the apprenticeship period, it is discouraging to him to have his apprentice leave under such conditions and work for another printer for a small increase in wages. The second printer has paid nothing for the training the boy received when he was a loss to the first employer, and he therefore gets all the benefit from the change. This does not mean that there are printers in Richmond who make a practice of encouraging apprentices to float from job to job, but that there is no agreement among the employers about employing such help. One printer made the statement that this difficulty is the result of there being no uniform apprentice wage and also because the printers have not acted as a unit in this matter. One solution of the problem would seem to be an agreement among printers on a scale of wages for apprentices and to abide by it whenever a boy comes from another printer.

Besides the inconvenience and embarrassment given the employer, the other serious aspect of the case is the result to the boy himself. If he works for a number of printers while he is supposed to be learning his trade, he is compelled to receive instruction from several instead of one. His training is therefore broken up into installments, with the chance of not being made a well-rounded journeyman if he continues to the end. He is apt to become discouraged by the frequent changes, although he himself is responsible, decide that the printing industry is not for him, and enter some other line of employment. He must then begin anew in whatever he takes up, and the time spent in the printing trade is lost in so far as it applies to the trade he has selected to learn.

It is the opinion of some printers that the lack of proper encouragement from the parents of the boys during the apprenticeship period is responsible sometimes for the boy not serving his time. Instead of encouraging him to finish his apprenticeship, although he must of necessity work for a low wage while doing it, they allow him to stop and pick up a job that pays more at the start, but which never leads anywhere. Of course in all the discussion it is understood that some boys who enter the printing trades are lazy and shiftless and will not stick to any one job very long at a time. They even float from shop to shop without any increase in wages and would never serve an apprenticeship no matter how attractive it be made.

The replies received to the foregoing five questions reveal several important facts: (1) The need of some systematic instruction other than what the apprentice can pick up on the job; (2) the fact that the duty of giving such instruction is generally intrusted to the foreman; and (3) that a true apprenticeship system practically does not exist in Richmond. There are few establishments which have more than a verbal understanding regarding apprenticeship. As a consequence of this lack of a definite formal indenture boys entering the trades do not feel bound in any way to their employers when a chance to leave and earn larger wages with another printer presents itself. This is one cause of the floating from shop to shop which is a cause of common complaint among master printers. The effect upon the boy himself is necessarily demoralizing, since he does not stay in one shop long enough to learn his trade. It may be noted further that ambitious boys might generally be held during the apprenticeship period if a definite system of progressive training in various lines of work were provided for under an agreement. "Employers, as a rule, have not been very much interested in the apprenticeship question and most of them have been content to let the other fellow handle the problem, regardless of how unsatisfactorily it may have worked out. As has been noted, this policy has resulted in a scarcity of men qualified to fill the higher positions." In speaking of this scarcity of all-round skilled men, one Richmond employer says:

> The meager inducements held out to our boys to "learn a trade," the almost utter lack of individual instruction given them in the shops by the journeymen or foremen (the reason for this is the common, brutally frank statement of many mechanics: "If I teach my boy, he'll get my job"), the lack of an apprentice system, of sensible, broad, and fair laws covering such contracts. Most indentured boys under these conditions realize their mistake in less than the first year and "skip." The indentured apprentice seems to feel it to be a condition of slavery—un-American—and the result in every instance under my observation appears to be unsatisfactory. I do not know of an indentured printer's apprentice of my generation to have "come out" a finished workman. I know of a number of specialty men, make-up men, ad. men, and straight-matter men, all fairly efficient in their particular branch, but not a single all-round man, who could step into any branch of printing, take off his coat, and pitch in.

SCHOOLING REQUIRED BEFORE ENTERING THE TRADE.

Employers very generally report that they have difficulty in getting beginners who have a good elementary or grammar-school education, and specify this as the most common deficiency. Special mention is made of such elementary subjects as reading, writing, arithmetic, spelling, grammar, and punctuation. Two employers mention drawing and designing, and two—photographers—mention chemistry. The replies received would seem to indicate that the beginners who enter the printing trade in Richmond leave school before completing seven years of school work or that the course of study offered in the first years of school is not of such a nature as to give adequate preparation for entrance to the printing trades. If the present seven-year course does not, in fact, give adequate preparation for the printing trades, that in itself might largely account for boys leaving school before completing the course.

As regards the advantage of school training beyond the seventh or final grade of the grammar school, 35 out of 46 employers report that experience would seem to indicate that a complete high-school course is of advantage to the worker in the printing trades.

One employer qualifies his answer by saying that it depends upon the curriculum of the high school. "If it teaches nonessentials—things that will never be of use to the boy in the shop—a high-school training would indicate no particular advantage." In explaining why they are of this opinion, one employer observes that in considering the value of a high-school course he also "takes into account the fact that four years of time is required to complete such a course," another that "a boy graduated from high school would not be willing to stick until he learned."[1]

AGE OF BEGINNERS.

The average age of beginners in the printing trades in Richmond, as indicated by replies from 37 firms, is 15⅓ years. Even assuming that boys are going to enter the trade at this age, the average boy would have time to do one or possibly two years of high-school work before entering the shop.

KIND OF SCHOOLS FAVORED FOR APPRENTICES.

About one-half of the firms interviewed favor a night school and approximately one-third favor a part-time day school for apprentices. Nineteen firms think some kind of school should be provided for workers in all occupations and a large number specify compositors, engravers, proof readers, and pressmen. As to the subjects that should be taught in such schools, English easily heads the list, followed by arithmetic, reading, spelling, grammar, and punctuation. Other subjects specified are design, drawing, history of printing, chemistry, color harmony, physics, and color mixing.[2]

With regard to the number of hours the apprentice should attend a part-time school the answers vary from 3 per week to 15, with more favoring 6 hours than any other arrangement.[3]

EMPLOYERS WILL COOPERATE IN ESTABLISHMENT OF PART-TIME SCHOOLS.

Twenty-four employers state that they are willing to enter into an agreement to employ workers for a definite period of apprenticeship at a fixed scale of wages, and to permit the attendance of apprentices at a part-time day school for a definite number of hours per week. The employers who do not agree to such an arrangement favor, in most cases, a night school. Of the occupations for which the employers are willing to enter into such an agreement, hand composition leads, followed by presswork, engrav-

---

[1] Of the 45 establishments replying to the question, "In what occupations, if any, is general school training beyond the seventh grade of value in increasing efficiency as workers?" 19, representing all the printing trades, state that such training is of value in all occupations. Of the replies specifying in what particular occupations school training beyond the seventh grade is of value, 14 include compositor, 8 include proof reading, 2 engraving, 2 design, 1 finishing, and 1 photo-engraving. Five firms reply that general school training beyond the seventh grade is not of special value in any occupation.

[2] In reply to the question, "What kind of a school would most help workers in the various occupations during the apprenticeship period?" 23 employers state that a night school would be most desirable; 11 prefer a part-time day school; 5 reply that either a part-time day school or a night school is needed; 1 firm answers "trade school" and another "high school"; 9 express no preference. Of those employers who specify individual occupations that schools could be provided for to best advantage, 16 include composition, 5 presswork, 3 engraving, 2 proof reading, and 1 linotype operating; 12 make no reply. In giving their opinion as to what should be taught in such part-time day or night schools 20 employers include English; 17, arithmetic; 12, reading, writing, and spelling; 11, grammar; 7, design; 6, drawing; 5, history of printing; 5, higher mathematics; 4, punctuation; 3, chemistry; 3, color harmony; 2, physics; 2, machine operation; 2, hand composition; 1, manipulative skill; 1, color mixing; 1, bindery handwork; 1, proof reading, and 3, general education; 5 make no reply.

[3] Twenty-one replies were received to the question, "If a part-time day school were established, in your opinion how many hours per week should an apprentice attend?" Three of the 21 employers favor 3 hours per week; 2, 4 hours; 4, 5 hours; 5, 6 hours; 1, 8 hours; 4, 10 hours; 1, 12 hours; and 1, 15 hours. Twenty-nine employers make no reply. The large number making no reply is accounted for to a considerable extent by the fact that the employers who prefer a night school naturally do not answer this question.

ing, bookbinding, and designing. Seven firms are willing to enter for all occupations. Practically the same occupations are specified as being those for which such an agreement would be most valuable.

EVENING-SCHOOL COURSES FOR JOURNEYMEN.

In specifying subjects which should be covered in evening-school courses for journeymen, drawing and design, history and chemistry of the trade, modern methods, and ink mixing are mentioned. The employers feel that the new features and ideas that are constantly being brought forward in the trades should be covered in evening lectures, demonstrations, and courses.[1]

HOURS, WAGES, AND OCCUPATIONS.

In the tables following are presented statistics relative to regular hours of labor per day and week in the printing trades establishments; number of beginners employed aged 14 to 22 years; usual and preferred age of beginners; wages of beginners, and usual wages the second year; number reported as employed in the summer of 1914, classified by sex and occupation; and range of wages paid workers, classified by sex, in reported occupations.

The hours of labor vary from 46 to 54 per week with practically all establishments working a short Saturday of from 4 to 6 hours. The newspaper plants work either 45 or 48 hours, with no short Saturday.

The minimum wage reported for males, exclusive of apprentices and flyboys, is $4, which is received by one employee who packs cards, letterheads, stationery, etc. Aside from this one instance, the minimum is $6, reported for press feeders; the maximum, $35, is reported for steel engraver and photo-engraving operator. For females, exclusive of apprentices, the minimum is $4.08, this wage being reported for cigarette-book makers, while the maximum wage, $17, is received by a proof reader.

As is shown in Table 65, classifying workers by occupation, bookbinders, compositors, and press feeders constitute the largest occupational groups. Of the 384 females, 224 are bookbinders, 54 press feeders, 14 hand and power stampers, 5 monotype operators, 5 proof readers, 1 is a linotype operator, 1 a ruler, and 80 are employed in miscellaneous occupations. It is thus seen that a majority of the girl help is employed in bookbinding, and that practically all die stamping done in the city is performed by girls.

[1] Thirty-nine replies were received to the question, "What do you believe a night school should teach to help the journeyman who wants to advance in his trade?" Following is a list of the subjects suggested and the number of employers specifying each subject: English, 12 employers; design, 9; drawing, 6; history of trade, 6; estimating and cost finding, 5; arithmetic, 5; color harmony, 4; chemistry of the trade, 4; lectures and demonstrations, 4; modern methods, 4; grammar, 3; higher mathematics, 3; punctuation, 2; reading, 2; writing, 2; spelling, 1; physics, 1; ink mixing, 1. One employer who replies that "such a school should keep the journeyman abreast of the progress of the time both at home and abroad," aptly expresses the sentiment of 6 employers who make replies along this line.

TABLE 61.—REGULAR HOURS OF LABOR IN PRINTING TRADES ESTABLISHMENTS.

Hours per day.	Employees working specified number of hours per day.		Hours per week.	Employees working specified number of hours per week.	
	Number.	Per cent.		Number.	Per cent.
7½ and under 8	24	2.0	45	22	1.8
8 and under 8½	91	7.4	48	546	43.9
8½ and under 9	435	35.5	50	11	.9
9 and under 9½	238	19.4	51	90	7.2
9½ and under 10	438	35.7	54	575	46.2
Total	[1] 1,244	100.0	Total	1,244	100.0

[1] This is not the sum of the items because of the 49 establishments reporting number of employees all did not report on this particular question. The percentages are based on the number reported, 1,226.

TABLE 62.—BEGINNERS REPORTED IN THE PRINTING TRADES ESTABLISHMENTS, BY AGE GROUPS.

Age.	Number.
14 and 15 years	37
16 and 17 years	71
18 to 22 years	70
Total, 14 to 22 years	178

TABLE 63.—USUAL AND PREFERRED AGE OF BEGINNERS IN PRINTING TRADES ESTABLISHMENTS.

Age.	Number of employers reporting specified age at which beginners—	
	Usually enter.	Are preferred.
13 years	1	1
14 years	2	2
14 to 15 years		3
14 to 16 years	6	
15 to 16 years	2	2
15 to 17 years		1
15 to 18 years	1	1
14 to 18 years	1	
15 years	11	
16 years	12	14
18 years		2
16 to 18 years	1	1
Total	37	27

TABLE 64.—WAGES PER WEEK OF BEGINNERS IN PRINTING TRADES ESTABLISHMENTS AND USUAL WAGES SECOND YEAR.

Wages per week.	Number of establishments reporting specified wage.				Total.
	Printing establishments.	Bookbinding establishments.	Photo-engraving and lithographing establishments.	Plate engraving establishments.	
Beginner:					
$2.50	1				1
$3.00	4	2	1		7
$3.50	3				3
$4.00	6	1		1	8
$4.50	1				1
$5.00	1		1		2
Total	16	3	2	1	22
Second year:					
$3.50	1				1
$4.00	1	2	1		4
$4.50	4				4
$5.00	2	1	1		4
$5.50	1				1
$6.00					
$6.50	1				1
$7.00					
$7.50					
$8.00			1		1
Total	10	3	3		16

TABLE 65.—EMPLOYEES IN PRINTING TRADES ESTABLISHMENTS, BY SEX AND OCCUPATION, MAY AND JUNE, 1914.

Occupation.	Establishments reporting.	Employees in shops reporting.		
		Males.	Females.	Total.
Hand typographers	37	147		147
Monotype operators	7	16	5	21
Linotype operators	9	51	1	52
Proof readers	22	30	5	35
Make-up men	11	19		19
Stonehands	10	13		13
Web pressmen	5	8		8
Cylinder pressmen	20	68		68
Platen pressmen	27	46		46
Pressmen's helpers	11	24		24
Press feeders	28	100	54	154
Stereotypers	9	21		21
Photo-engravers (artist)	2	10		10
Photo-engravers (mechanic)	3	17		17
Bookbinders (hand)	15	57	171	228
Bookbinders (machine)	2	12	53	65
Rulers	9	17	1	18
Paper cutters	16	37		37
Lithograph engravers	3	9		9
Lithograph pressmen	3	12		12
Lithograph designers	2	3		3
Lithograph transferrers	3	9		9
Lithograph press feeders	2	15		15
Lithograph flyboys	3	7		7
Steel engravers	4	7		7
Plate printers	4	8		8
Hand and power stampers	4	1	14	15
Miscellaneous	12	12	80	92
Apprentices	24	84		84
Total		860	384	1,244

TABLE 66.—RANGE OF WEEKLY WAGES IN PRINTING TRADES ESTABLISHMENTS, BY OCCUPATION AND SEX, 1914.

Occupation.	Number of shops reporting.	Employees in shops reporting.		Weekly wages.			
				Males.		Females.	
		Males.	Females.	Lowest.	Highest.	Lowest.	Highest.
Hand typographers	34	137		$12.50	$32.00		
Monotype operators	7	16	5	19.00	26.75	$8.16	$16.00
Linotype operators	9	51	1	12.50	27.00	11.00	11.00
Proof readers	21	28	5	18.00	30.00	10.00	17.00
Make-up men	10	19		17.00	27.00		
Stonehands	9	12		17.00	27.00		
Web pressmen	4	7		10.00	27.00		
Cylinder pressmen	20	68		11.00	22.50		
Platen pressmen	26	45		9.00	25.00		
Pressmen's helpers	10	20		6.00	22.00		
Press feeders	27	99	54	6.00	16.00	5.00	12.00
Stereotypers	8	21		9.00	21.00		
Photo-engravers (artist)	2	10		18.00	30.00		
Photo-engravers (mechanic)	2	17		18.00	35.00		
Bookbinders (hand)	15	57	171	10.00	25.00		
Bookbinders (machine)	2	12	53	12.00	21.00	[1] 4.00	14.00
Rulers	9	17	1	15.00	21.00	7.00	7.00
Paper cutters	16	37		10.00	20.00		
Lithograph engravers	3	9		26.00	30.00		
Lithograph pressmen	3	12		15.00	25.00		
Lithograph designers	2	3		28.00	30.00		
Lithograph transferrers	3	9		22.00	30.00		
Lithograph press feeders	2	15		7.14	10.00		
Lithograph flyboys	5	7		4.00	5.10		
Steel engravers	4	7		15.00	35.00		
Plate printers	4	8		12.00	27.00		
Hand and power stampers	4	1	14	10.00	10.00	5.50	10.00
Miscellaneous	11	9	78	4.00	22.00	4.08	12.00
Apprentices	17	62		2.50	12.00		
Total		815	382				

[1] This wage is paid to apprentices.

ANALYSIS OF OCCUPATIONS IN DETAIL.

HAND COMPOSITION.

Processes.—Composition is the art of assembling type for the purpose of making printed reproductions of the characters so assembled. The work of the hand compositor falls into three distinct lines—straight composition, tabular matter, and display work. By straight composition is meant such work as book and pamphlet composition or newspaper reading matter. Tabular and rule and figure matter consists of such work as railroad time-tables, tabulations, price lists, etc. Display or job composition embraces such work as cards, labels, letterheads, title-pages, posters, and all work in which the element of display enters.

It is obvious that the straight-matter compositor has to concern himself chiefly with the correct setting of the type, the proper spacing, and length of line. The tabular-matter compositor, although he has a more or less definite copy form to follow, must exercise considerable mechanical skill and ingenuity in spacing, and cutting and fitting rules, etc. The elements of proportion and design also enter somewhat into his work. Display or job composition requires a knowledge of the principles of design, especially with reference to balance, proportion, shape and tone harmony, arrangement of lines and masses for the filling of space, etc. A knowledge of color harmony is also necessary. On the mechanical side, the job compositor must also possess considerable skill in accurate spacing and correct alignment, etc., in order that the execution of his work shall accurately follow the design.

The composing or setting of type is done as follows: The compositor selects the desired type one at a time from a case and places it in a small frame or container called a "composing stick" which he holds in his left hand. One side of this "stick" is slidably mounted so that it can be adjusted to the length of the line of type to be set up. If straight or tabular matter is being set, line after line is thus set up until the stick is full, when it is carefully removed from the stick and placed in a shallow tray or frame with upright sides called a galley. Display matter is generally set up in the stick, though for some very large work it may be set in the galley or even on an imposing stone. The display compositor also generally "makes up" his own forms.

Product or specialties.—The product of the hand compositor includes bodies of type composed or assembled for reproduction but not necessarily made up into the final forms.

Importance of the trade.—According to the returns on the survey schedules, which are practically complete for the trade, there are in Richmond 147 hand compositors, all males.

Conditions of employment.—The hand compositor's work does not involve any peculiar physical or nervous strain. All of the work stimulates the interest, the finer grades especially. No peculiar occupational diseases were reported in Richmond, although dust from type metal may cause lead poisoning. While tuberculosis is known to be common among printers, no Richmond figures are available.

Economic conditions.—The seasonal fluctuation in demand for workers is approximately 13 per cent. Owing to the many kinds of printing done, the busy and slack seasons vary throughout the trade, but in general the period from September to June is considered the busy season and July and August the slack season. Regular hours of labor per day and week vary. In newspaper offices hours are from 7½ to 8 per day, 45 to 48 per week; in other plants from 8 to 10 hours per day, 46 to 54 per week; practically all establishments, except newspapers, work a short Saturday of from 4 to 6 hours.

A compositor's apprentice receives from $3 to $4 per week during his first year of apprenticeship, $4 to $5 per week in the second year. No regular scale of wages is maintained for the third, fourth, and fifth years, the wage being dependent on individual proficiency. Journeymen receive from $12 to $32 per week, the union scale being 33⅓ cents per hour or $16 per week. The trade is about 80 per cent organized.

Age of maximum productivity.—Boys enter the trade between the ages of 15 and 16 and serve an apprenticeship of about five years. The period of maximum productivity is between the ages of 21 and 50.

Demand for labor.—The demand for labor is increasing. The supply of highly skilled workers is inadequate, that of medium grade labor is ample. Workers are recruited from boys in the grammar grades and transient journeymen.

Educational and technical requirements.—The compositor should have a good general elementary education, especially in English, with emphasis on punctuation and spelling. A very considerable amount of trade and technical knowledge is necessary. The compositor should be familiar with the principles of design, color harmony, and lettering; the composition of forms for letterheads, business cards, covers, title-pages, and other display matter, and have some knowledge of proofing and imposition. The manipulative skill required in picking up and handling type rapidly and accurately is very considerable. Accuracy is of first importance to the compositor, while initiative, a quick memory, and artistic sense are very necessary.

What the industry gives.—The period of apprenticeship is five years. Wages are generally increased every six months, and in some cases a bonus is given at the termination of the apprenticeship. This five-year apprenticeship should give the boy the necessary facility in handling type and in composition; sufficient trade knowledge to make him a profitable producer, but not enough for the greatest possible efficiency.

As there is no provision made in the shop for systematic instruction of either apprentices or journeymen the extent to which the trade can be learned in the shop is limited, and is becoming more limited each year, owing not so much to the fact that less information is available or that specialization has narrowed opportunity, as to the fact that more and more is demanded of the compositor if he is to meet successfully the modern requirements as to artistic and harmonious composition. That this demand has not been fully met is evidenced by the rising influence on the trade of the commercial artist and designer. The line of promotion is from journeyman to foreman.

Deficiencies of workmen.—The common deficiency of compositors is lack of sufficient knowledge of English, punctuation, and spelling, and especially of the principles of design and color harmony.

What the school ought to give.—Before entering the shop the boy should have received a complete elementary school education and prevocational courses, with emphasis on English, spelling, and punctuation. Apprentices and journeymen should receive specialized courses dealing with the principles of design, color harmony, lettering; composition of forms for letterheads, business cards, title-pages; i. e., fundamental principles of typography, including the history of the trade; modern methods and trade news.

LINOTYPE COMPOSITION.[1]

Processes.—The linotype method of composition differs from that of the monotype in that a solid line of composed and justified type is cast in one piece (slug) by one machine, instead of casting individual type through the agency of two machines, as is the monotype method.

The linotype operator works at a keyboard something like that of a typewriter. Above and at the back is located a magazine which holds hundreds of flat brass plates called matrices, having inserted in one edge a female letter or character. The depression of a key on the keyboard causes a matrix to be released. Whereupon it is conveyed to a suitable holder. When sufficient matrices are assembled to form the desired line of type the line of matrices is automatically transferred to a mold, of which it forms the face. The line of type is cast in this mold in one piece or slug, which is automatically conveyed to its proper place in the galley, and the matrices after being used are automatically returned to their proper location in the magazine.

While linotype work may be divided into three distinct occupations—operator, machinist-operator, and machinist—the general demand is for machinist-operators, men who can operate and at the same time keep the machine in good running order.

Product or specialties.—Galleys of composed and justified type, each line of which is in one piece, constitutes the product of the linotype operator.

Importance of the trade.—According to the returns on the survey schedules, which are practically complete for the trade, there are 52 linotype operators in Richmond.

Conditions of employment.—The close and long-continued application to his work, required of the operator, induces nervous strain. All of the work tends to stimulate the intelligence, provided there is sufficient variety. No peculiar occupational diseases were reported in Richmond, although fumes from the pot of melted type metal may be injurious. No figures were available to show the extent of tuberculosis among printers.

Economic conditions.—The economic conditions governing linotype composition are practically the same as for hand composition (see p. 107), except as to the wages received. Journeymen receive from $12.50 to $27 per week. The union scale is 41⅔ cents per hour, or $20 per week.

[1] This outline is based on the assumption that the linotype operator has also been trained in hand composition.

Age of maximum productivity.—Boys enter the trade between the ages of 15 and 16, and serve an apprenticeship of five years. The period of maximum productivity is between the ages of 21 and 50.

Demand for labor.—The demand for labor is increasing. High-grade workmen are difficult to obtain, but the supply of medium-grade workmen is ample. Workers are recruited from among the apprentices and journeymen hand compositors.

Educational and technical requirements.—The linotype operator should have a good general elementary education, especially in English, with emphasis on punctuation and spelling. Linotype composition consists of straight matter and tabular work, and therefore does not require the very considerable amount of technical knowledge necessary to a display-matter compositor. The operator should know how to care for and repair his machine. Accuracy is of first importance to the linotype operator, as well as dexterity and a quick memory.

What the industry gives.—The period of apprenticeship is five years. Wages are generally increased every six months. This five-year apprenticeship, which includes training in hand composition, should give the boy the necessary facility in operating the linotype machine, and sufficient trade knowledge to make him a profitable, if not a most efficient, producer. There is no provision made in the shop for systematic instruction of either apprentices or journeymen. The line of promotion is journeyman to foreman.

Deficiencies of workers.—The common deficiencies of linotype operators are lack of sufficient knowledge of English, punctuation, and spelling, and lack of rapid and efficient manipulative skill.

What the school ought to give.—Before entering the shop the boy should have received a complete elementary-school education and prevocational courses, with emphasis on English, punctuation, and spelling. Apprentices and journeymen should receive specialized courses dealing with the fundamental principles of typography, including history of the trade, modern methods, and trade news.

MONOTYPE COMPOSITION.[1]

Processes.—Machine composition by the monotype method is done with the aid of two machines, a composing machine and a type-casting machine. The composing machine has a keyboard very similar to that of a typewriter, except that there are many more keys. In fact the general appearance of the composing machine is not unlike that of a large typewriter mounted on a pedestal. On the back of the machine are two spools, from one of which a paper ribbon is automatically unwound, passed above a row of punches, and rewound on the other spool. The manipulation of the keys causes the punches to perforate the ribbon as it passes above them, giving it a very similar appearance to that of the music roll used in a self-playing piano. When the roll is full it is taken off the machine and sent to the monotype caster.

The monotype caster operates a machine which automatically casts and sets type. The spool of paper ribbon is placed in position on the casting machine, and as it unwinds compressed air is forced through the perforations, each of which corresponds to the letter or typographical symbol of the "copy." This jet of air sets in motion the machinery which places the proper type matrix, or mold, in position, and completes the work of casting the type and placing it in position in the galley. The operation of the machine is entirely automatic, except for the occasional replenishing of the type metal in the melting pot and the taking away of the full galleys of type. The machine automatically stops if any mistake or accident occurs. The

[1] This outline is based on the assumption that the monotype operator has also been trained in hand composition.

chief duties of the caster man, or monotype machinist as he is coming to be called, are to set the machine for work to be done and to keep it in running order. At least one skilled man is required to take charge of the caster machines, although boys are usually employed if assistants are needed.

Product or specialties.—Monotype composition consists of straight matter and tabular work, and its product is galleys of composed and justified type.

Importance of the trade.—According to the returns on the survey schedules, which are practically complete for the trade, there are 21 monotype operators in Richmond.

Conditions of employment.—The close and long-continued application to his work required of the monotype operator induces nervous strain. All of the work tends to stimulate the intelligence, provided there is sufficient variety in copy. No occupational diseases were reported in Richmond, although the lead dust necessarily means danger of lead poisoning. No figures were available to show the extent of tuberculosis among monotype operators.

Economic conditions.—The economic conditions governing monotype composition are practically the same as for hand composition (see p. 107), except as to wages received. Both males and females are engaged in monotype operating. Journeymen receive from $19 to $26.75 per week; women from $8.16 to $16 per week. The union scale is 41⅔ cents per hour, or $20 per week.

Age of maximum productivity.—Boys enter the trade between the ages of 15 and 16 and serve an apprenticeship of five years. The period of maximum productivity is between the ages of 21 and 50.

Demand for labor.—The demand for well-equipped skilled workers is increasing. The supply of high-grade labor is insufficient, while that of medium-grade labor is ample. Workers are recruited from hand-composition apprentices and journeymen.

Educational and technical requirements.—The monotype operator should have a good general elementary education, especially in English, with emphasis on spelling and punctuation. Monotype composition consists of straight matter and tabular work and therefore does not require the very considerable amount of technical knowledge necessary to a display compositor. The operator should know how to care for and repair the machines. Accuracy is of prime importance to the monotype operator, as well as dexterity and a quick memory.

What the industry gives.—The period of apprenticeship is five years. Wages are generally increased every six months. This five-year apprenticeship, which includes training in hand composition, should give the boy the necessary facility in operating the composing machine; sufficient trade knowledge to make him a profitable producer, but not enough for the greatest efficiency. There is no provision made in the shop for systematic instruction of either apprentices or journeymen. The line of promotion is journeyman to foreman.

Deficiencies of workers.—The common deficiencies of monotype operators are lack of sufficient knowledge of English, spelling, and punctuation, and lack of rapid and efficient manipulative skill.

What the school ought to give.—Before entering the shop the boy should have received a complete elementary-school education and prevocational courses, with emphasis on English, punctuation, and spelling. Apprentices and journeymen should receive specialized courses dealing with the fundamental principles of typography, including history of the trade, modern methods, and trade news.

STEREOTYPING.

Processes.—Stereotyping is the process of making metal plates, reproducing in facsimile the surface of engravings or type set up as for direct printing. The stereotype plate is made in the following manner: The form of type which is to be reproduced is imposed in an ordinary chase in the same manner as for direct printing except that iron bearers, type high, are placed all around the type matter before the form is locked up. The material for the matrix, by the papier-mâché process, is formed by spreading paste on a sheet of moderately thick unsized paper and covering it with successive sheets of tissue paper, each carefully pasted and rolled down smooth. This prepared sheet is saturated with water, laid on the form, tissue side next to the type, and then is thoroughly beaten into the form with a stiff brush. By another method, used especially in newspaper offices, the material is forced into the form by means of a power roller exerting great pressure. After being beaten in, the form and sheet, covered with a blanket, are conveyed to a drying press or steam table to be "cooked," which consists of applying heavy pressure while at the same time subjecting them to considerable heat. The matrix thus becomes dry and hard very quickly. It is then taken from the drying press, removed from the form, its edges trimmed, and then placed face up on the bottom of a casting box, where it is held firmly in position while the lid is fastened down. Molten metal is then poured in at one end of the casting box, after which the plate thus formed is removed, trimmed, and sent to the pressroom.

Product or specialties.—Metal plates reproducing in facsimile the surface of engravings or type and called stereotype plates are the product of the stereotyper.

Importance of the trade.—According to the returns on the survey schedules, which are practically complete for the trade, there are 21 stereotypers in Richmond.

Conditions of employment.—The stereotyper is compelled to work in a very high temperature, especially in the summer. The work also involves considerable heavy lifting. The molten metal gives off fumes that are injurious to the health, and there is also liability of being burned by the hot metal. The knowledge that the good appearance of the finished print depends largely upon his skill and ability naturally tends to stimulate the interest of the stereotyper.

Economic conditions.—There is very little seasonal fluctuation in the demand for workers. The busy and slack seasons and hours of labor are practically the same as for compositors. No information is available as to the wages paid during the apprenticeship. Journeymen are reported as receiving from $9 to $21 per week. The union scale is 35.42 cents per hour, or $17 per week.

Age of maximum productivity.—Boys enter the trade between the ages of 16 and 18 and serve an apprenticeship of five years. The period of maximum productivity is between the ages of 21 and 50.

Demand for labor.—The supply of labor is sufficient to meet the present demand. High-grade labor is always in demand. Workers are recruited from among boys in the grammar schools and from casual labor.

Educational and technical requirements.—The stereotyper should have a good elementary-school education. Very little technical knowledge is required. The trade knowledge consists of the necessary information in regard to the preparation of mats, how to "beat in" in forming matrices, the proper length of time to "cook," proper temperature of type metal for casting, how to prepare matrix and casting box for casting, and how to correct errors in stereotype plate. A very considerable amount of manipulative skill in handling the brush in "beating in," and in handling and pouring hot metal, is necessary. The essential qualities are accuracy, strength, patience, and endurance.

What the industry gives.—The term of apprenticeship is five years. Under favorable conditions practically all of the necessary trade knowledge may be acquired in the shop, as well as the required manipulative skill. However, there is no provision made for the systematic instruction of either apprentices or journeymen. There is little opportunity for promotion, except in the large shops and newspaper offices where the promotion is to foreman.

Deficiencies of workmen.—The most common deficiency of stereotypers is lack of sufficient trade knowledge.

What the school ought to give.—Before entering the shop the boy should have received a complete elementary-school education and prevocational courses. Apprentices and journeymen should receive specialized courses dealing with theory and history of the trade, modern methods and practices.

PROOF READING.

Processes.—The proof reader's duty is to read the proof, comparing it with the original copy, and to note all errors made in composition, whether mechanical or in punctuation and spelling. The proof reader may be assisted by a copy holder, whose duty is to read aloud to the proof reader. After the compositor has made the corrections as indicated by the proof reader another proof is "pulled," and if necessary further corrections are made. When the proof is reasonably correct and the proof reader has "queried" to the author any doubtful points to which it is desirable that the latter's attention should be drawn, it is known as the first revise and is ready to be sent, along with the original manuscript, to the author for correction or alteration. When the proof is returned and the final corrections are made, the galleys of type and the proofs are turned over to the "make-up" man. After the matter has been made up into pages another proof is made and corrections noted. In bookwork a final or (F) proof is made after the forms have been imposed.

Products or specialties.—Revised proof; the duties of a proof reader practically make him the author's representative in the composing room.

Importance of the trade.—According to the returns on the survey schedule, which are practically complete for the trade, there are 33 proof readers in Richmond.

Conditions of employment.—Constant reading induces eyestrain, which in turn often produces nervous strain. Proof reading not only stimulates the interest, but is unusually widening and broadening to the intelligence. There are no peculiar occupational diseases.

Economic conditions.—The seasonal fluctuation in demand for workers is approximately 13 per cent. Owing to the many kinds of printing done, the busy and slack seasons vary throughout the trade, but in general the period from September to June is considered the busy season and July and August the slack season. Regular hours of labor per day and week vary. In newspaper offices hours are from 7½ to 8 per day, 45 to 48 per week; in other plants, 8 to 10 per day and 46 to 54 per week. Practically all establishments except newspapers work a short Saturday of 4 to 6 hours.

So far as reported, there is no formal apprenticeship. Both males and females are employed in proof reading. Journeymen receive from $18 to $30 per week. There is no union scale.

Age of maximum productivity.—Boys or girls enter the trade between the ages of 17 and 20 and are advanced according to individual proficiency. The period of maximum productivity is between the ages of 21 and 50.

Demand for labor.—The demand for efficient proof readers is increasing. Workers are recruited from boys and girls who have completed the grammar school or have done high-school work.

Educational and technical requirements.—The proof reader should have a good elementary education and in addition a high-school English course or a special course giving thorough training in English, with emphasis on punctuation and spelling. The trade knowledge required consists of a knowledge of the use of the conventional signs, symbols, and markings used in correcting proofs. Accuracy, keenness of sight, and quick perception are qualities very essential to the proof reader.

What the industry gives.—There is no formal apprenticeship, nor is there any provision made in the shop for systematic instruction. Increase in wage depends on individual proficiency. The only promotion possible is from proof reader to head proof reader.

Deficiencies of workers.—The common deficiencies of proof readers are insufficient education and lack of special adaptability.

What the school ought to give.—Before entering the shop the boy or girl should have received an elementary and high-school education or, in place of the high-school course, a special course in English with emphasis on punctuation and spelling. Those already in the shop should receive specialized courses in English, and in history and modern practices of the trade.

MAKE-UP AND IMPOSITION.

Processes.—While the occupation of the make-up man is distinct from that of the stonehand, the work is similar in nature, and in Richmond the make-up, imposition, etc., are generally done by one man, as few establishments are large enough to require both a make-up man and stonehand.

The make-up man receives the galleys of composed type or linotype slugs and a proof of the same. He divides this matter into page lengths, inserts the cuts, puts in the running titles and folios, spaces the pages out to equal lengths, and then ties them up with strong cord to prevent them becoming "pied." Proofs are then pulled and corrections made, and a set of proofs is sent to the stonehand, in case there is a separate man for this work.

The pages of type are then ready for imposition, which consists of laying them in their proper order on a smooth even surface, generally a table with an iron or marble top, which is called an imposing stone. A strong iron frame called a chase is put around the pages, the margins are properly spaced, the type leveled down with a mallet and planer, and the form securely locked up by means of sets of double wedges called quoins. Any number of pages may be imposed in one form according to the size of the page and press to be used, but the usual number is from 4 to 32 pages in units of four pages. In bookwork a final or (F) proof is then made and the forms are ready to be electrotyped, stereotyped, or sent directly to the press, according to the method to be used.

Product or specialties.—The assembling of galleys of type into suitable form for reproduction by the electrotype or stereotype methods or for direct use in the printing press constitutes the product of make-up and imposition work.

Importance of the trade.—According to the returns on the survey schedules, which are practically complete for the trade, there are 32 make-up men and stonehands in Richmond.

Conditions of employment.—There is nothing in the make-up or imposition work that subjects the worker to any unusual physical or nervous strain. The work stimulates the interest to a moderate extent, especially the higher grade. So far as known, there are no peculiar occupational diseases.

Economic conditions.—Seasonal fluctuations in hours of labor are the same as for hand compositors (see p. 107). Journeymen receive from $17 to $27 per week. The make-up men and stonehands are not organized independently, but a considerable number of them belong to the typographical union.

Age of maximum productivity.—Boys enter the trade between the ages of 15 and 16. No information was received indicating a definite apprenticeship. The period of maximum productivity is between the ages of 21 and 50.

Demand for labor.—The demand for labor is increasing. The supply is inadequate for the present demand. Workers are recruited from boys in the grammar grades and transient journeymen.

Educational and technical requirements.—Both the make-up man and the stonehand should have a good general elementary education. The trade knowledge required is not of an extremely varied nature. It is necessary to be familiar with the best methods of handling bodies of type, inserting cuts, folios, and running titles, and tying up pages; also to know how to impose forms, space margins, and lock up. No special technical knowledge is required.

What the industry gives.—There is no available definite information as to the apprenticeship, but wages are advanced according to individual proficiency. Sufficient trade and technical knowledge may be gained in the shop to make the worker a profitable producer, but not enough for the greatest efficiency. The necessary dexterity in handling bodies of type rapidly and accurately can be gained in the shop. No provision is made in the shop for the systematic instruction either of apprentices or journeymen, and in fact the greater part of the required trade knowledge could be learned to good advantage outside of the shop. So far as Richmond shops are concerned there is practically no opportunity for promotion, except by changing occupations.

Deficiencies of workmen.—The common deficiency is lack of general and trade knowledge.

What the school ought to give.—Before entering the shop the boy should have received a grammar-school education and prevocational courses until the sixteenth year. Journeymen as well as those learning the trade should take specialized courses dealing with imposition, and the theory and history of the trade. On the manipulative side dexterity in handling bodies of type rapidly and accurately is very necessary. Strength, accuracy, and initiative are among the essential qualities.

PRESSWORK.

Before describing in some detail the occupations in the pressroom, it may be of advantage to give a brief description of the methods of printing and of the presses or machines employed in these methods.

There are three methods employed in printing, each one separate and distinct from the others. They are:

1. The relief method, consisting chiefly of typography, but including printing from wood blocks, halftones, and etchings, which are carved or engraved in relief.

2. The intaglio method, or printing from plates that have been etched or engraved, the etched part being filled with ink and printed on some medium by pressure. This includes steel and copperplate engraving, photo-engraving, etc.

3. The lithographic method, consisting principally of lithography, or printing from stone or from zinc or aluminum plates.

Regardless of the method used the end is accomplished by transferring, by contact and by pressure, the ink or color from the form or design to the medium to be printed. The presses employed are somewhat similar, although differing in some minor points.

The first printing press was the "wooden-screw" press, in which the pressure was applied, after the form had been inked and the paper put on, by lowering the screw. After each impression the screw was raised and the printed sheet taken out. This was the form of press used by Gutenberg. The first improvement in this machine was made in 1620, when a device was installed for rolling back and forth the bed on which was fastened the type, thus obviating the necessity for lifting the bed out by hand. Various other improvements were made from time to time until there are now in use machines for all classes of work from job work to the printing of newspapers. These presses fall under two general heads, platen and cylinder. In the platen press the form and the platen, or impression surface, are both flat, the impression being made by bringing both surfaces together under pressure. This machine is used mostly for small work, such as printing cards, handbills, labels, etc.

The cylinder presses are of two general classes—(1) those in which the bed carrying the form is flat and passes back and forth beneath a revolving cylinder or impression surface; and (2) those where the paper is fed between two cylinders revolving in opposite directions, one carrying the form and the other forming the impression surface. The former is the press in more general use, while the latter is used for newspaper and book work where large editions are printed. Very few hand-power presses are in operation now, except in country offices and in small home plants. The method of driving direct from a motor is becoming more popular all the time, because of the ease of starting and stopping the presses and the convenience of having each press separate from all others by having individual motors.

In the pressroom the different occupations are pressmen, press feeders, and pressmen's helpers. Some plants have no helpers, in which case the work is done either by the pressman or the feeder, or both.

Cylinder Pressman.

Processes.—The operations that generally fall to the pressman are as follows: To make ready forms, to mix inks, to keep color uniform, to avoid imperfect sheets, to register forms, to emboss, and to take care of presses and rollers.

Probably the most important duty of the pressman is to make ready the forms. By this is meant the adjustment of the form on the bed of the press to make the impression clear and even. When the first impression is pulled it may be too weak or too strong in spots, and the pressman regulates this in one or more of three general ways—(1) by applying more pressure, (2) underlaying, and (3) overlaying. If the general tone of the impression is weak, it may be regulated by applying more pressure, but care must be taken not to injure the paper. If this does not suffice, either underlaying or overlaying must be resorted to. By underlaying is meant the raising of the form at the point where the impression is weak, and by overlaying is meant the adding to or building up on the tympan the weak spot and removing from the cylinder some of the paper where the impression is strongest. This is especially difficult on halftone work, where the impression from the halftone is flat and lifeless. One of the tests of a good pressman is his ability to make ready halftone work.

Another very important part of a pressman's duty is his ability to keep the colors uniform. He must not only be able to regulate the amount of ink to be used but to detect the slightest change in color that may occur. This is especially difficult and important when matching colors on work which may have been printed for some time.

A pressman must detect instantly any imperfections in the sheets as they come from the press. Sometimes the forms get dirty and clogged up and the impression is not clear, or particles of foreign matter may get on the tympan or plate and cause a blur. Whatever the cause, it must be quickly detected and remedied. The pressman must be able to mix inks and match colors, and he should therefore develop, if possible, a sense of color harmony. The pressman must see that the forms register and that the margins are correct. This is especially important in bookwork, where a very unpleasing effect is caused by lack of uniformity in the margins. This is remedied by adjusting the form until it registers correctly.

The care of the press is of prime importance. If it is not properly oiled and cleaned and watched for any sign of mechanical disorder it will finally become unfit for good work, so that no matter how carefully the pressman makes ready, mixes the inks, or feeds the press the best results can not be obtained.

The chief difference between the work done by the pressman on the platen and flat-bed cylinder machine and that done on the web or newspaper press is in the makeready, due to the difference in the forms. The form on the web press is cast in one piece to fit the cylinder that holds it, and the impression is regulated altogether by underlaying. Since newspapers must be printed in a very short time, the question of rapidity of production is important. Hence web pressmen are required who can produce the work in the limited time allowed. There is generally a pressman in charge in a newspaper plant who has general oversight of the machine and work.

Product or specialties.—The product or specialty of the pressman is the production of printed matter from type forms in one or more colors. These forms may be made of type, or may be electrotyped or stereotyped.

Importance of the trade.—According to the information obtained on the schedules, there are 68 cylinder pressmen in Richmond. This does not include, however, the platen pressmen, who number about 45.

Conditions of employment.—The most serious strain the pressman is subjected to is that caused to the eyes by making ready difficult forms. Constant scrutiny of the printed sheets as they come from the press in order to detect any imperfections sometimes causes an eyestrain, and the noise and vibration of the press affect some men. Some pressmen suffer because of the lack of ventilation in a pressroom that must be closed at times to avoid drafts and dampness and to make the ink flow properly.

Most all work of the pressman is of a nature to stimulate interest, and this is especially true of color work, high-grade advertising, and catalogue work. There is nothing to restrict the mental development, even if work lacking variety does not stimulate. It is a debatable question whether or not the inks are injurious, some pressmen holding to the view that they are and others that they are not.

Economic conditions.—The beginning wage of a pressman's apprentice is generally from $3 to $4 per week, with an increase of 50 cents per week each six months. This scale is not uniform in all the shops, for there is no understanding among the printers regarding the employment of apprentices or the wages paid. The minimum wage for a pressman reported on the schedules is $11 per week and the maximum $22.50. The union scale is $14 per week.

The hours of labor per week are from 45 to 48 in newspaper plants and from 46 to 54 in all other establishments. Hours per day vary from 7½ to 8 in newspaper plants and from 8 to 10 in all other shops. Practically all establishments, except newspapers, work a short Saturday of from 4 to 6 hours. The busy season is generally from September 11 to June 1 and the dull season during the summer months. The fluctuation in employment during 1913 was about 13 per cent, an approximation secured from the maximum and minimum number of employees during that year.

Age of maximum productivity.—Boys generally enter the printing trade between the ages of 15 and 16, and the time required to learn the trade varies from four to five years, being generally five. The age period of maximum productivity is so dependent upon the worker that no definite conclusion can be drawn. It is the opinion of a number of printers, however, that this period is between the ages of 21 and 50.

Demand for labor.—The supply of skilled, efficient pressmen is somewhat limited, but there seems to be an abundance of pressmen of the ordinary type. One reason for the shortage of skilled pressmen is the lack of a definite apprenticeship system. The demand for them seems to be increasing.

Educational and technical requirements.—A pressman should have a good general education, at least through the grammar grades, with emphasis on colors, free-hand drawing, and English. He needs to know the chemistry of inks, color harmony, different methods of make-ready, proper speeds of press for different classes of work, adjustment of ink flow, and how to detect and remedy imperfect sheets. He should also know something of the processes of lithography, engraving, stereotyping, and electrotyping, and of all the modern methods used in an up-to-date pressroom. He must be able to detect any changes of color in the impression and to correct same. Because of the very nature of some of the work a pressman must be accurate, quick, patient, and possess some initiative.

What the industry gives.—There is no regular period of apprenticeship in most of the print shops in Richmond, but the majority of those reporting gave it as from four to five years. Practically none of the shops give systematic instruction to the apprentice or journeyman, and only a little technical knowledge can be acquired without some instructions. The manipulative skill required to run the press and the trade knowledge necessary for turning out the work can be learned in the shop. It is very difficult, however, for a boy to learn ink mixing, color harmony, and the kindred subjects there.

The line of promotion is generally from an apprentice boy to a pressman; from a press feeder, who is given a chance to learn the work of the pressman, to a pressman. From a pressman the only line of promotion is to a foremanship.

Deficiencies of workmen.—The most common deficiencies of the pressman are his inability properly to make ready all forms of work and his limited knowledge of anything pertaining to printing outside of his own shop. Another deficiency quite common is the pressman's lack of knowledge of the mechanism of the press, being therefore unable to make simple repairs and adjustments when anything goes wrong.

What the schools ought to give.—The schools should give a boy a good general education supplemented by a prevocational course to determine his aptitude for printing. After a boy has entered the shop and decided to become a pressman he should be given an opportunity in a day or night school to study the technical features of his work that can not be learned in the shop, such as the theory and history of the trade, mechanism of printing presses, chemistry of inks, color harmonizing, electrotyping, stereotyping, engraving, and lithography. This work should be carried on in connection with courses in English and arithmetic as applied to the printing trade. This course of work is applicable to day or night classes and to apprentices or journeymen.

Press Feeder.

Processes.—A press feeder is primarily one who feeds paper to the presses, but he also has some other duties to perform. They are (1) to make general wash up of press and rollers; (2) spot up sheet; (3) help make ready; (4) oil press and (5) assist pressman whenever needed.

Platen feeder.—The chief difference between the platen-press feeder and the feeder on a cylinder press is that since on a platen press only small work, such as cards, labels, etc., is done, and the press does not deliver, the feeder must feed with one hand and remove the printed work with the other. He places a stock of paper by his right hand, feeds a sheet at a time with that hand, and after the impression has been made he removes the finished product with his left hand. He must therefore be always on the alert in order to feed the machine, remove printed product, and watch for any imperfections in the impression.

Cylinder feeder.—The cylinder press feeder stands on the side of the press and feeds the sheets of paper, one at a time, to the press. The bed, with a reciprocating motion, moves under the cylinder which forms the impression surface and the impression is made. The sheet is then delivered automatically at one end of the press. The sheets are generally large and hard to handle, and the feeder must acquire the knack of placing the paper, without wrinkles, against the guides in order that it may be fed straight into the press. Otherwise the sheet will go through the press wrinkled or get on to ink rollers and be ruined. The feeder is also expected to watch for any defect in the impression or in the operation of the press and report same to the pressman.

The feeder helps the pressman hang the make-ready, regulate the impression, care for the machine, and make a general wash up of the press and ink rollers. The forms are washed with a solution of lye and water or gasoline and the rollers cleaned with gasoline or oil, or any of the modern noncombustible wash-up fluids.

On some of the latest presses, both cylinder and platen, self-feeding devices for feeding the sheets into the machines are in use, and these of course obviate the necessity of having a feeder for each press. A man is required, however, to furnish the paper to the machine. One man can thus handle several machines.

As stated above, there are no press feeders in the newspaper offices using web presses. The paper is fed from a roll of paper, is printed on both sides as it goes through the press, and comes out in the form of a newspaper, counted, folded, and ready for delivery, at the rate of 60,000 12-page papers an hour, and even faster than that on some of the larger presses.

In some establishments where the feeder is kept busy all the time feeding the press a pressman's helper does such work as assisting the pressman, washing up, oiling the machine, etc. He helps hang the make-ready, cares for the presses, and helps whenever needed on any kind of work incident to the pressroom, except that of feeding the machines.

Importance of the trade.—According to the information obtained on the schedules there are 154 press feeders in Richmond—100 males and 54 females.

Conditions of employment.—Some press feeders are affected by the purely mechanical movement required and by the noise and vibration of the press. Others suffer from long-continued standing at the press. Where much bronzing is done the press feeder may be seriously affected. Confinement and lack of ventilation may also tend to debilitate the feeder. A press feeder's work is not especially stimulating, unless it is color work or there is variety in the class of work he does.

Economic conditions.—The maximum wage per week reported on the schedules for males is $16, for females $12. The minimum wage for males is $6 and for females $5. The press feeders are not organized at present. They were affiliated with the pressmen, but withdrew to form an organization of their own. This organization has since been disbanded. The feeders work from 48 to 54 hours per week, 8 to 10 per day, and practically all work a short Saturday of from 4 to 6 hours. The busy season for feeders is generally from September to June and the dull season in the summer months. The fluctuation in employment is about 13 per cent.

Age of maximum productivity.—Boys and girls generally take up press feeding at the ages of 15 or 16. Because of the nature of the work the age period of maximum productivity is indeterminate.

Demand for labor.—The supply of skilled labor is somewhat limited; the number of beginners and of semiskilled workers is adequate. Since the printing trade in Richmond seems to be growing each year, the demand for feeders will also increase. The feeders are recruited from the ranks of the boys and girls who stop school at an early age to go to work and also from the floaters who go from shop to shop.

Educational and technical requirements.—Very little school training is necessary for the mere purpose of feeding a press, but should the feeder expect to become a foreman he should have the school training necessary to become an efficient pressman. Even if he does not become a pressman, he could hardly afford to have had less than a few years' training in elementary schools to make him a better citizen in being able to read and write and talk intelligently on topics of the day.

The feeder should be able to feed the press so that the paper registers properly; to help the pressman make ready; to make a general wash up of press and rollers. He must necessarily be fast and accurate in feeding, possess a certain amount of strength to be able to stand at the press all day, and have a keen eye to help the pressman discover imperfect sheets.

What the industry gives.—There is no apprenticeship for press feeding. A boy soon learns to feed a press well enough to do simple rough work, and as he becomes more proficient he is given work of a more difficult character. Unless a boy is serving an apprenticeship to become a pressman, press feeding leads nowhere. There are cases, however, where a feeder who has helped the pressman to the best of his ability has gained enough knowledge to become a pressman. This does not happen unless there is close cooperation between the pressman and press feeder. There is no regular line of promotion for a feeder after he has reached his maximum earning power as a feeder. As stated above, he may have the chance to become a pressman, but unless he is an apprentice this is the exception to the rule.

Deficiencies of workers.—The most common deficiency of a press feeder seems to be carelessness in feeding a press, thereby producing imperfect sheets. Another one is the lack of a color sense, in which case the feeder is not able to detect any change of color that may occur on the impressions.

What the school ought to give.—The school should give enough general knowledge to keep the press feeder from being illiterate, even though there is little need for much education in press feeding. After entering the shop the feeder should be taught in a day or night school those subjects in general education which seem necessary and those that apply to a pressman, if the feeder should by any chance become a pressman. No special trade or technical knowledge is necessary for a feeder, and the manipulative skill required must be obtained in the shop.

STEEL AND COPPERPLATE ENGRAVING.

Engraving is the process of reproducing a design by means of sunk lines on a copper or steel plate in order that impressions may be made. The art of engraving on metal is undoubtedly of very ancient origin, the desire to ornament swords, knives, and tools of metal leading the owner to decorate them by means of carving, incised lines, and other forms of ornamentation. The art of engraving in metal for the purpose of printing, however, is of more recent origin, the first known print from an engraving having been made in 1452 by a goldsmith named Finiguerra of Florence, Italy. He made an impression from a silver pax he had engraved for a church. Both the pax and print are now priceless treasures, the former being in the Church of St. John, Florence, Italy, and the latter being in the French National Library at Paris.

Engraving is done in two general ways, by making the depression or sunk lines (1) with a steel tool called the burin or graver and (2) by means of acids. The latter method is called etching. Under the first head may be classed line engraving, mezzotint, and dry point work and under the second etching and aquatint work.

Until recently, portraits and illustrations were, to a large extent, engraved. With the advent of photo-engraving, however, the work that had formerly been engraved has now largely been superseded by half tones and photogravures. This is a much quicker method and less expensive, and for ordinary commercial work is just as good. For fine portrait work, though, the print from the engraved plate is far superior to everything that has ever been done by any other process or method.

Steel and copperplate engraving is now mostly confined to the printing of personal cards, wedding invitations, announcements, stationery, bank notes, and stamps. Because the printing is done almost entirely by hand and the output per day is limited, the work is necessarily expensive. Very few power machines are in use, except in stamp and bank-note work, and they require much attention and handwork.

It is the purpose of this article to deal especially with the side of engraving most commonly seen, that of making calling cards, invitations, stationery, etc., and this description will thus cover, to a large extent, the processes used in other engraved work, the minor differences being omitted. In an engraving shop where work of this character is done the following workers may be seen: Engravers, plate printers, die stampers (hand and machine), and packers.

Processes.—The first step in making an engraving is to have a design, which may be a drawing, painting, or lettering. In some very large shops a designer may be employed for this work, but in most plants it is done by the engraver. It is therefore necessary that the engraver should be able to create original designs and modify those sent him for suggestions until they are artistic and pleasing to the eye. This is also true of lettering, and his working knowledge of different alphabets and styles of letters should not be too limited. Photography has helped the engraver to a large extent in recent years, for instead of reducing or enlarging by hand a picture of a building, say, he photographs it the exact size it is to appear on the engraving and makes a tracing of it on gelatin with a sharp-pointed instrument called a scribe or marking-in point, just piercing the gelatin. This enables him to transfer the design to the metal simply by brushing some powder over the gelatin until the lines have become filled. Then by laying the tracing face down on the die or plate, which has a coating of wax on its surface, the powder adheres to the metal and the design is transferred. This is a great improvement over the old way, wherever a photograph of the exact size can be made. All designs are not made on gelatin first; some are drawn directly on the metal. This is true of simple card work of a few lines.

Assuming the engraver has his design either on gelatin or in mind, he next decides whether to use a copper or steel plate. If the plate is to be used just a few times, he generally selects a copper plate, but in case the plate is to be used over and over again, steel is used, because it lasts longer. For very fine lines, such as are used in portraits, steel is generally used. A method of applying a coat of steel to the copper plate after it has been engraved has proved very successful. The film of steel is heavy enough to protect the copper, and it does not fill up the engraving to any extent. Whichever metal is used, the plate must be perfectly smooth and highly polished until it resembles a mirror. This was formerly done by the engraver, but most plants now buy the plates the proper size, already polished. Some large plants have engravers who make a specialty of either metal or copperplate work, for it is difficult to work on copper and then on steel, because of the difference in the behavior of the metal under the graver. The steel requires much more strength than the copper. A competent engraver must be able to engrave on both copper and steel, because most plants are too small to specialize.

When the plate has been selected the engraver proceeds to transfer or draw the design. If it be on gelatin, he transfers it in the manner mentioned above and then marks in with a scribe the powder lines to prevent any possibility of losing the design. If the design is to be placed directly on the plate, he puts a film of grease on it and by means of a T square, triangle, or parallel ruler, and a scribe, draws the design. The plate is then ready to be engraved, and for this purpose a burin or graver is used. This is simply a four-sided piece of steel either square or rhomboidal in cross section, with one end cut off at an angle to form a good cutting edge. The other end fits in a handle which the engraver holds in the palm of his hand. The plate is placed on a pad so that it may be easily handled and the engraver cuts or engraves the lines of the design by pushing the graver in the metal and taking off small chips or ribbons. The parts of the design to be printed must be engraved or cut out. By using gravers with edges of different sizes and shapes, different portions of the design may be engraved, from hair lines to broad, flat, or round work.

The graver raises a burr or edge on each side of the engraved line, and this is taken off with soapstone. It is worked along the lines of the design and the roughness removed. If steel, the plate is next smoothed with a burnisher, a piece of steel oval in section. This restores the plate to a good even condition and makes it suitable for printing. It is possible to make corrections or alterations on copperplates by scraping out the required part with a three-edge-shaped tool called the scraper and then placing the plate on an anvil and hammering on the back of the plate exactly opposite the part to be corrected. This brings it to a level and the plate can be made smooth and the correction made. After the plate has been cleaned with cheesecloth to remove all traces of grease, rubbed with charcoal and buffed to restore its polish and remove any scratches, it is ready for the plate printer. The engraver may have to go over the plate, when he sees a proof, to strengthen some lines or lighten others, in which case the plate is sent him from the plate printer.

If the plate is to be etched and not cut with a graver, the engraved line must be sunk or bitten with acids. The plate is covered with an etching ground or acid-resisting substance, made in several ways, but generally of wax, resin, pitch, and asphaltum. These are mixed together, worked into a ball, and wrapped in a piece of silk. This ball is warmed and rubbed over the plate and the plate rubbed carefully with a dabber or ball of cloth until the etching ground is evenly distributed. The plate is next smoked with a wax candle, in order to render it easier to work. With an engraving needle the engraver draws the design on the plate, piercing the etching ground wherever the lines are to be engraved until the metal is exposed. He has several needles of varying sizes to enable him to draw fine or coarse lines. When the design has been drawn and the back of the plate covered with the ground to protect it from the acid the plate is ready for the acid bath. There are several acid baths in use, but the one most generally used is a solution of nitric acid and water. The plate is put in the bath and allowed to stay until the metal has been bitten the proper depth, when it is removed and cleaned. Should some part need more etching, the plate is again covered with the ground and all the lines of the design stopped up that are not to be bitten any more, leaving bare only the part that needs more etching. This may be repeated several times until the lines are all of the proper size and depth. The etched line is not of the same character as the one made by the graver, for it is the same throughout, while the graver makes lines that end in a fine point. An engraved plate may be gone over with a graver and touched up, which adds greatly to it sometimes. An acid bath known only to the trade is now being used, and it has the advantage of being able instantly to stop the etching process. The plate is banked up around the side, after it is ready for the bath, and this acid bath poured on the plate. The plate will not be affected by the bath, however, until a piece of zinc is used, one end being placed in the bath and the other end on the plate. Thus, to stop the etching, the engraver simply removes the zinc. Sometimes part of a plate is engraved with a graver and the remainder etched. This is especially true when large areas are to be engraved and time may be saved by the etching process.

Another line of work the engraver must know is that of making steel dies for stamping or embossing on stationery. A good quality of soft steel is used. The engraver makes a female die much the same as he engraves a card plate. After the die has been engraved it is sometimes hardened to withstand the wear.

Product or specialties.—The product of an engraver in Richmond does not differ materially from that in other cities.

Importance of the trade.—According to the schedules, there are seven steel and copper-plate engravers in Richmond.

Conditions of employment.—An engraver is subjected to a severe strain on the eyes, produced by the close application required on all work. Some engravers also suffer from lack of exercise and from close confinement caused by having to sit at the bench all day. The work is highly stimulative and none of it can be said to restrict mental development in any way.

Economic conditions.—The beginning wage of an apprentice varies from $3 to $4 per week, with no fixed scale of increase. This increase is generally 50 cents per week each six months. The maximum wage reported is $35 per week and the minimum wage $15. The engravers are not organized in Richmond; hence no union scale. Engravers in Richmond work from 48 to 52 hours per week, 8½ to 9½ per day, and from 4 to 5 on Saturdays. The busy season is generally from October to June and the dull season during the summer months. The fluctuation in employment among engravers is about 13 per cent.

Age of maximum productivity.—The entrance age of boys who serve apprenticeship is generally 16, and it takes five years to learn the trade. It is difficult to state the age period of maximum productivity of an engraver. As soon as his eyes become weak, however, he becomes less efficient until the point is reached when he can not do accurate work.

Demand for labor.—There is always a demand for an efficient engraver, although the field is very limited. This is probably due to the fact that some talent is necessary for the best work, and it is difficult to find such engravers. The demand for efficient engravers is likely to continue to increase because of the popularity at present of engraved or die-stamped work. The apprentices are generally boys from school who feel they have a talent for that work or else believe it to be a profitable means of employment and try it without any special fitness.

Educational and technical requirements.—Because of the high-class work an engraver is called upon to do, he can hardly afford to have less than a good common-school education. A knowledge of grammar, punctuation, and spelling is especially important to prevent mistakes being made in engraved plates. Free-hand drawing and design are very essential. Besides being able to engrave a plate properly an engraver should know something of the action of acids on metals, of the chemistry of inks for die stamping, and should have a working knowledge of alphabets, emblems, insignia, of the different methods used in printing, and of modern methods in engraving. He should have special adaptability, patience, keenness of sight, accuracy, and originality in making designs.

What the industry gives.—The regular apprenticeship period is five years. Because of the nature of engraving, which necessarily requires some talent in originating designs and alphabets, some boys do not finish their trade because they find they have no particular fitness for it. Generally speaking, there is no systematic instruction of apprentices or journeymen. The apprentice is taught the tool manipulation necessary to engrave a plate and he eventually masters some alphabets, but most of the technical knowledge he must pick up for himself or not get it at all. The only line of promotion is to the foremanship of the engraving department.

Deficiencies of workers.—Probably the most common deficiency of an engraver is his lack of originality in making designs and drawing alphabets. Another deficiency is the lack of knowledge of forms of printing other than engraving and of any trade other than his own. This may be true also of men in other trades, but it is given as a drawback to an all-round journeyman.

What the school ought to give.—A boy before he begins to serve an apprenticeship as engraver should have a training at least through the elementary schools, with special emphasis on grammar, spelling, punctuation, free-hand drawing and design, and a knowledge of what the trade has to offer. After he enters on his apprenticeship he should continue his education by attendance at either a day or night school, studying subjects of general education in which he is deficient. At the same time he should have courses in free-hand drawing and design, with special reference to his work; a study of the theory and history of engraving, and of the different methods of printing, the chemistry of the trade as applied to ink and the action of acid on metal in etching should be offered.

Plate printer.

Processes.—When the engraver finishes the plate it is sent to the plate printer, who proceeds to make ready the plate for printing. The press used is not at all like the ordinary printing press. It consists of an iron frame on which is mounted horizontally two cylinders or drums, the top one of which is in the form of a D. A plate or bed, upon which is put the engraved plate, slides back and forth between the cylinders under pressure. The cylinders are revolved by handles or levers at the side and the pressure on the plate is varied by screws at the top of the frame of the press. A gas flame is kept under the bed to render the ink easier to wipe off. This is practically the form of the first press used for plate printing, except that it may be a little heavier and stronger. The same methods are also used in printing as were first used, no improvement having been made in all this time. In order that all the pressure on the plate may be on the engraved part only, the printer takes an impression on a card, cuts out the printed part, and pastes this on the back of the plate exactly opposite the engraving. This relieves the pressure on all except the part to be engraved. If this were not done, the card would become smooth and the texture injured. After the printer finishes this part of the make-ready, he pastes a piece of paper over the back of the plate, rubs a form of soap over it, and places the plate on the bed of the press. This soap serves as glue and fastens the plate securely to the bed. The next operation is to put the guide marks on the plate. He makes a mark on the plate where the end of the card is to go and also on the side, thus locating the proper position. After adjusting the pressure the printer is ready to print. The method on all hand machines is as follows: The plate is inked by rollers which pass over it. The ink is thick and sticky and is softened by the flame under the plates. When the plate has been inked, it is wiped off with the hand, then wiped with whiting or some powder to further clean it. It is of extreme importance that the plate be clean, for under the pressure used all the ink is taken up by the card. After the plate has been inked and wiped, the card or paper is placed on the plate even with the guide marks. This is one of the most difficult operations of the plate printer, for he has no raised guide to feed against as has the typographical printer. When the card has been placed, the printer grasps a handle on the left of the machine, turns it until the plate has been moved between the cylinders and back again, and then removes the card. In this process the card is forced into the depressions of the engraving where it receives the ink in fine, slightly raised lines, and with a clearness not possible in any other form of printing. The reason for the D-shaped roller is obvious; it allows the bed of the press to roll back without coming into contact with it. As the printer takes the cards from the press he places them back to back in rows and puts sheets of paper between the engraved sides to keep the ink from smearing. As may be seen, this method of inking the plate, wiping it clean, placing the work, applying pressure, and removing the work is a slow process, and a good printer will hardly average more than 1,500 calling cards per day. This is why the scope of the work done in engraving is limited.

Product or specialties.—The product of a plate printer in Richmond is like that in other cities, the production of engraved material from a plate attached to a plate-printing press.

Importance of the trade.—According to the information collected on the schedules, there are eight plate printers in Richmond.

Conditions of employment.—A plate printer may suffer physical strain from having to stand at the press all day and operate it by means of hand power. This requires endurance and some strength. He also suffers an eyestrain if he works at night or under an artificial light during the day. Because engraved work is of a high class there should be something stimulative about all of it. This is especially true of wedding invitations and fine stationery.

Economic conditions.—Most apprentices are given from $3 to $4 per week at the start and are increased 50 cents each six months. The maximum wage paid journeymen was reported as $17 per week and the minimum as $12. The hours of labor vary from 48 to 52 per week, 8½ to 9½ per day, and 4 to 5 on Saturday. The busy season is generally from October to June and the dull time from June to October. There is very little fluctuation in employment among plate printers in Richmond. The men are not organized.

Age of maximum productivity.—Apprentices generally enter the trade at the age of 16, and five years are required to learn it. The age of maximum productivity was not reported.

Demand for labor.—There is a demand for the efficient plate printer and this demand is likely to increase in the future. The field is limited, but very few enter the trade. The demand is supplied by boys who serve an apprenticeship and by journeymen from other cities.

Educational and technical requirements.—As in the case of the press feeder only a small amount of general education is necessary for the process of operating a plate-printing press. But should the plate printer aspire to a foremanship or even to be an alert, efficient workman, he should have enough education to enable him to take an interest in the things outside of his own sphere of work and to discuss intelligently current topics and matters of general interest. It would be of advantage to him to know something of free-hand drawing and design to appreciate more fully the work of the engraver. He should know something of the action of acids on metals. He must be able to make ready forms quickly and accurately and to regulate the proper amount of pressure and ink required. He must be able to handle all materials without smearing. This requires him to be careful, accurate, and patient. A certain amount of strength and endurance is also necessary.

What the industry gives.—The period of apprenticeship is five years. There is, generally speaking, no systematic method of instruction for the apprentice or journeyman in Richmond. The trade knowledge necessary to operate a press is readily learned in the shop, but very little other than that can be learned. The apprentice can learn to make ready the plate, to ink and clean the plate, to feed and remove the work properly and all other points necessary for the production of printed work. There seems to be no line of promotion for a plate printer, except in a large plant where he may become foreman of that department.

Deficiencies of workers.—Plate printers are most deficient in the proper way of feeding work to the press and in the manner of handling material without smearing.

What the school ought to give.—The school should give the boy who intends to serve an apprenticeship an elementary school education, supplemented by some prevocational work, to find out if possible whether the boy has a liking for mechanical work. After he begins to learn his trade, he should have instruction in the general subjects and in the theory and history of the trade, and in the chemistry of the trade as applied to inks and action of acids on metals. Some free-hand drawing and design would be of advantage to him in appreciating the work of the engraver. This same line of instruction would apply to the journeyman who was lacking in those subjects.

Die Stamper.

Processes.—Closely allied to plate printing in some of its operations is die stamping, or the process of stamping or embossing letters or designs in relief, which may or may not be printed. Both hand and power machines are in use. In the hand machines the engraved or female die is placed on a die box that can be easily slipped off the press. The pressure is applied by turning a handle fastened to a large screw, which lowers and raises the die.

When the die is sent to the stamper she glues it on the die box and makes an impression of it on tag or tar board. This male or counter die, which is raised like type form, is trimmed or tapered on the sides until just the face of it comes in contact with the paper. This counter is then fastened firmly on the counterplate or stationary bed of the press directly beneath the engraved die and a proof is taken of the work. If the proof is accepted, the stamper locates the exact position of the paper to be stamped and places pins or other guides on the bed to feed against. The stamper places the paper against the guides, grasps the handle with one hand and turns it until the pressure has been sufficient to cause the counter to force the paper in the upper die, and then releases the handle. The paper is taken out and the operation repeated. If color work is required, the stamper removes the die box containing the steel die, paints the face of the die with ink, using a small brush, and then rubs the surface of the die on paper to remove all traces of ink except that in the engraved lines. The die box is then placed in its position and an impression made. The sheets must be handled carefully until the ink dries. The ink contains a large quantity of varnish to give it a gloss after it is printed.

In the case of power machines the inking and operation of the machines are done by power and not by hand. The plate is wiped by means of paper and the stamper simply feeds the paper to the press and receives it after the impression has been made.

Product or specialties.—The product of a die stamper in Richmond does not differ materially from that work done elsewhere. It is the production of printed designs or letters in relief on stationery, cards, etc.

Importance of the trade.—There are 15 die stampers employed in Richmond, 1 male and 14 females.

Conditions of employment.—As in plate printing, there is a strain caused in die stamping by the continual standing required. If there is any variety in the work it should be stimulative.

Economic conditions.—The minimum wage reported for females was $5.50 per week and the maximum wage $10. The one male worker makes $10 per week. The die stamper works the same hours as the plate printer, 48 to 52 per week, 8½ to 9½ per day, and 4 to 5 on Saturday. The busy season is from October to June and the dull season during the summer months. The fluctuation in employment is very slight. There is no organization among the die stampers.

Age of maximum productivity.—The entrance age is 16 years, and no apprenticeship is necessary. The worker soon learns enough to do simple stamping, and as she becomes more proficient she is given work of a more difficult character. The age of maximum productivity was not reported.

Demand for labor.—There is not much demand for die stampers as a whole, but limited as the field is, an efficient stamper is always in demand. Because of the growing popularity of stamped work the demand for workers of this character should increase in the future. The workers are generally girls who stop school at an early age to go to work.

Educational and technical requirements.—It is not absolutely necessary for a die stamper to have a complete elementary-school education, but it is desirable for the broadening influence on the worker. She should possess some knowledge of how the die is made, be able to make the counterdie, adjust dies to press, regulate proper amount of pressure, ink and wipe clean the die, and handle the printed sheet without smearing. A knowledge of the different methods of printing would be of benefit in broadening the scope of the worker's knowledge in other lines of work.

What the industry gives.—The trade knowledge necessary for the production of printed matter is learned in the shop, but none of the general or technical part that would be of benefit. There is no apprenticeship necessary to become a die stamper and there is little chance for promotion to any higher position.

Deficiencies of workers.—The most common deficiency among die stampers seems to be their carelessness in handling printed sheets, resulting in smeared, defective work.

What the school ought to give.—The school should give these workers a training through the elementary schools, if possible, with some training in color harmony. After entering the shop they should continue their training in a day or night school in the subjects in which they are deficient and in other subjects mentioned above, to make more efficient, alert workers.

The Packer.

Processes.—After the ink has dried, the cards are packed in boxes by packers, who place sheets of tissue paper between the printed surfaces to prevent any possible chance of smearing. In the case of invitations or work requiring envelopes, the packer also places the finished work in the proper envelopes, with tissue paper next to the printed side. The packer is held responsible for the condition of the work as it leaves the shop, so that she must quickly detect any defective work and cast it aside. This work is generally done by girls.

Product or specialties.—The product of a packer is essentially the examination and packing of engraved material in boxes or packages. There is no difference in the methods used in Richmond and those used elsewhere.

Importance of the trade.—Thirteen packers are employed, according to the employers' schedules, 1 male and 12 females.

Conditions of employment.—There is no physical or nervous strain caused by packing and no occupational disease to be guarded against. The work is stimulative to a certain degree, for the packer is held strictly to account for the condition of the work that leaves the plant.

Economic conditions.—The minimum wage reported for females is $4.50 per week and the maximum $6.50. The male worker receives $10 per week. The hours of labor are the same as for die stampers, 48 to 52 per week, 8½ to 9½ per day, and 4 to 5 on Saturday. The busy season is also the same, from October to June, and the dull season from June to October. There is very little fluctuation in employment. The packers are not organized.

Age of maximum productivity.—The usual entrance age of beginners is about 16, and no apprenticeship is necessary. As in die stamping, the beginner is given simple work at first and gradually led into harder and more responsible work. The age of maximum productivity was not reported.

Demand for labor.—As the demand for engraved and stamped work grows, more packers will be needed, for increased demand affects this occupation as well as those of engraver, plate printer, and die stamper, all of whom are necessary to work of this character. The packers are generally girls from the schools who stop to go to work, whether from choice or because of necessity.

Educational and technical requirements.—The packer should have an elementary school education, not so much for use in her work as for her own general improvement and to equip her more fully for some higher position. She should know something of the materials used in engraving and the sizes and kinds of stationery for all occasions. She must be careful and neat and have a quick eye to discern any defective work. She must also be accurate in sorting out the amount in each order.

What the industry gives.—The purely trade part can be picked up in the shop, but the technical part, as a rule, can not.

Deficiencies of workers.—The most common deficiencies of packers are (1) careless handling of printed work; (2) inaccuracy in counting; and (3) inability to detect imperfect sheets.

What the school ought to give.—The school can hardly afford to give less than an elementary school education to any worker, regardless of whether it is required in her daily work. After the worker has left school, she should have instruction, day or night, in those subjects in which she is most deficient and in other subjects that apply to the engraving business.

LITHOGRAPHY.

Lithography is the art of drawing on stone or some substitute, with chemically prepared ink or crayon or engraving with a needle or diamond point, and printing therefrom with lithographic ink. It differs from relief and intaglio printing in two ways—(1) it is surface printing and (2) it is chemical printing. The other methods of printing are both mechanical. The theory of lithography depends entirely upon the principle of chemical affinity, the attraction of greasy substances to each other, and the antipathy or repulsion of grease and water.

History.—The art of lithography was discovered in 1796 by Aloys Senefelder, an actor of Bavaria, Germany. He had been trying for some time to make etched copperplates that would take the place of type-printing forms. He used a stone for mixing his ink and an acid-resisting preparation to protect the stone from the acids used in etching. It is interesting to note that the preparation he made has ever since been the foundation for all lithographic crayons or ink. It is also interesting to note that the art of lithography was partly discovered by accident. One day Senefelder's mother asked him to copy down his laundry list before it was sent out, and, having no paper on which to write it, he dipped a pen in the acid-resisting preparation and wrote the list on the stone he was inking with. The thought occurred to him immediately to apply acid to the stone and etch it, thereby leaving the writing in relief. He did this and was successful in taking a few impressions. If he had only wiped the acid off immediately after it was put on the stone and applied water and ink, he could have made as many copies of his laundry list as he wanted and the art would have been discovered and in operation years before it was. He did not give up, however, and it is not surprising to find that he kept doggedly at his work for years. When he did discover the means of lithography he covered the field so thoroughly that few improvements have been made except in the method of pulling impressions by power presses.

The chief materials used in lithography are (1) the stone, (2) crayon or chalk, (3) lithographic touche, (4) lithographic printing ink, and (5) paper.

The stone.—The best stone that has ever been found comes from Solnhofen, Bavaria. It is a fine-grained limestone, and varies in color from a dull gray to a light creamy gray. It is cut at the quarry in slabs varying in thickness from 3 to 4 inches and in size from 6 by 8 to 44 by 64 inches, the large sizes being hard to obtain free from imperfections. The stones are sawed this thickness because of the great pressure applied to them in printing. In recent years aluminum or zinc plates have taken the place of the stone for commercial work because of the ease with which these plates may be handled and because of their adaptability to the offset press. For extra fine work, though, most lithographers still prefer the stone.

Crayon.—The crayon or chalk used for drawing the design on the stone is composed of wax, turpentine, shellac, soap, tallow, and lampblack. It is hard when dry and is molded into pencil forms that are sharpened from the point upward. This greasy mixture repels the water and attracts printing ink.

Lithograph ink.—Lithograph ink is used for making the transfers and is composed of practically the same ingredients as the crayon, although it is in pasty form.

Printing ink.—The ink used for printing is like ordinary printing ink, except that it is of a much better quality.

Paper.—The paper used in lithograph work contains a little sizing. When used for making labels it is finished on one side only. The paper must be strong in order to withstand the frequent handling received in color work, and the less it stretches or shrinks because of atmospheric conditions the better adapted it is for lithograph work.

Processes.—The processes in lithography may be stated as follows: (1) Design is made; (2) design is engraved or lithographed; (3) engraving is proofed; (4) transfers are made; (5) impressions are made; (6) printed work is allowed to dry; and (7) sheets are cut up into proper sizes and forms.

Occupations.—The occupation may be classed as follows: Designers, engravers, lithographers, proofers, transferrers, printers (feeders and flyboys), and cutters (collators, numberers, folders, perforators, bookmakers, and padders).

Engraver and Lithographer.

Processes.—The designer in a lithograph plant either originates the design himself or reproduces it from the ideas given him by the customer. Very few designs are sent to the plant already worked out and ready for the engraver. The designer makes the design on drawing paper, which may or may not be the size of the finished product. He must be able not only to execute the drawings but to suggest the proper colors, if it be color work, to make the design more attractive and useful for its purpose.

After the design has been made and accepted it goes to the engraver or color artist to be put on stone. There are two methods of applying design to stone—(1) by engraving and (2) by drawing with a piece of lithograph crayon. For color work the crayon is generally used, but for fine line work the stone is always engraved. This is not a fast rule, for it makes no difference in the finished product which method is used. The object is to get the design on the stone in lithograph ink, and this is accomplished by either means. If the stone is to be engraved, it may be treated with a weak solution of nitric or muriatic acid and gum arabic before the design is put on. This etches the face of the stone and makes it grease proof. The stone can then be handled with impunity. However, the lithographer or color artist must work with crayon on the stone before it has been etched, and he must therefore keep it free from grease. Even a finger print would absorb ink and would print when the stone went through the press.

The engraver uses a sharp-pointed steel tool or a small diamond point for engraving. This stone, after it has been engraved or lithographed, is called the key or drawing plate, and from it all transfers are made. It is filed away and kept for any subsequent orders of work. If the design has more than one color, a plate must be made for each color and all must tally with the key plate. Hence, if a label is to have six colors, the key plate is made by the engraver or lithographer first, and then five additional stones prepared in the same way from the key plate, each so that it will print the proper color in the required place on the design. If the finished work registers properly, the register marks on the six stones will coincide on the impression, making a single line.

Proofer.—After the drawing on stone has been made it goes to the proofer for a try out. This is to make sure that the colors are right, and to reveal any imperfection in the work or any mistakes that have been made and allowed to pass unnoticed. The proofer generally uses a small hand press to make the impression. He first takes the stone, which is of course perfectly true and flat and has a properly prepared surface, and treats it with a weak solution of nitric or muriatic acid and gum arabic in order to prepare for printing, and to keep the design from spreading. He next moistens the surface of the stone with water which adheres to the blank part of the stone but not to the design, since the lithograph ink used is greasy and repels water. Next he runs an ink roller over the plate depositing ink only on the design and leaving none on the moistened part of the stone. Then he puts a piece of paper on the stone, applies pressure as in a letterpress and takes his first impression. The ink that adhered to the design is thus transferred to the paper and the proofer is able to detect mistakes; or he may send the impression to the office, where corrections are sometimes made. If the work be of several colors, the proofer uses the same piece of paper to take an impression from each color plate. After the last impression he can tell whether or not the colors register. The last impression should show the finished product with each color in its proper place and of the proper shade. The customer is generally sent one of these impressions to make any correction or criticism he may desire before the printing is done. When the proofer obtains an impression that is correct in design and color it is attached to the order and all impressions afterwards are compared with it to see that the colors match and the work registers.

Product or specialty.—The product or specialty of a lithograph engraver is the preparation of designs on lithograph stone, from which impressions may be printed.

Importance of the trade.—There are approximately 15 lithograph engravers in Richmond; none were reported on the schedules.

Conditions of employment.—An engraver is subjected to a severe eyestrain because of the nature of the work, and he may also suffer because of a lack of exercise, his work confining him very closely all the time. His work is highly stimulative, and none of it can be said to narrow or restrict in the least his mental development.

Economic conditions.—The apprentice is started on a wage of from $3 to $4 per week, with an increase of about 50 cents each six months. The minimum wage reported for journeymen was $26 per week and the maximum $30. The hours of labor vary from

48 to 51 per week, 8½ to 9 per day, and from 4½ to 6 on Saturday. The slack time is generally during the summer months, but there is very little fluctuation in employment. The engravers in Richmond are not organized.

Age of maximum productivity.—Apprentices are generally taken at the age of 16, and it takes about five years to learn the trade. The age period of maximum productivity, although varying and indeterminate, may be said to be between 21 and 50.

Demand for labor.—The efficient engraver is always in demand, because of the limited scope of the field; the trade could easily be overrun by inefficient workers. It does not seem that the demand will increase in the future, but will remain about stationary. The supply of journeymen is generally obtained from boys who serve their time as apprentice to lithoengraver.

Educational and technical requirements.—The lithograph engraver does work that requires a great deal of skill and also of time. Consequently, if a mistake is made, it may cause hours of work to be thrown away; for that reason, if for no other, the engraver should possess a good education, to prevent mistakes in spelling, punctuation, and grammar. Where an engraver is also the designer he should use original ideas in design and be able to execute those ideas on the stone. As the principle of lithography is based on chemistry, he should know the chemistry of the trade and also the history. A knowledge of alphabets and insignia is also beneficial, and the efficient engraver should have at least an understanding of the different methods of printing.

What the industry gives.—It takes a boy about five years to learn the trade. He is taught the trade requirements mentioned above and is therefore able to engrave on a stone, but very little of the technical part is taught him. There is, generally speaking, no systematic instruction for apprentices or journeymen.

Deficiencies of workers.—The deficiencies most commonly reported are (1) lack of general education, especially in spelling, punctuation, and grammar; (2) lack of originality and ability to design; and (3) inability to do different classes of work required.

What the school ought to give.—The school should give the engraver at least an elementary schooling, with emphasis on free-hand drawing and design. After the boy enters the trade, he should continue his schooling, by attendance at either a day or night school, in those subjects in general education in which he is deficient, together with such technical subject as the efficient engraver needs. These subjects include chemistry, history and theory of the trade, knowledge of materials used, free-hand drawing, and others mentioned above. These courses would apply with equal fitness to apprentices and journeymen.

Transferrer.

Processes.—After the work of the designer, engraver, and proofer has been accepted, the order then goes to the transferrer. When the art of lithography was first discovered, all impressions were taken from the original or key plate. As the demand for the work grew, means of duplicating were found necessary and the system of transferring was invented. By this method as many duplicates of the original impression are made as are desired. This corresponds in printing to electrotyping. A new occupation was thus made necessary—that of transferrer. He makes as many impressions from the key plate with lithographic ink as are needed, on a specially prepared paper, coated on one side with a sizing of starch, flour, and glycerin. These impressions are then placed on a sheet of paper, with the coated side out, in the order they are to appear on the finished product, using the register marks from the key plate to adjust them properly. The transferrer next places this paper with the prepared side next to the stone or aluminum plate, and by applying pressure in a press transfers the ink from the paper to the stone. The paper is washed off and the stone, treated with acid as in the case of the key plate, is ready for printing. Thus a number of impressions of the original are printed at one time, instead of one at a time from the key plate as had been the custom. This saves the key plate for all future work and keeps it in good condition. The transferrer must be very careful and accurate in order to have the work register when it is placed on the stone, for an error unchecked at this point would mean a mistake in each sheet printed. This is especially true of work of more than one color, for the colors must register after each printing and a difference of one thirty-second of an inch would render them valueless.

Product or specialty.—The product of a transferrer in Richmond does not differ materially from that of transferrers in other towns.

Importance of the trade.—There are approximately 15 transferrers in Richmond.

Conditions of employment.—Most transferrers suffer from an eyestrain caused by the extreme care needed to place the transfers properly on the stone, in order that the impressions register. Some also suffer from the close confinement caused by having to keep the windows closed to prevent drafts and dust which are injurious to the work. All the work a transferrer does is very skilled and it tends therefore to stimulate and arouse his interest. There are no occupational diseases in the work of a transferrer.

Economic conditions.—An apprentice boy is generally given from $3 to $4 per week at the beginning of his apprenticeship and his pay is increased at the rate of about 50 cents per week each six months. The minimum wage for journeymen reported was $22 per week and the maximum $30 per week. The union scale is $22.50 to $25. The hours of labor are the same as for engravers, 48 to 51 per week, 8½ to 9 per day, and from 4½ to 6 on Saturday. There is little fluctuation in work or employment except during the summer months, the dull season in lithograph work. The transferrers and printers have an organization and they are well organized.

Age of maximum productivity.—Apprentices generally enter the trade between the ages of 15 and 16, and it takes about five years to learn the trade. The age period of maximum productivity may safely be said to be between the ages of 21 and 50.

Demand for labor.—Although the field of this work is limited there is always demand for the efficient transferrer, but not the medium-grade worker. It is not likely that the demand will increase in the near future. The journeymen here generally come from the ranks of the apprentices or from other cities.

Educational and technical requirements.—A transferrer needs a good elementary-school training with special emphasis on arithmetic. He should know something of the history, theory, and chemistry of the trade and of the materials used. He should have a knowledge of the different methods in printing and any modern method in lithography. An efficient transferrer will arrange the design on the stone in such manner as to use the least paper in printing.

What the industry gives.—An apprentice can learn all that is necessary for the purpose of making transfers, but he does not get the general education he may be lacking in nor any of the technical part of the trade that is necessary for an alert, efficient transferrer.

Deficiency of workmen.—Some workmen are unable to place the transfers accurately on the stone and to arrange them in the most economical way. This seems to be the most common deficiency of the worker.

What the school ought to give.—An apprentice boy should have a good elementary-school training, with emphasis on arithmetic, before he enters the trade. After entering on his apprenticeship he should have courses of instruction in a day or night school in the general subjects in which he is deficient, and at the same time in subjects pertaining to the technical part, as the theory, history, and chemistry of the trade, different methods of printing, and others mentioned above.

Lithograph Printer.

Processes.—After the transfers have been made the stone or plate is sent to the printer for printing. The presses used are of the flat-bed cylinder type similar to those used in other printing, with the difference that lithograph presses contain the means for moistening the stone before each inking. The stone is placed on the bed and moves with a reciprocating motion under the impression cylinder, which carries the paper. Ink rollers are at one end and water rollers at the other. As the stone passes the water rollers it is moistened and immediately afterwards is inked by passing under the ink rollers. Ink adheres only to the design or transfer so long as the stone is kept wet because of the antipathy of water and grease, and when the paper on the impression cylinder is brought in contact with the stone an impression is made This process of moistening and inking the stone and oiling the impression must be done for every impression that is made.

Because of the size and weight of the stone used and the slow speed of the flat-bed press, which makes about 8,000 impressions a day, the rotary offset press, making 4,000 an hour, is becoming more popular. This press has three cylinders, one of which holds the aluminum plate containing the transfers. This plate prints on a rubber blanket around the surface of the second cylinder, and this in turn prints on the paper carried by the third or impression cylinder. As this offset press runs at a much greater speed than the flat-bed press, it seems destined to replace it to a large extent.

The printer in a lithograph plant corresponds to the pressman in a printing shop. He is given the stone or plate from the transferrer and the blank paper and is then held responsible for the finished product. He has just one press, as a rule, to be responsible for, but he is held rigidly responsible for that. His duties are as follows: (1) To make ready the stone or plate, (2) to mix inks until he matches the color on the impression sent him by the proofer, (3) to watch for any change of color on the printed sheets, (4) to watch for imperfect sheets, (5) to see that the finished sheets are taken from the press and put on the proper piles, and (6) to see that the press is oiled and properly cared for.

A printer makes ready the stone by seeing that the impression is printed evenly all over. He levels the stone on the bed and makes any other adjustments necessary to remedy the impression should it be faulty. As the stones are polished on the face time and time again, they necessarily become thinner. The presses are constructed to take care of this difference by adjusting the distance between the bed and the cylinder.

The printer must mix his inks to match the colors on the impression made by the proofer. This is one of his most difficult operations, for if it be a job of several colors and one of the colors varies from the original, the finished product will have the wrong color effect.

The printer must watch for any change of color in the sheets and for any imperfection that may occur from various causes. If the paper, after one printing, should shrink or stretch, the colors will not register when the paper is put through the press the second time. The printer puts the finished sheets as they collect at the end of the press on the proper stacks, unless the sheets are small and can be handled by the flyboy. As the paper is delivered from the press it is hard to handle and much care must be exercised.

Another very important duty of the printer is to take the proper care of his press. The rollers, both ink and water, must have attention, the press oiled and cleaned at regular intervals, and care taken in every way to keep it as efficient as possible.

Product or specialties.—The production of impressions from a lithograph stone after the proper make-ready has been made.

Importance of the trade.—There are about 20 lithograph printers in Richmond.

Conditions of employment.—The printer may be affected by the noise and vibration of the presses and by confinement in a room with doors and windows closed to exclude drafts and moisture. Bronzing, if done in large quantities, may be injurious. All work should be stimulative, especially that in colors.

Economic conditions.—Apprentices are paid from $3 to $4 per week at the beginning of apprenticeship, with an increase of about 50 cents per week each six months. The minimum wage reported for journeymen was $15 per week and the maximum $25. Lithograph printers in Richmond work from 48 to 51 hours per week, from 8½ to 9 per day, and from 4½ to 6 on Saturday. The busy season is generally from September to June and the dull time during the summer months. The lithograph printers are organized with the transferrers.

Age of maximum productivity.—Beginners generally enter the trade between the ages of 15 and 16, and it takes five years to learn the trade. The period of maximum productivity is probably between the ages of 21 and 50.

Demand for labor.—There is always a demand for the efficient lithograph printer, but this demand will probably be stationary in the near future. The journeymen printers are recruited from the ranks of the apprentices and occasionally from a press feeder who is given a chance to learn the trade.

Educational and technical requirements.—A lithograph printer needs at least an elementary-school training, with a sense of color harmony. He should be able to make ready all kinds of work, to make adjustments to press, to mix inks, to detect imperfect sheets, and to do anything required to turn out good work. He should have a knowledge of the theory, history, and chemistry of the trade, of material used, and of the mechanism of the press.

What the industry gives.—The apprentice can acquire the trade knowledge necessary for the production of the required work, but he can not obtain the technical part in the shop.

Deficiencies of workers.—The most common deficiencies are (1) inability to make ready all kinds of work, (2) to make adjustments to press, and (3) to detect changes in color.

What the school ought to give.—Before a boy enters on his apprenticeship, he should have a complete training in the elementary schools. After entering on his trade he should attend either a day or night school and take those subjects he is deficient in, together with such work as the theory, history, and chemistry of the trade and other subjects needed to make an alert efficient printer.

Lithograph-press Feeder.

Processes.—The lithograph-press feeder, primarily, does nothing but feed the press. He must learn to feed the paper exactly where it belongs, for in color work a slight variation will cause the colors not to register. He stands at the back of the machine, grasps the paper with one hand and places it in the proper position with the other. He must be on the lookout for imperfect sheets, as far as possible, although he is up high at the end of the machine and must observe the work as it goes through the press. The feeder helps the printer to care for the machine and to make ready, if he is not engaged in feeding another press. All offset presses have a self-feeding service and, although no feeder is required to feed the presses, a man is required to furnish paper to the presses. One man, though, is not required to each offset press.

Flyboy.—The flyboy catches the printed sheets as they come through the press, keeps them in a straight pile and throws out any that may become torn or injured by coming through the press crooked. He keeps the feeder supplied with blank paper, and helps the printer to handle the finished sheets, if help is needed. If the work is small and the flyboy can manage the sheets, he does that for the printer. The flyboy helps to clean the machine and to do at all times whatever the printer may require of him.

Product or specialties.—The product of a lithograph-press feeder is primarily the feeding of paper to a lithograph press.

Importance of the trade.—There are about 25 feeders in Richmond.

Conditions of employment.—Standing all day at the press causes a physical strain and the noise and vibration of the presses may cause a nervous strain on some. Bronzing may be injurious if done to a great extent. There is nothing specially stimulating about press feeding, but there seems to be no reason to believe it narrows or restricts in any way.

Economic conditions.—The lowest wage reported was $7.14 per week and the maximum $10 per week. The hours of labor vary from 48 to 51 per week, 8½ to 9 per day, and 4½ to 6 on Saturday. The busy season is from September to June, the dull time during the summer. There is, however, very little fluctuation in employment. The lithograph-press feeders are not organized.

Age of maximum productivity.—Feeders generally enter their work between the ages of 15 to 16 and no specified time is required to become proficient.

Demand for labor.—The supply of skilled, efficient press feeders is limited, but there is an abundance of medium-grade men. The supply of feeders is obtained from the boys who leave school to go to work, and from transient workers.

Educational and technical requirements.—A lithograph-press feeder does not need much schooling to be able to feed a press, but if he expects to get a better position he needs to have an elementary-school training. Very little trade knowledge is necessary for a press feeder. He should have the manipulative skill to feed the paper to the press and to help the printer make ready. It would be to his advantage to have a knowledge of the theory, history, and chemistry of the trade. A feeder must possess good eyesight, be quick, and have some endurance.

What the industry gives.—There is no apprenticeship in press feeding. The workers are either apprentice boys serving to become printers or feeders who do not expect to go any higher. A feeder soon becomes proficient enough to handle simple work and he is given work of a more difficult character to do as he improves. The feeder, therefore, learns enough of the work to produce, but he learns nothing of the technical side of the work. There is not much chance of promotion after a feeder earns his maximum wage as a feeder, unless he has been given a chance by the printer to learn some of his duties. In that case he may in time become a printer.

Deficiencies of workers.—Careless feeding of paper is the most common deficiency, together with inability to detect imperfect sheets.

What the school ought to give.—Before a boy begins to feed a press he should have had a training in general education, through the grammar grade, if possible; after entering on his work he should take up a course of instruction, day or night, that will help him to advance and make of him a good citizen.

PHOTO-ENGRAVING.

Owing to the small number of workers engaged in photo-engraving in Richmond, the similarity in general trade conditions and requirements and the fact that the worker sometimes engages in more than one occupation, the four occupations of the photo-engraver have been considered under one head.

Processes.—Photo-engraving is a photomechanical process of engraving in which the printing surface is in relief. It includes zinc etching and other processes of making line cuts, and the halftone and other processes.

Operator.—The photographer in a photo-engraving establishment is known as the "operator." The picture or drawing to be reproduced by the halftone process is placed on a support in front of a specially designed copying camera. Wet plates are made instead of the dry plates of ordinary photography. Just in front of the dry plate is placed the "screen," which is a gelatin film on which a series of black lines have been photographed. This film is cemented between two sheets of plate glass. In place of the gelatin film a mechanically engraved sheet of glass may be used. After exposure to light in the usual manner, the resulting print or negative consists of the subject appearing in half tone on a ground of lines; that is, the surface of the negative is broken up by lines or dots in regular series. The operator develops his own negative, which is in the form of a collodion film on a glass plate. In making a negative for a zinc etching the process is the same except that the screen is not used.

Etcher.—The etcher receives from the operator a developed film or negative which has been stripped from the original glass plate; this he cements to another sheet of plate glass. A sheet of copper is highly polished and prepared by being coated with chemicals which are sensitive to light. This sheet of sensitized metal is brought in close contact with the sheet of glass having on its surface the negative. The whole is then exposed to an intense light which renders the surface of the plate resistant to acid in a varying degree, dependent on the amount of light which has been admitted by the negative. The process for line etchings is somewhat different, but the principle is the same. The sheet of copper is then placed in an acid bath so arranged that by means of a rocking motion the acid is carried back and forth over the surface of the copper. When the plate has been etched deep enough it is removed from the bath and washed off. It is generally necessary to re-etch to bring out certain portions of the halftone to the best advantage. This consists of coating with asphaltum—which is resistant to acid—all those portions of the plate which are etched deep enough and etching deeper the remaining parts. When the etching process is complete, the halftone is turned over to the finisher. In some plants the finisher does the re-etching instead of the etcher.

Router.—The router by means of a specially designed machine cuts out the etching or halftone to proper size and bends the edges, cuts away or lowers such parts as must be removed for multicolor work, and when the plate has been inspected and corrected by the finisher, the router mounts it on a wood block, which makes the cut type high. The router also does some hand engraving at times, such as cutting out borders, etc.

Finisher.—The finisher is a hand engraver, and to him falls the work of correcting small defects in the finished halftone or etching, such as cutting out spots and building up. He also "tools out" high lights, burnished shadows, vignettes, and outlines the plates for the router to cut by. The finisher also does all the fine cutting out that can not be done by the router. In Richmond the finisher also makes his own proofs on a hand proof press. A proofer is sometimes employed for this purpose in larger establishments.

Product or specialties.—The production of halftone and zinc line etchings.

Importance of the trade.—According to the returns on the survey schedules, which are practically complete for the trade, there are 11 photo-engravers in Richmond.

Conditions of employment.—The operator is compelled to work in intense light, which results in considerable eyestrain. The work is stimulative to both interest and the intelligence because it varies from day to day, each job calling for special treatment and a high degree of skill. The eyes are liable to injury from the intense light. The fumes from the chemicals used are injurious to some.

The etcher's work calls for careful and alert attention, and there are uncertainties in regard to the action of the chemicals, etc., which tend to induce a nervous strain. The work is highly skilled and is stimulating to the intelligence. The fumes from some of the acids used are injurious and there is danger from poisoning, especially from bichromate of ammonia.

The router's work necessitates close application which may induce eyestrain. The work is moderately stimulating and high grade, and multicolor work especially so. There is danger of accidental injury from the fast-revolving, unprotected router knives.

The finisher's work requires close application and the minute character of the work induces eyestrain. All the work is stimulative.

So far as ascertained, there is no occupational disease peculiar to the photo-engraver, unless the danger of poisoning to which the etcher is subjected, as already mentioned, may be so called.

Economic conditions.—There is practically no seasonal fluctuation in the demand for workers. Each firm holds its full force throughout the year. The busy season is from September to June, except January; the slack months are July, August, and January. Photo-engravers generally work 8½ hours per day and 5½ hours on Saturday. In all cases the hours worked per week are 48.

Apprentices receive $2.50 to $3.50 per week during the first year of apprenticeship, $4.50 to $5.50 the second year, $7 to $10 per week the third year, $12 to $14 the fourth year, and $14 to $16 per week the fifth year. Journeymen receive the following wages: Operators, $18 to $35 per week—union scale, halftone operator, $23; line operator, $18. Etchers, $18 to $27.50 per week; union scale, $22. Routers, $18 to $25 per week; union scale, $18. Finishers, $22 to $30 per week; union scale, $22. The trade is fully organized.

Age of maximum productivity.—Boys enter the trade between the ages of 15 and 16 and serve an apprenticeship of five years. The period of maximum productivity is, generally speaking, between the ages of 21 and 50.

Demand for labor.—The demand for labor is increasing. The supply does not more than meet the present demand. Workers are recruited from among boys in the grammar and high school grades who show aptitude for the work after trial by the employer. In the case of journeymen the supply is limited and new workers are frequently obtained from other cities.

Educational and technical requirements.—All photo-engravers should have a good general elementary education. The operator and etcher should also have high-school or special courses in free-hand drawing and chemistry. The router should have a special course in free-hand drawing, and the finisher courses in free-hand drawing and the principles of design. The trade and technical requirements for each occupation are as follows:

For the operator: Thorough knowledge as to the making and developing of wet plates; proper handling of the camera, lights, filters, screens, etc.; the ability to determine the proper lengths of exposure necessary for the best results; a knowledge of chemistry, with special reference to the chemistry of the trade; free-hand drawing and design; dexterity in handling expensive "screens" and in developing negatives, accuracy, initiative, keenness of sight, and mental alertness.

For the etcher: Thorough knowledge as to the preparation of zinc plates (sensitizing) for printing; preparing for and making the print on the sensitized metal surface; preparation of zinc plates for etching (with "dragon's blood" powder); preparation of the chemicals for etching and the process of etching; a knowledge of chemistry, with special reference to the chemistry of the trade; some knowledge of free-hand drawing; dexterity in handling and etching plates; accuracy, mental alertness, initative, and keenness of sight.

For the router: Training in the care and use of the routing machine and how to engrave by hand; free-hand drawing; dexterity in the use of the routing machine; accuracy, keenness of sight, and initiative.

For the finisher: A thorough knowledge of how to engrave by hand on copper and zinc, and the best methods of correcting defects in halftone and zinc etchings; free-hand drawing; principles of design; some chemistry; dexterity in handling the engraver's tools; accuracy, initiative, and keenness of sight.

What the industry gives.—The period of apprenticeship is five years. Although there is no provision made in the shop for systematic instruction for either apprentices or journeymen, still under favorable conditions the necessary trade knowledge can be gained in the shop. It, however, could be supplemented to good advantage by outside work. Technical knowledge can be gained in the shop to a limited degree only. The manipulative skill can be acquired fully in the shop. The line of promotion is from journeyman to foreman.

Deficiencies of workers.—The most common deficiency is lack of sufficient trade and technical knowledge, such as free-hand drawing, the principles of design, and chemistry.

What the school ought to give.—Before entering the school the boy should have received a complete grammar-school education, special prevocational course in free-hand drawing, the principles of design, and chemistry. Apprentices and journeymen should receive specialized courses in drawing and design and trade chemistry; also a course in modern methods and practices.

BOOKBINDING.

Folding, Pasting, Gathering, Collating, and Sewing.

Processes.—Folding, pasting, gathering, collating, and sewing, while they are separate and distinct operations, may properly be grouped under one head, as in many binderies the occupations, with the possible exception of sewing, are interchangeable, the operators, who are girls and women, working sometimes at one occupation and sometimes at another.

The first process of making a book is folding. Large sheets of paper are generally printed so as to fold in sections of 16 pages. Such a section, when properly folded, is called a signature. The folding may be done by hand or by a folding machine. Machines are generally used for large "runs," but for small editions, booklets, etc., it is often cheaper to fold by hand, owing to the expense of the make-ready on the folding machine.

In the making of the book there is a considerable amount of pasting to be done, but the work included under this specific head is limited to the pasting operations required for putting in inserts, such as plates, maps, illustrations, charts, etc. This work is done before the sections are gathered.

After the sections or signatures have been folded they are collected in piles, all the sections in each pile being the same. These piles are laid out in consecutive order so that when one signature is taken from each pile a complete book will have been made. The process of collecting these signatures is called gathering. Gathering machines are also used in the larger binderies.

When the book has been gathered and pressed, it goes to the collator, by whom it is examined to see if any signature is misplaced or omitted.

The book is then ready to be sewed. Practically all sewing is done by machine, though in a few small binderies hand sewing is done. The machine not only sews much more rapidly but also does better work. The signatures are sewed one at a time and with from two to five stitches, so that if one breaks the signature is still held fast by the other stitches, while in hand sewing the sewing is done in such a manner that should the thread break the book is ruined. Small pamphlets are often bound together with staples, while some larger pamphlets and small books are sometimes stitched, which consists of stitching or sewing through all the sections of the book at one time in much the same manner as two pieces of cloth are sewed together.

Product or specialties.—The product or specialty of a bookbinder in Richmond does not differ materially from that of a bookbinder in other cities.

Importance of the trade.—There are about 225 females employed in this specific kind of work in Richmond.

Conditions of employment.—Some muscular effort is required in gathering and folding, and collating and sewing require close attention, which in some may cause a strain on the eyes. There is very little in this work to stimulate the interest or intelligence if the worker is kept on one kind of work all of the time. On the other hand, the worker is placed in the atmosphere of books and this is an incentive to some to read good books. There are no occupational diseases and very little liability to accident.

Economic conditions.—The beginning wage is generally about $4, and the usual wage from $7 to $9. The maximum wage reported was $14. The regular hours of labor vary from 8½ to 9½ per day, from 48 to 54 per week, and from 5 to 6 on Saturday. The busy season is generally from September to June and the dullest months July and August. This varies, however, for the class of work done. The fluctuation of the year ending May, 1914, was about 18 per cent. There is no organization among the workers.

Age of maximum productivity.—The entrance age is generally between 16 and 18, and no apprenticeship is served. The beginner is given more difficult work as she learns and is soon able to earn her maximum salary. The age of maximum productivity was not reported.

Demand for labor.—The supply of labor seems to be adequate at present, but the prospects are that it will increase in the future. The workers are generally girls from the graded schools and unskilled women.

Educational and technical requirements.—A bindery girl should have a common-school education, although her work may not call for it. If she expects to advance in her work or to be alive to the conditions around her, she certainly needs such training. Very little trade or technical knowledge is required, although it would be of advantage to know something of the machine used every day and of the material used. A knowledge of the history of bookmaking would be of importance. She must be rapid in handling her work and also neat and accurate.

What the industry gives.—The necessary amount of manipulative skill can be obtained in the shop. This includes pasting, handling folding stick, picking up signatures, handling book, and sewing. There is no formal apprenticeship and the advancement is due entirely to the accuracy and rapidity with which the work is done. Promotion is made a matter of money from one phase of work to another.

Deficiencies of workers.—The common deficiencies of workers are lack of application to the work, lack of speed, and inaccuracy.

What the school ought to give.—Before a girl enters on her work in a bindery she should have had an elementary-school education and training in household arts; after entering her work she should have training in a day or night school in subjects in general education, as English, spelling, etc., and also in household arts. A course in the history of bookbinding would also be of advantage to her.

Forwarding.

Processes.—Under the head of forwarding there are a number of occupations as follows: Trimming, rounding, backing, lining up, and casing in. The work is generally performed by men, and, while the occupations are dissimilar, the workers are to a certain extent interchangeable in all but the larger binderies, where a separate worker is employed for each occupation.

After being sewed the books are gathered, or "jogged up" in bunches and the edges trimmed in cutting machines.

"Rounding" consists of rounding the back of the book; this also results in concaving the front of the book. Rounding may be done by hand with a hammer or by a machine called a "rounder and backer."

"Backing" is the process of putting in the groove on which the cover is hinged, and is done in three ways. The oldest way is to clamp the book in a press between "backing irons" with the backs slightly projecting, the edges being then gradually drawn over with a hammer. The groove may be made with the machine called a "roller backer" or the book may be rounded and backed in a machine called a "rounder and backer."

"Lining up" is the process of gluing to the back of the book a piece of coarse woven cloth, wide enough to project about an inch each side of the back. Also cloth head bands are sometimes put at the top and bottom of the back.

"Casing in" or putting on the cover is done both by hand and by machine. In either case the process consists of pasting the outside of the first and last leaves of the book, putting the cover in the proper place against these pasted leaves and then putting the book between boards, the back projecting, and applying pressure for several hours.

Product or specialties.—The product or specialty of a forwarder in Richmond does not differ materially from that of a forwarder in other places.

Importance of the trade.—There are about 69 forwarders and finishers in Richmond.

Conditions of employment.—Some of this work requires long continued standing, and this tends to produce a physical strain. All the work is moderately stimulative and this is especially true of fine work. The binderies are small as a rule and opportunity is given for variety of work. There seem to be no occupational diseases in this work.

Economic conditions.—The minimum wage reported was $12 per week and the maximum $25. The union scale is $15. The regular hours of labor per day vary from 8½ to 9½, 48 to 54 per week, and practically all establishments have a short Saturday, from 5 to 6 hours. The busy season is generally from September to June, and the dull time in the summer, but this varies sometimes according to class of work done. The trade is about two-fifths organized; to be more exact, 43 per cent.

Age of maximum productivity.—Indeterminate. The entrance age is about 16.

Demand for labor.—The supply of medium-grade workers is ample, but there is always a demand for the skilled worker. This demand is likely to increase in the near future. The workers are generally obtained from boys who leave school at an early age, and from transient workers.

Educational and technical requirements.—A forwarder should have an elementary-school education with emphasis on English and literature, in order to appreciate more fully the work in which he is engaged. This would stimulate him to read books and take a pride in his work. He should know something of the materials used, as glue, paste, paper, cloth, etc. A history of bookmaking would be of advantage to him also. He must be able to handle the tools and machines with dexterity and to be neat and accurate in gluing, pasting, etc.

What the industry gives.—A beginner can learn and acquire the manipulative skill necessary for the accomplishment of the work, but he does not learn anything about the theme of the trade. There is, generally speaking, no provision made in the shop for the systematic instruction of the journeymen. The line of promotion is generally from journeyman to foreman.

Deficiencies of workers.—Deficiencies most common among forwarders are (1) lack of application to work, (2) inaccuracy, and (3) lack of dexterity.

What the school ought to give.—Before a boy enters the trade, he should have had an elementary-school training with prevocational work until he is 16 years old. This would tend to give him an idea of several lines of work and allow him to choose the one he likes best. After he has entered the trade he should continue his training by attendance in a day or night school, taking up courses in general education in which he is deficient and supplementing this by work on the theoretical and technical part of the trade, as the history of bookmaking, and knowledge of paper, glue, and paste.

Finishing.

Processes.—Finishing, which consists of placing the design and title on the cover, is generally done in hand or power presses, special dies cut from hard brass being used for the purpose. In fine leather-covered books the design, etc., is often "tooled in" by hand. Finishing is done by men, though girls and women assist in a few operations, such as laying gold leaf on the cover preparatory to stamping, inspecting, etc.

Product or specialties.—The product or specialty of a finisher in Richmond does not differ materially from that of a finisher in the other cities.

Importance of the trade.—There are about 69 forwarders and finishers in Richmond at the present time.

Conditions of employment.—Some of this work requires long-continued standing, and this necessarily causes a physical strain. The work of a finisher is also stimulative and some of it to a very high degree. As the binderies are somewhat small, the worker is given work of a varied nature, and this tends to keep it from becoming monotonous. There are no occupational diseases in the work of a finisher.

Economic conditions.—The lowest wage reported for a finisher was $12 per week and the highest $25. The union scale is $15. The regular hours of labor vary from 48 to 54 per week, 8½ to 9½ per day, and from 5 to 6 on Saturday. Practically all establishments work a short Saturday. The busy season is generally from September to June and the dull time during July and August. This varies somewhat, however, according to the nature of the work. The fluctuation last year was about 18 per cent. About 43 per cent of the finishers and forwarders are organized.

Age of maximum productivity.—Indeterminate. The beginners generally enter the work at 16 years of age.

Demand for labor.—There is always a demand for the highly skilled, efficient workers, and this demand is likely to increase in the future. The workers are recruited from the grade schools and from transient help.

Educational and technical requirements.—A finisher, to be efficient, could hardly have less than an elementary-school education; he should have a working knowledge of free-hand drawing and design, ink mixing, and color harmony. He must be able to make ready for stamping, know how to apply gold leaf, and have the other trade knowledge necessary for the accomplishment of his work. It would also be of advantage for him to know something of the history of his trade, and of the material used. He needs accuracy, neatness, speed, and mental alertness.

What the industry gives.—The manipulative skill and knowledge necessary for the accomplishment of the work can be acquired in the shop, but very little of the theoretical or technical part. There is, generally speaking, no systematic instruction for journeymen. The only line of promotion is from journeyman to foreman.

Deficiencies of workmen.—The most common deficiencies are (1) lack of application; (2) lack of knowledge of anything pertaining to the trade except the work actually being done.

What the school ought to give.—Before a boy begins to learn this work, he should have an elementary-school education with prevocational course until the sixteenth year. After entering on his trade he should take courses in a day or night school in the subjects he is most deficient in and those of a theoretical and technical nature that can not be obtained in the shop. These include the theory and history of bookmaking, design, ornamentation, color harmony, and ink mixing.

Cigarette-book Makers, Collaters, etc.

Processes.—After the lithographed work has dried it goes to the cutting department to be cut up into labels, checks, book covers, etc. This department includes cutters, collaters, perforaters, numberers, bookmakers. If the work happens to be bank checks, for instance, the printed sheets go first to the perforating machine to be perforated.

Perforators.—These machines are run by foot or motive power and the perforation is done by means of a disk which has teeth around its circumference. These teeth run over the paper and cut holes or perforations. Workers on these machines do nothing but work of this character.

Numberers.—If the checks are to be numbered they are sent to a numbering machine, run by foot or steam power, and the operator by adjusting the numbering device, prints numbers in any order required, the numbers changing automatically after each printing.

Collaters.—Where several different kinds of work are to be collated or put together, workers known as "collaters" are used. For instance, in calendar making, the printed sheets for each month are put in separate piles and the collater gathers one sheet at a time, in the proper order, until one of each has been collected, and places them in a pile or passes them on to the next worker who may bind them together with glue or tape.

FINDINGS ABOUT OCCUPATIONS IN THE PRINTING TRADES IN RICHMOND, VA.

[This chart is intended to summarize the statements and opinions of employers and employees in the trades in Richmond. The chart does not, therefore, necessarily represent the views of the Survey Committee, nor conditions and opinions of the trade elsewhere.]

ANALYSIS OUTLINE.	HAND COMPOSITOR.	LINOTYPE OPERATOR.	MONOTYPE OPERATOR.	STEREOTYPER.	PROOF READER.	MAKE-UP AND STONEHAND.	CYLINDER PRESSMAN.	PRESS FEEDER.
1. Process	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2. Product or specialties	Primal compositions of type into galleys, pages, or forms.	Type slugs, composed, justified, and cast by machine.	Type, cast, composed, and justified by machine.	Stereotype plates.	Revised proofs.	Pages of type assembled and locked up for printing or plating.	Impressions from type forms or plates in one or more colors.	Feeding in paper to press in operation.
3. Importance of trade (number employed).	147 males.	51 males; 1 female.	16 males; 5 females.	21 males.	28 males; 5 females.	32 males.	68 males.	100 males; 54 females.
4. Conditions of employment— (a) That involve physical or nervous strain.	None.	Close and long-continued application induces nervous strain.	Close and long-continued application induces nervous strain.	Heavy lifting, and working in high temperature.	Constant reading causes eye strain.	None.	The close attention required to make ready certain kinds of work, to keep colors uniform and to detect imperfect impressions, and the noise and vibration of the presses may produce eye and nerve strain.	The purely mechanical movements required and the noise and vibration of the presses induce nervous strain in the case of some feeders; others report physical strain from long-continued standing at the press.
(b) That stimulate intelligence and interest.	Variety in copy and necessity for originality in designing make-ups, and in selecting and composing type.	Variety in copy and necessity for exercising mechanical skill.	Variety in copy.	Variety of processes and sense of responsibility arising from the knowledge that upon the skillful work of the stereotyper depends the quality of the finished prints.	Variety in copy and necessity for quick detection of typographical and other errors in proofs.	Frequent change in the character of the work calls for the exercise of technical skill and of judgment in making up and assembling page forms.	Responsibility for perfection of presswork; high-grade technical skill is required, especially in color, book, and halftone printing.	None to any considerable extent.
(c) That narrow or restrict mental development.	None.	None.	None.	None.	None.	None.	None.	Routine.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Dust from type metal causes lead poisoning; no cases reported by Richmond employers or employees.	Fumes from the pot of melted type metal are injurious; no poisoning or impairment of health from fumes is reported by Richmond employers or employees.		Fumes from the melted metal are injurious to health, as is also the high temperature of the stereotype room; there is, also, some danger of getting burned in manipulating the hot metal.	None.	None.	Confinement in rooms closed to exclude drafts and moisture and overheated to insure proper manipulation and spread of ink is debilitating; bronzing, where done in large quantities, is injurious to health of pressmen.	Confinement in rooms closed to exclude drafts and moisture and overheated to insure proper manipulation and spread of ink is debilitating; bronzing, where done in large quantities, is injurious to health of press feeders.
5. Wages: Apprentices— (a) Beginning wage	$3 to $4 per week.	$3 to $4 per week.	$3 to $4 per week.	Not reported.	No apprentices.	No apprentices.	$3 to $4 per week.	No apprentices.
(b) Second-year wage	$4 to $5 per week.	$4 to $5 per week.	$4 to $5 per week.				$4 to $5 per week.	
(c) Third-year wage	No regular scale maintained.	No regular scale maintained.	No regular scale maintained.				No regular scale maintained.	
(d) Fourth-year wage	No regular scale maintained.	No regular scale maintained.	No regular scale maintained.				No regular scale maintained.	
(e) Fifth-year wage	No regular scale maintained.	No regular scale maintained.	No regular scale maintained.				No regular scale maintained.	
Journeymen— (f) Minimum wage	$12 per week.	$12.50 per week.	Males $19, females $8.16, per week.	$9 per week.	Males $18, females $10, per week.	$17 per week.	$11 per week.	Males $6, females $5, per week.
(g) Maximum wage	$32 per week.	$27 per week.	Males $26.75, females $16, per week.	$21 per week.	Males $30, females $17, per week.	$27 per week.	$22.50 per week.	Males $16, females $12, per week.
(h) Union scale	$16 per week.	$20 per week.	$20 per week.	$17 per week.	None.	None.	$14 per week.	$7.50 to $10 per week.
6. Hours of labor (regular, per day; per week; on Saturdays).	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	In newspaper offices hours are 7½ to 8 per day, 45 to 48 per week; in other plants 8 to 10 per day, 46 to 54 per week. Practically all establishments, except newspaper, work a short Saturday of 4 to 6 hours.	Hours 8 to 10 per day; 48 to 54 per week; on Saturday, except newspaper work, generally 4 to 6.
7. Seasonal activity: (a) Busy season	September to June.	September to June.	September to June.	September to June.	September to June.	September to June.	September to June.	September to June.
(b) Slack season	July and August.	July and August.	July and August.	July and August.	July and August.	July and August.	June to September.	June to September.
(c) Fluctuation in employment.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.
8. Extent to which the trade is organized.	About four-fifths.	About four-fifths.	About four-fifths.	Not reported.	Some are in typographical union.	Some are in typographical union.	Not reported.	Not organized.
9. Entrance age	15 to 16 years.	15 to 16 years.	15 to 16 years.	16 to 18 years.	17 to 20 years.	15 to 16 years.	15 to 16 years.	16 years.
10. Years required to learn trade	About 5 years.	About 5 years.	About 5 years.	About 5 years.	No apprenticeship.	Not reported.	About 5 years.	No apprenticeship necessary; a boy readily learns enough to handle certain classes of work.
11. Age of maximum productivity.	From 21 to 50 years of age.	From 21 to 50 years of age.	From 21 to 50 years of age.	From 21 to 50 years of age.	From 21 to 50 years of age.	From 21 to 50 years of age.	From 21 to 50 years of age.	Indeterminate.
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	The supply of highly-skilled labor is insufficient; of semiskilled labor is ample.	The supply of highly-skilled labor is insufficient; of semiskilled labor is ample.	The supply of highly-skilled labor is insufficient; of semiskilled labor is ample.	Supply is sufficient at present, although highly-skilled labor is always in demand.	Good proof readers are in demand.	Supply is inadequate for present demand.	Supply of skilled labor is limited, also of apprentices.	Supply of skilled labor is somewhat limited; the number of beginners and of semiskilled workers is adequate.
13. Is demand for labor increasing or decreasing?	Increasing.	Increasing.	Increasing.	Increasing.	Increasing.	Increasing.	Increasing.	Increasing.
14. What is the source of supply?	Apprentices, recruited from the elementary schools, and transient journeymen.	Apprentices and journeymen hand compositors.	Apprentices and journeymen hand compositors.	Boys from elementary schools.	Boys or girls who have done some high-school work or have at least completed elementary school course.	Boys from the graded schools and transient journeymen.	Apprentices and press feeders, who enter the shop from elementary schools, and journeymen from other communities.	Boys from the schools and the streets, and floaters from shop to shop.

ANALYSIS OUTLINE.	STEEL AND COPPER PLATE ENGRAVER.	PLATE PRINTER.	DIE STAMPER.	PACKER.	LITHOGRAPH ENGRAVER.	TRANSFERRER.	LITHOGRAPH PRESSMAN.	LITHOGRAPH PRESS FEEDER.
1. Process	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2. Product or specialties	Engravings on plates of steel or copper.	Engraved cards or sheets.	Designs or letters in relief on stationery.	Examining, counting, and packing engraved cards or sheets for shipment.	Designs on lithograph stone; engraved, or drawn with lithograph crayon.	Inked impressions in duplicate on a lithograph stone, or plate of aluminum or zinc, from which prints can be taken.	Lithographed impressions.	Feeding in paper to lithograph press.
3. Importance of trade (number employed).	7 males.	8 males.	1 male; 14 females.	1 male; 12 females.	15 males.	15 males.	20 males.	25 males.
4. (a) That involve physical or nervous strain.	Constant use of lens, especially when work must be done under artificial light, results in eye strain.	Close inspection of work induces eye strain, especially when work is done under artificial light; some physical strain results from constant standing.	Close inspection of work induces eye strain, especially when work is done under artificial light; some physical strain results from constant standing.	Practically none.	The close application required may result in eye strain.	None.	The close attention required to make ready certain kinds of work, to keep colors uniform, and to detect imperfect impressions, and the noise and vibration of the presses may produce eye and nerve strain.	The purely mechanical movements required and the noise and vibration of the presses induce nervous strain in the case of some feeders; others report physical strain from long-continued standing at the press.
(b) That stimulate intelligence and interest.	Variety of work, and in some cases necessity for originating the designs engraved.	As compared with printing from type, the presswork in plate printing involves a greater variety of processes which require manual dexterity.	The preparation and adjustment of dies to the press gives a variety to the work and requires mechanical skill and manual dexterity; color work is exacting, and all work requires neatness.	Final responsibility for perfection of work sent out to trade.	The character of originality, technical skill, and variety attaches to all work.	The small amount of routine and the requirement of manual dexterity and technical skill.	The character of the press requires for its successful operation high-grade mechanical skill, especially in multicolor work.	Multicolor work especially requires skillful manipulation of sheets.
(c) That narrow or restrict mental development.	None.	None.	None.	None.	None.	None.	None.	Routine.
(d) That are in other respects important as affecting the welfare of workers.	Close confinement; sitting at work, which gives practically no physical exercise.	None.	None.	None.	None.	None.	Confinement in rooms closed to exclude drafts and moisture, and overheated to insure proper manipulation and spread of ink, is debilitating; bronzing, where done in large quantities, is injurious to health of pressmen.	Confinement in rooms closed to exclude drafts and moisture, and overheated to insure proper manipulation and spread of ink, is debilitating; bronzing, where done in large quantities, is injurious to health of press feeders.
5. Wages: Apprentices— (a) Beginning wage	$3 to $4 per week.	$3 to $4 per week.	No apprentices.	No apprentices.	$3 to $4 per week.	$3 to $4 per week.	$3 to $4 per week.	No apprentices.
(b) Second-year wage	$4 to $5 per week.	$4 to $5 per week.			$4 to $5 per week.	$4 to $5 per week.	$4 to $5 per week.	
(c) Third-year wage	No regular scale maintained.	No regular scale maintained.			No regular scale maintained.	No regular scale maintained.	No regular scale maintained.	
(d) Fourth-year wage	No regular scale maintained.	No regular scale maintained.			No regular scale maintained.	No regular scale maintained.	No regular scale maintained.	
(e) Fifth-year wage	Bonus given at end of apprenticeship sometimes.	No regular scale maintained.			No regular scale maintained.	No regular scale maintained.	No regular scale maintained.	
Journeymen— (f) Minimum wage	$15 per week.	$12 per week.	Males $10, females $5.50, per week.	Males $4, females $4.50, per week.	$26 per week.	$22 per week.	$15 per week.	$7.14 per week.
(g) Maximum wage	$35 per week.	$17 per week.	Males $19, females $10, per week.	Males $10, females $6.50, per week.	$30 per week.	$30 per week.	$25 per week.	$10 per week.
(h) Union scale	None.	None.	None.	None.	None.	$22.50 to $25 per week.	None.	None.
6. Hours of labor	Hours 8½ to 9½ per day; 48 to 52 per week; 4 to 5, generally, on Saturday.	Hours 8½ to 9½ per day; 48 to 52 per week; 4 to 5, generally, on Saturday.	Hours 8½ to 9½ per day, 48 to 52 per week, 4 to 5, generally, on Saturday.	Hours 8½ to 9½ per day, 48 to 52 per week, 4 to 5, generally, on Saturday.	Hours 8½ to 9 per day, 48 to 51 per week, 4½ to 6 on Saturday.	Hours 8½ to 9 per day, 48 to 51 per week, 4½ to 6 on Saturday.	Hours 8½ to 9 per day, 48 to 51 per week, 4½ to 6 on Saturday.	Hours 8½ to 9 per day, 48 to 51 per week, 4½ to 6 on Saturday.
7. (a) Busy season	October to June.	October to June.	October to June.	October to June.	September to June.	September to June.	September to June.	September to June.
(b) Slack season	June to October.	June to October.	June to October.	June to October.	June to September.	June to September.	June to September.	June to September.
(c) Fluctuation in employment.	Approximately 13 per cent.	Very slight.	Very slight.	Very slight.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.	Approximately 13 per cent.
8. Extent to which the trade is organized.	Not organized.	Not organized.	Not organized.	Not organized.	Not organized.	Fully organized.	Fully organized.	Not organized.
9. Entrance age	16 years.	15 to 16 years.	16 years.	16 years.	16 years.	15 to 16 years.	15 to 16 years.	15 to 16 years.
10. Years required to learn trade	About 5 years.	About 5 years.	No apprenticeship.	No apprenticeship necessary.	About 5 years.	About 5 years.	About 5 years.	No apprenticeship.
11. Age of maximum productivity.	From 21 to 50 years of age.	Indeterminate.	Indeterminate.	Indeterminate.	From 21 to 50 years of age.	From 21 to 50 years of age.	From 21 to 50 years of age.	Indeterminate.
12. Is supply of labor adequate to meet demand?	There is a demand for efficient all-round engravers; supply of semiskilled workers is adequate.	Always a demand for the skilled, efficient plate printer. The field is limited and comparatively few enter the occupation.	Skilled labor is in demand.	Efficient packers are in demand, although the field is small.	Demand for skilled workers who can engrave and use crayons.	There is a demand for skilled transferrers, not for semiskilled. The field is limited.	Supply of skilled labor is limited, also of apprentices.	Supply of skilled workers is limited.
13. Is demand for labor increasing or decreasing?	Increasing.	Increasing, but limited.	Increasing because of growing popularity of die-stamped work.	Increasing because of growing popularity of die-stamped and engraved work.	Relatively fixed.	Increasing.	Increasing.	Increasing.
14. What is the source of supply?	Boys from the elementary schools, who serve an apprenticeship, and journeymen from other communities.	Boys from elementary schools, who serve an apprenticeship, and journeymen from other communities.	Girls from elementary schools.	Girls from elementary schools.	Boys from the elementary schools, who serve an apprenticeship and journeymen from other communities.	Boys from elementary schools, who serve an apprenticeship, and transient journeymen.	Apprentices and press feeders and transient journeymen.	Boys from elementary schools and transient workers.

ANALYSIS OUTLINE.	PHOTO-ENGRAVING OPERATOR.	ETCHER.	ROUTER.	PHOTO-ENGRAVING FINISHER.	BOOKBINDER.	FORWARDER.	FINISHER.	CIGARETTE-BOOK MAKER.
1. Process	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2. Product or specialties	Developed and fixed films or negatives for the engraver.	Etched halftone plates and zinc plates of line etchings.	Mounted halftone and line-etched plates.	Correction of defects in and the improvement of halftone and line-etched plates.	Bound book ready for finishing.	Books and pamphlets sewed or stitched, ready for forwarding and finishing.	Decoration and lettering on covers of bound books.	Books or packages of cigarette papers.
3. Importance of trade (number employed).	6 males.	[illegible]	[illegible]	[illegible]	225 females.	[illegible]	[illegible]	26 females.
4. (a) That involve physical or nervous strain.	The intense light under which the work must be done causes eye strain.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) That stimulate intelligence and interest.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(c) That narrow or restrict mental development.	None.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(d) That are in other respects important as affecting the welfare of workers.	None.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5. Wages: Apprentices— (a) Beginning wage	$2.50 to $3.50 per week.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Second-year wage	$4.50 to $5.50 per week.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(c) Third-year wage	No regular scale maintained.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(d) Fourth-year wage	No regular scale maintained.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(e) Fifth-year wage	No regular scale maintained.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Journeymen— (f) Minimum wage	$18 per week.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(g) Maximum wage	$35 per week.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(h) Union scale	Halftone operator, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6. Hours of labor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7. (a) Busy season	September to June, except January.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Slack season	July, August, January.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(c) Fluctuation in employment.	Very slight.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8. Extent to which the trade is organized.	Fully organized.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9. Entrance age	15 to 16 years.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10. Years required to learn trade	About 5 years.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11. Age of maximum productivity.	Indeterminate.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12. Is supply of labor adequate to meet demand?	Supply does not more than equal the demand.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13. Is demand for labor increasing or decreasing?	Increasing.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14. What is the source of supply?	Boys from the elementary schools, who serve an apprenticeship, and journeymen from other communities.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

FINDINGS ABOUT EDUCATION FOR OCCUPATIONS IN THE PRINTING TRADES IN RICHMOND, VA.

ANALYSIS OUTLINE.	HAND COMPOSITOR.	LINOTYPE OPERATOR.	MONOTYPE OPERATOR.	STEREOTYPER.	PROOF READER.	MAKE-UP AND STONEHAND.	CYLINDER PRESSMAN.	PRESS FEEDER.	STEEL AND COPPER PLATE ENGRAVER.	PLATE PRINTER.	DIE STAMPER.	PACKER.	LITHOGRAPH ENGRAVER.	TRANSFERRER.	LITHOGRAPH PRESSMAN.	LITHOGRAPH PRESS FEEDER.	PHOTO-ENGRAVING OPERATOR.	ETCHER.	ROUTER.	PHOTO-ENGRAVING FINISHER.	BOOKBINDER.	FORWARDER.	FINISHER.	CIGARETTE-BOOK MAKER.
15. What does worker need to properly equip him for trade? (a) General education.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Trade and technical education.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(c) Manipulative skill.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(d) Other requirements: Qualities essential, such as accuracy, etc.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16. What the industry gives: (a) Conditions of apprenticeship.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Provision for systematic instruction of apprentices.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(c) Trade and technical knowledge.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(d) Manipulative skill.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(e) Extent to which the trade can be learned in the shop.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(f) Provision made in the shops for systematic instruction of journeymen.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(g) Line of promotion.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17. Common deficiencies of workers.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II. After entering the shop— (a) Trade and technical knowledge.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(b) Manipulative skill.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
III. Nature of part-time courses needed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IV. Nature of evening school courses needed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Cutters.—The cutter takes the sheets when they are ready to be cut, adjusts the cutting machine to make the proper cut, and by pushing a lever with the hand, on a foot or power machine, cuts the work into the required size and shape. In the cutting department girls are used almost without exception, except on the large cutting machines, where the work to be handled is too bulky or too heavy for them.

Polishers.—In the large lithograph plants there are some occupations that are not found in the small plant. For instance, there are men who do nothing but polish stones for the engraver and transferrer. The stone must first of all be even and true on the face and it must have a properly grained or polished surface. The polisher puts the stone on a table or support, puts on it water and sand of the proper grade for the graining and rolls or rubs another stone over its surface. This polishes and at the same time grains the face. A stone may thus be used many times for lithographing work.

Paper stock.—In the paper-stock room there are men who take charge of the blank paper. This paper must be laid out to dry, should it come to the plant in a damp condition or should it become damp by atmospheric conditions while in the stock room. Specially prepared racks are constructed, each section of which holds a certain grade or quality of paper.

Bookmakers.—When books of cigarette papers are made, the cigarette-book maker folds the cover into the proper shape, inserts the required number of sheets of cigarette paper, and then binds the whole together.

Product or specialties.—The product or specialty of a cigarette-book maker consists of books or packages of cigarette papers.

Importance of the trade.—According to the schedules, there are 26 female cigarette-book makers in Richmond.

Conditions of employment.—There are no nervous or physical strains caused by this work and nothing to stimulate. It can not be said, however, that this work retards mental development.

Economic conditions.—The average wage reported was $4.08 per week. The hours of labor are 51 per week, 9 per day, and 6 on Saturday. There is steady employment practically the whole year, the only dull season being during the summer months. There is no organization among the cigarette-book makers.

Age of maximum productivity.—Indeterminate. The entrance age is generally 16, and no apprenticeship is necessary to learn the work.

Demand for labor.—The supply of labor is adequate for the demand and this demand is apt to remain constant in the near future. The workers are recruited from the grammar schools.

Educational and technical requirements.—A cigarette-book maker, like the press feeder, needs very little education for the purpose of making cigarette books, but in order to be in line for a better position she should have at least a good elementary-school education, especially in arithmetic. She needs to be quick and accurate in folding covers and inserting papers. A knowledge of lithography would be of advantage to any worker in that trade.

What the industry gives.—There is no apprenticeship in this work. A girl is soon able to do the work required of her, but she has no chance to learn anything of the technical part of the trade to make her more intelligent as regards the lithograph work as a whole.

Deficiencies of workers.—The most common deficiency is the inability to count the papers accurately and to fold the covers correctly.

What the school ought to give.—The school should give the cigarette-book maker an elementary-school education, to enable her to advance in her work. She should attend a day or night school to study those subjects she is deficient in and those that bear on her trade.

APPENDIX C.—ANALYSIS OF OCCUPATIONS IN THE BUILDING TRADES IN RICHMOND.

SUMMARY OF THE INDUSTRIAL SURVEY OF THE BUILDING TRADES.

SCOPE OF THE INQUIRY.

In all, 20 building trades establishments, employing at the date of the inquiry 875 workers, were covered by the survey, the number of workers employed by these establishments being approximately 30 per cent of all persons engaged in the building trades in Richmond, exclusive of those employed in the metal trades establishments.[1] These latter workers are included in the survey of the metal trades establishments and are covered in another section of this report.

PRODUCT OR SPECIALTIES.

The establishments from which schedules were secured represent every branch of building trades that is found generally in cities having approximately the same population as Richmond, the special lines being painting, decorating, sign painting, construction of buildings, plumbing, heating and steam fitting, plastering, cement and concrete work, wood millwork, furniture making, stonecutting, bricklaying, and electrical work.

SIZE OF ESTABLISHMENTS.

The number of workers employed in individual establishments at the date of the inquiry varied from 3 to 200. Inasmuch as the survey was taken in the summer, which is the busy season for the building trades generally, the number reported employed at the date of filling out the schedules is, in the case of a number of establishments, their maximum for the year. In the following table the establishments are classified according to size, the classification being based, as regards each establishment, upon the maximum number employed at any time during the previous year. It will be apparent that in this table the total number of workers, 1,034, does not represent the number employed at any one time, but is approximately the number which would be employed if the busy seasons for the several establishments were exactly coincident.

TABLE 67.—BUILDING TRADES ESTABLISHMENTS CLASSIFIED ACCORDING TO MAXIMUM NUMBER EMPLOYED DURING THE YEAR.[2]

Maximum number employed.	Establishments.	Employees.
25 and under	6	55
26 to 50	4	136
51 to 100	8	540
101 to 200	2	303
Total	20	1,034

[1] See United States Census of Occupations, 1910. The census classification by occupation does not enable one to determine exactly the number of workers engaged in the building trades, outside of the metal trades establishments.

[2] Four establishments employing, respectively, 63, 57, 31, and 10 workers, which made no report of maximum and minimum number employed during the year, have been classified on the basis of number employed at the date of the inquiry.

In the table following the fluctuation in number employed is shown by individual establishments.

TABLE 68.—NUMBER OF EMPLOYEES IN 20 BUILDING TRADES ESTABLISHMENTS IN JUNE, 1914, AND MAXIMUM AND MINIMUM NUMBER EMPLOYED IN 1913, BY ESTABLISHMENTS.

Establishment No.	Character of work done.	Number employed.			Percentage the minimum is of the maximum.
		June, 1914.	Maximum during 1913.	Minimum during 1913.	
1	Painting and decorating	3	4	3	75
2	Millwork and house finishing	63	(1)	(1)	
3	Antique and colonial furniture	75	75	75	100
4	Marble and granite cutting	10	10	4	40
5	Brick manufacturing and contracting	47	47	20	43
6	Painting, decorating, and paper hanging	15	30	10	33
7	Electric construction (inside work)	9	12	8	67
8	Painting, decorating, and paper hanging	46	60	8	13
9	Building contractor	11	57	8	14
10	Heavy construction (carpenter and builder)	200	200	25	13
11	Sign lettering and painting	7	10	8	80
12	Plastering contractor	46	103	20	19
13	do	72	75	12	16
14	Builder and contractor	57	(1)	(1)	
15	Heating contractor	31	(1)	(1)	
16	Sheet-metal work, plumbing, and gas fitting	9	9	4	44
17	Building and ornamental stonework	10	(1)	(1)	
18	Concrete and cement work	65	75	15	20
19	Plumbing and heating	21	28	14	50
20	Office and store fixtures	78	78	78	100
	Total	875			

[1] Not reported.

FLUCTUATIONS OF EMPLOYMENT.

Generally speaking, in the building trades of Richmond, as compared with the printing and metal trades, the fluctuations in employment are in a greater degree seasonal. This is not true, however, as regards certain important groups included in the building trades, such as, for example, those employed in the making of furniture, office fixtures and hardwood finish, in which employment is fairly steady all the year round. The most marked seasonal fluctuations are to be found chiefly in trades engaged in the actual construction of buildings. In this respect, conditions in Richmond do not differ materially from those obtaining in other cities, except for the fact that the active season in building, owing to the milder climate, is longer in Richmond than in cities situated farther north.

In the case of only 5 of the 16 establishments reporting maximum and minimum number of workers employed during the year preceding the inquiry did the minimum exceed 50 per cent of the maximum. In the case of 5 establishments the minimum was less than 20 per cent of the maximum.

SLACK AND BUSY PERIODS.

Establishments engaged in actual construction work state that their slackest periods occur during the winter months. Two establishments report the summer months of July and August as being the slackest season; both of these were engaged in the manufacturing of high-grade office furniture and fixtures. Establishments engaged in heating, plumbing, and steam fitting report that their slack period is in the spring months.

It is apparent from the report on the schedules that for a majority of the establishments the busiest months of the year are from March to November, inclusive.

SUPPLY OF COMPETENT JOURNEYMEN.

Almost all of the employers state that difficulties are experienced in obtaining competent journeymen. The opinion is that these difficulties are to be traced chiefly to lack of any system of regular indenture as regards apprentices in the building trades.

AGE OF MAXIMUM PRODUCTIVITY.

Though constantly qualifying their statements by saying "it depends upon the individual," opinions of employers vary radically with reference to the age period of maximum productivity. The lower age limits are variously estimated at from 21 to 25; the upper limit ranges from 35 to 60.

SUPPLY OF SKILLED AND UNSKILLED LABOR.

Although employers differ in their opinions as to the adequacy of the supply of unskilled labor, they, with a surprising unanimity, agree that the supply of skilled labor is becoming steadily more inadequate relatively to the demand, and the explanation given is, as has been already stated, the lack of any systematized apprenticeship.

PROMOTIONS FROM ONE OCCUPATION INTO ANOTHER.

Chances for promotion in the building trades seem to be very slight. Only one out of seven employers reports that such promotions take place in his establishment. Employers reporting, in answer to the question "What is the usual line of promotion for a journeyman?" answer invariably "to foreman." It should be noted, however, that in the building trades the opportunity for experienced journeymen to establish themselves independently is greater than it is in those industries which are organized on a large scale. This fact goes far to offset the small opportunity for promotion so long as workers remain employees.

TRADES THAT CAN BE LEARNED IN THE SHOP.

In the establishments covered by this investigation, employers state that the following trades can be learned by practice in the occupations: Painting, decorating, paper hanging, general millwork, granite and marble cutting, bricklaying, carpentry, and plastering. Two employers—electrical contractors—report that "nothing" can be learned in their establishments. The returns above noted, as regards the possibility of learning the trade in the shop, should be interpreted in the light of answers to other questions on the schedule bearing on the subject. For example, in answer to the question "What occupations can be learned in your shop with little or no instruction?" employers invariably answered "none." In answer to the question as to whether beginners get any instruction in their shops and by whom, if any, the instruction is given, the answer was almost invariably, "Yes, by the foreman." It would appear, therefore, that the extent to which instruction is given is measured by the ability of the busy foreman to give it, and in most instances such instruction is undoubtedly very inadequate, because the foreman has not in any case the time in which to give instruction, and in some cases he lacks the ability.

UNTRAINED BEGINNERS IN THE SKILLED TRADES.

In three-fourths of the establishments visited no untrained beginners, save apprentices, are employed. This again would seem to indicate that the trades can not be learned "on the job."

FOREIGN AND AMERICAN TRAINED WORKERS.

Opinions of employers are equally divided on the question as to whether the foreign-trained mechanic is superior to the native American. Those who think that foreign-trained workers are superior say that this superiority is due to the more thorough industrial and general schooling of the foreigners. The experience of Richmond employers with foreign-trained mechanics is, however, as shown in other parts of this report, inconsiderable.[1] The deficiencies most commonly noted on the schedules as characteristic of the native American are: (*a*) Lack of a thorough training in the trade, (*b*) lack of general education, (*c*) lack of a desire to stick to the trade, and (*d*) "whisky." The following deficiencies are, however, specified: Laziness, lack of self-control, and lack of ability to apply himself to business.

STEADY WORK FOR COMPETENT HELP.

A majority of the employers in the building trades report that they are in a position to provide steady employment all the year round to their competent journeymen. Others, however, state that they find it necessary when business slows down to lay off some even of their most competent workers.

CONDITIONS UNDER WHICH WORK IS PERFORMED.

Employers deny the existence in their establishments of conditions that might tend to cause nervous or physical strain to their employees, but do make mention of the fact that there is danger of accident in certain lines of work, such as that on tall buildings, and generally in the placing of heavy timbers and in the erection of steel structures. Establishments employing painters and stonecutters make slight mention of well-known occupational diseases associated with those trades, such as lead poisoning and various affections of the lungs and throat due to inhalation of dust. These and other conditions which tend to impair the health of the workers are considered in detail in the full text description of the several occupations to be found elsewhere in this report.[2]

CONDITIONS THAT STIMULATE INTELLIGENCE OF WORKERS.

Employers agree that intelligence of workers is stimulated only by occupations involving more or less skill, and by those which do not involve constant repetition. In certain branches of the building trades there is a considerable amount of rough-work which can not appeal to the interest of the workers.

HOW WORKERS ARE TRAINED.

Although a number of employers state that in their shops some instruction is given to beginners by foremen, the returns indicate that there is, in general, in the building trades no provision for systematic training. Employers, nevertheless, generally assert that none of the building trades can be learned in the shops without instruction of a kind not now given carefully planned and carried out over a series of years.

TERMS OF APPRENTICESHIP AGREEMENTS.

Ten employers report that they have no apprenticeship agreements whatever; seven state that they have "verbal understandings" with their apprentices. Only three have written agreements covering definite periods of apprenticeship, these being in the organized trades in which the workers have collective agreements with their employers regulating all matters, including apprenticeship.

Those reporting apprenticeship agreements state that the terms of these agreements specify three or four years as the period of apprenticeship and a sliding scale of wages determined in accordance with the acquired skill of the apprentice.

It is the general opinion of employers, more especially of those who have agreements with their apprentices, that boys working under agreements take their work more seriously than do boys working without any agreement.

---

[1] See Table 18, p. 73.

[2] See pp. 147 to 182.

INDUSTRY HAMPERED BY LACK OF ELEMENTARY TRAINING.

It is the unanimous opinion of employers that the efficiency and wage-earning power of their employees is impaired by the lack of elementary education, and that in consequence the building trades industries as a whole suffer. The employers generally assert that school training beyond the seventh grade would be of great value to the workers. In addition to a complete elementary-school training, subjects strictly vocational in character are specified as particularly advantageous; such as, for example, drawing, shop mathematics, estimating, and reading of blue prints for workers engaged in construction work, and color harmony and paint mixing for the painter.

KIND OF SCHOOL DESIRED.

Four-fifths of the employers favor evening industrial schools, very few of them expressing preference for part-time day industrial schools. As regards each separate occupation the subjects specified by employers to be taught in evening school classes are included in the outlines of courses given in the analyses of occupations.

EMPLOYERS WILL COOPERATE IN ESTABLISHMENT OF PART-TIME SCHOOLS.

Employers suggesting part-time day industrial schools express willingness to enter into an agreement providing for definite periods of attendance of their apprentices at such schools, at the expense of the employers, apprentices to receive their usual wages while at school. From six to eight hours per week—not exceeding two hours per day—it is thought would be adequate to meet the needs of apprentices for school training.

WHAT WORKERS SHOULD BE TAUGHT BEFORE THEY ENTER THE SHOPS.

As has been noted, employers insist that a complete elementary general education is an essential condition of success in the building trades. Eight of the employers think that this general education should be supplemented by special courses covering shop mathematics and drawing. A few of the employers suggest purely industrial subjects pertaining to specific occupations, such as paint mixing, color harmony, estimating, and "trade knowledge." as subjects which should be taught the workers before entering the shops.

NIGHT SCHOOLS FOR JOURNEYMEN.

Among the subjects suggested for advanced trade evening courses to be given for journeymen to increase their efficiency are the following, each being recommended with reference to the specific needs of particular occupations: Free-hand, mechanical, and architectural drawing, shop mathematics, reading and making of blue prints, methods of estimating of costs, paint mixing, color harmony, modeling, lettering, history of the trade, and theory of electricity.

EFFICIENCY TESTS AND RECORDS.

In comparatively few cases do employers keep any written records of individual efficiency, and the usual method of testing the fitness of applicants for employment is by actual trial.

EMPLOYERS WILL COOPERATE IN SYSTEMATIZING SHOP PRACTICE.

Three-fourths of the employers expressed perfect readiness to cooperate with the school authorities in organizing shop practice in order to develop the efficiency of their workers.

In the two tables following, statistics are presented showing for the 875 workers employed in the 20 building trades establishments covered by the survey establishment schedules—(1) the number of journeymen, apprentices or beginners, and semiskilled workers in each occupation; (2) the regular hours of labor per day; and (3) the regular hours of labor per week.

TABLE 69.—NUMBER OF JOURNEYMEN, APPRENTICES OR BEGINNERS, AND SEMISKILLED WORKERS IN 20 BUILDING TRADES ESTABLISHMENTS, CLASSIFIED BY OCCUPATION, JUNE, 1914.

Occupation.	Number of workers.			
	Journeymen.	Apprentices or beginners.	Semiskilled helpers or laborers.	Total.
Bench hand	17			17
Brick mason	58	2	25	85
Cabinetmaker	67	5		72
Carpenter	122	3	100	225
Carver	5			5
Cement finisher	3		60	63
Cement worker			2	2
Decorator	3	1		4
Draftsman	2	1		3
Electrician	4	5		9
Gilder	2			2
Granite cutter	8	1	2	11
Lather	7			7
Marble cutter	6	2		8
Marble polisher	1			1
Mill worker	43	4	30	77
Painter	52	2		54
Paper hanger	10	1		11
Plasterer	73	6	32	111
Plumber	11	4	20	35
Sign painter	4	1	2	7
Steam fitter	15	2	3	20
Tinner and sheet-metal worker	4	1	1	6
Upholsterer	8			8
Wood finisher	32			32
Total number	557	41	277	875
Per cent	63.7	4.7	31.7	100

TABLE 70.—REGULAR HOURS OF LABOR IN 20 BUILDING TRADES ESTABLISHMENTS.

Hours per day (except on Saturday).	Number of shops reporting specified number of hours.[1]	Employees.		Hours per week.	Number of shops reporting specified number of hours.[1]	Employees.	
		Number.	Per cent.			Number.	Per cent.
8 hours	7	114	13.0	44 hours	2	52	5.9
8½ hours	3	61	7.0	48 hours	8	123	14.1
9 hours	7	420	48.0	53 hours	1	65	7.4
9½ hours	4	142	16.2	54 hours	10	497	56.8
10 hours	2	138	15.8	55 hours	1	75	8.6
				56 hours	1	63	7.2
Total	20	875	100.0	Total	20	875	100.0

[1] Three shops are included twice, different hours being reported for different groups of workers.

ANALYSIS OF OCCUPATIONS IN DETAIL.

CARPENTERING.

Processes.—The processes in carpentering are essentially simple. They embrace such work as that of cutting timbers, boards, and finish to length and shape; framing up structures; boarding in; weatherboarding; lathing; stair building; putting on exterior and interior finish; and building frames for concrete.

These several processes require manipulative skill and trade and technical knowledge in varying degrees, and in many communities specialization has gone far in establishing distinct trades within the general field of carpentering, such as, for example, that of the framer, the joiner, the stair builder, the parquet-floor layer, and the hardwood finisher. In Richmond, however, while there is some specialization along these several lines, the carpenter is in general expected to be an all-round carpenter and joiner, and to be more or less proficient in all lines of ordinary carpentering. He is expected on occasion to stake out a building from specifications; to get out the frame, and in buildings of simple construction erect it from sill to peak; to weatherboard, shingle, and lath; to build stairs having straight lines and square turns; to do all simple outside and inside finishing in soft wood; and to fit and hang ordinary sashes, doors, and blinds. The several lines of work which are more or less specialized into distinct trades may be briefly described as follows:

The joiner puts in window frames, hangs sashes, doors, and blinds; does all kinds of inside woodwork on doorframes, jambs, and trim, washboards, picture moldings, wainscotings, and paneled ceilings; he sets mantels, builds the less difficult staircases, and does all kinds of interior finish, both in hard and in soft wood.

The stair builder makes a specialty of building the more difficult and ornamental staircases, such as the double-turn and the spiral types. His work consists of building and putting in place the stairs, the newel posts, and the handrailings, in the space provided for them in the building, with due regard to safety, comfort, artistic design, and ornamentation.

The parquet-floor layer lays parquet floors, which are of hard wood, inlaid usually in geometrical patterns, often in different colors.

The hardwood finisher works on the finishing of hardwood interiors, scraping and polishing them until perfectly smooth and ready for the stainer and varnisher.

The framer, in the construction of buildings and other structures of concrete, builds wooden frames or forms for inclosing the concrete and holding it in place until hard.

In all of these lines the carpenter must work accurately from blue prints or specifications, accuracy in following plans and specifications being fully as essential, for example, in the rough work of framing up buildings, as it is in the finer work of inside finishing or stair building. The carpenter's work is practically all of it bench or hand-tool work, and requires the use of a great variety of more or less complicated tools.

Finally, a considerable amount of the carpenter's time is occupied in caring for and sharpening his tools—filing his saws, crosscut, block, and rip; sharpening his chisels and bits of different sizes and shapes; and sharpening and adjusting the knives of his planes.

Product or specialties.—The characteristic product of the carpenter, in Richmond as in other communities, is a building or structure of wood, framed up, boarded in, weatherboarded, shingled, with outside and inside wood finish put on, floors laid, sashes, doors, and blinds hung, and all surfaces prepared for painting, or staining and varnishing.

Importance of the trade.—The total number of carpenters in Richmond in 1910, according to the returns of the Federal census, was 1,281, of whom 1,121 were white and 160 were colored. This total includes carpenters in the mills and car shops. The number of carpenters in the building trades is at the present time approximately 600.

Conditions of employment.—Practically all of the work of the general carpenter calls for the exercise of physical strength; some of it involves heavy lifting, as in the placing of heavy timbers, and some, such as floor laying, may involve long continued stooping. Generally, however, the work is sufficiently varied to avoid any serious physical strain for the experienced, hardened workman. Even in such work as floor laying, the carpenter alternates between the use of the saw and the hammer; he must select his boards, and as the floor is laid it must be scraped, or planed, or sandpapered smooth. The character and variety of the work, and the fact that the carpenter must work from specifications, and must on occasion draw up his own specifications, makes his work stimulative. For men engaged upon rough work, the way of promotion is open in proportion as the worker acquires experience. In none of its aspects, except possibly unvaried roughwork, does carpentering restrict the mental development of the worker. While in certain lines of work as, for example, in erecting frames there is some danger of accident, there are no occupational diseases, and in general the conditions of work are such as to insure the worker's good health.

Economic conditions.—During his first year the apprentice earns from $4 to $5 per week, and his wage is increased from year to year, so that during the last year of his apprenticeship he is earning from $7 to $8 per week. The minimum wage reported on the survey schedules by journeymen is $15, the maximum wage $21 per week; the union scale is $18. Carpenters work from 8½ to 9 hours per day, with a short Saturday of 5½ or 6 hours, making a full-time working week of from 48 to 54 hours. While the fluctuation in employment from year to year depends largely upon activity in the building trades, the carpenters average about 10 months of work in the course of a year. In Richmond the climate is such that the active season in building is prolonged, extending in general from the 1st of March to the end of December, leaving a short slack season extending through January and February. Approximately one-half of the carpenters are members of the carpenters' and joiners' union.

Age of maximum productivity.—Boys enter the trade between the ages of 16 and 18 and serve an apprenticeship of four years. According to the returns on the schedules, the productivity of carpenters is at its maximum during the age period from 25 to 55.

Demand for labor.—In Richmond the demand for workers is increasing, especially for efficient skilled workmen who have served a full apprenticeship. The supply of semiskilled workers is, however, fully adequate to meet the demand for such labor. Apprentices are recruited largely from the lower grades of the grammar school. Casual laborers enter the trade as unskilled workmen, and as they acquire experience are employed on work requiring some degree of skill.

Educational and technical requirements.—Any deficiency in general education, such as is represented by the lack of a grammar-school course, can not fail to be a serious handicap for the carpenter who would advance in his trade to any position of independence. In addition to this he requires for success in his occupation a very considerable amount of trade and of technical knowledge, covering the uses of a great variety of hand tools, the qualities of various kinds of woods, the various methods of building construction, free-hand, mechanical, and architectural drawing, blue-print reading of architects' plans and specifications, and the mathematics required for determining angles, heights, weights, and strains.

Tools and Their Use.

The degree and diversity of manipulative skill and of trade knowledge required by the carpenter can best be indicated by a brief description of the principal tools in the use of which he must become adept. These are as follows:

Saws: A carpenter's handsaw consists of a thin piece of steel called the blade, upon which teeth are cut along the edge. The handle end of the blade is called the head and the other end the point. The blade is considerably wider at the head than at the point. Handsaws are classified as rip and crosscut; the ripsaw is for cutting with the grain of the wood and the crosscut is for cutting across the grain. They are also classified according to the number of teeth per inch. The saw in order to cut well and move freely must have what is called "set." Setting a saw consists of bending its teeth alternately from side to side, thus making the cut wider than the blade is thick. The amount of set varies according to the use of the saw. In sawing green or undried lumber the saw requires a greater set than in sawing well-seasoned lumber, and a crosscut saw requires more set than a ripsaw. The pitch of the saw tooth is the angle formed by the slanting edge of the tooth with a straight line drawn through the point of the tooth at right angles to the edge of the saw blade. The amount of pitch depends upon the kind of work for which the saw is to be used, ripsaws, for example, requiring more pitch than do crosscut saws.

The crosscut saw is used for cutting across the grain, and the teeth are filed so that the cutting edges are on the side. The teeth are sharpened to a point, one on one side, the next on the other, leaving a V-shaped space between and giving two parallel lines of sharp points. The ripsaw is used for cutting with the grain, and the teeth are filed straight across at right angles to the line of the blade, making them chisel shaped. The backsaw is a saw having a thin blade strengthened by a heavy steel backpiece and is used upon work requiring accurate cutting. The teeth are such that it may be used either as a rip or a crosscut saw. The compass saw has a thin narrow blade fitted in a handle and is used for inside curved sawing. The turning saw, used to cut along curved lines, has a thin narrow blade, fastened at each end in a frame in such a manner that it may be loosened and the blade put through an auger hole and then refastened. The carpenter must be skillful not only in the use of these various saws, but as well in filing and setting them properly and in testing new saws for proper temper and quality.

Planes: The plane, used for straightening and smoothing the surfaces, consists of a body in the bottom of which there is a slit called the throat, through which the cutting piece called the plane iron or blade projects. The cutting part of the plane consists of the plane iron the end of which is sharpened on a bevel to a cutting edge, and the plane cap iron, a flat curved piece of steel which is fastened against the plane iron about one-sixteenth of an inch from the cutting edge by a short heavy screw called the plane-iron screw. This cap iron serves to stiffen the plane iron and also bends and breaks the shaving, thereby preventing a splitting action in front of the cutting edge. Just back of the throat of the plane is the frog, fastened to the bottom by screws. The object of this frog is to hold the plane and cap iron in place and to carry the thumbscrews by which the plane iron is adjusted. The plane iron and cap iron are held firmly in place against the frog by means of a clamp worked by a cam. The vertical adjustment of the blade for thickness of shaving is made by means of a thumbscrew on the underside of the frog, and the horizontal adjustment of the plane iron is by a lever just under the plane iron.

Planes are made in different sizes and lengths to suit the different kinds of work. The jack-plane is about 13 inches long and is used for removing large quantities of rough wood, leaving the piece fairly smooth. The smooth plane is used for smoothing material which has been roughly smoothed and straightened. The jointer plane is often 2 feet or more in length and is used for straightening long and uneven material—most often for glue joints. The block plane is about 6 inches long and is used in planing the end grain of the wood, where there is no vise handy for holding the piece. A very considerable degree of skill is required for sharpening properly and adjusting these planes for different classes of work.

The brace and bit: The brace is a tool used to hold and turn the various kinds of bits used in boring, drilling, countersinking, or driving screws. They are made in two kinds, the ordinary brace and the ratchet brace; the latter is fitted with a ratchet in the grip so that the bit can be turned in one direction only. This brace is necessary where an entire revolution of the brace can not be made, and also for boring in hard wood, or turning large screws. The most common forms of bits used in the brace are the following: The auger bit, which has a spur to draw the bit into the wood, two nibs for cutting the fiber, and two lips to remove the waste which is brought by the twist to the surface. The drill bit which has only the twist sharpened at the end is made of tempered steel and is used in boring either hard wood or iron. The countersink bit has a large V-shaped cutting end for enlarging screw holes so that the screw head will draw down even with or below the surface. The screw-driver bit is like the blade end of a screw driver and is used for driving large screws.

Squares: The framing square is a large square made of one piece of metal; the long arm, which is usually 24 inches long, is called the blade, and the short arm, usually 18 inches long, is called the tongue. The square is graduated to inches and fractions of an inch; also on the blade there is a board-measure scale, and on the tongue a rafter-measure table. This is one of the most important tools the carpenter has to use. The framing square, however, is used more often in getting board measures, testing corners, and for setting the bevel to various angles. The try-square consists of a blade—a thin piece of steel— with a handle of wood or steel, called a beam, attached so that the edge of the beam forms a right angle with the edge of the blade. The blade is graduated into inches and fractions of an inch. The try-square is used in testing the end or edge of a piece of material to see that it is square with the adjoining surface and also to test the thickness of the piece.

Chisels and gouges: Chisels are commonly made in two kinds: The framing chisel, used for heavy work, which has the handle fitted into a socket on the end of the chisel; and the firmer chisel used for lighter work, which has a tang upon which the handle is fitted. Chisels are of varying widths, are used for cutting joints, and are among the most useful of the carpenter's tools. Gouges are similar tools except that the cutting edges are curved, with an inside or an outside bevel.

Gauges: The marking gauge consists of a beam holding a marking point or spur of metal, the beam being graduated to inches and fractions of an inch. There is a head which slides over the beam, and in the head is a thumbscrew for holding it in place at any desired distance from the spur. The marking gauge is used for laying out lines along the grain of the wood. In the pencil gauge a pencil point is inserted in place of the metal spur. In the slitting gauge the spur is made sharp and strong enough to cut through thin material, and in some cases the gauge is constructed with a handle like that on a plane.

Other tools in the use of which the carpenter must acquire manipulative skill are the spoke shave, for smoothing curved surfaces; the mallet, for driving chisels in heavy cutting; the bevel, with movable blade used in getting angles for cutting rafter ends and other material; screw drivers of various types, such as ratchet and spiral; hammers, flat and bell faced; miter boxes, levels, wrenches, awls, nail sets, rules, files, rasps, pliers, hatchets, bench axes and vises.

A very important part of the carpenter's trade knowledge relates to the care of his tools. The carpenter's bench, which is perhaps the most neglected of anything that he uses—with the result that it is frequently rendered unfit for use—must be kept free from nails, glue, and marred places in order not to scratch the work placed upon it. Saws by constant use in all sorts of weather become dulled, rusted, and loose at the handles, and must be properly repaired or they soon become useless for accurate work. If wooden planes are used, the metal parts must be kept bright and the wooden soles true and free from grooves caused by nails or sand particles. Iron planes, which rust easily, must be kept well oiled, especially in damp weather. Chisels must be kept bright and clean and the handles in good condition. The handle of a chisel should always be struck with the mallet, as the hammer will split it, and when in this condition it can not be safely used, nor can accurate work be done with it. All edge tools must be kept sharp and free from rust, as a matter of economy of time and labor and of quality of workmanship.

In addition to his vocational equipment in the way of manipulative skill, and of trade and technical knowledge the carpenter if he is to advance in his trade, must be a man of practical judgment, of good artistic sense and imagination, and with a capacity for solving the practical problems that arise in every line of his work.

What the industry gives.—The apprenticeship period for the carpenter is four years. During the first year the apprentice helps in moving lumber, carrying pieces to the man on the job, sandpapering, cleaning, and making himself generally useful. He learns something of the use of the different tools, and acquires some skill in sawing, planing, beveling, leveling, and plumbing. In his second year he helps in cutting flooring and ceiling joists, studding and plate timbers, and in framing up buildings. He is also generally employed in other work as a helper. During his third year the apprentice works at cutting and placing sills, joists, studding, and plates and also helps in the construction of common, hip, and valley roofs, in cutting and placing rafters, trusses, and braces, in weatherboarding, shingling, and lathing. In the fourth year of his apprenticeship, in addition to doing work as in the three preceeding years, he is allowed to do inside work on ceilings, wainscotings, and floors; to fit and hang sashes, doors, and blinds, and put on hardware. He is also given the more difficult outside work, as building and finishing porches and cornices.

As a result of apprenticeship training under favorable conditions, the boy who has served his full time may be expected to know the names and special uses of the carpenter's tools and to have acquired a fair degree of technical skill. Whether or not he will have acquired anything beyond this practical trade knowledge will depend upon the conditions under which he has worked, but in comparatively few cases is it true that the apprentice emerges from his apprenticeship with any adequate equipment of technical knowledge. Unless the conditions are exceptional this sort of knowledge, which is of greatest practical value, must be acquired in some other way than by practicing the trade. It may be noted that there is in Richmond very little, if any, well-defined systematic training of apprentices or of journeymen beyond the requirements of the work in hand. Some provision for such training would seem to be particularly important in the case of the carpenter, since the possibilities of advancement for him are almost entirely dependent upon his individual skill and capacity for assuming the responsibilities that necessarily attach to independent work in any line.

Deficiencies of workmen.—The common deficiencies of workmen, as noted on the schedules, emphasize this lack of systematic training, since they embrace not only a want of general elementary education, but also a lack of knowledge of such fundamental requisites of the trade as mechanical drawing, shop mathematics, and ability to read blue prints of architects' plans and specifications.

What the school ought to give.—In order to supplement the knowledge gained by the boy who is already working as a carpenter's apprentice, the aim of a school should be to give him a working knowledge of the scientific principles of the trade, which would enable him eventually to rise to a position of responsibility. In general, the following courses of study may be outlined. These courses are suggested by the schedule returns as necessary to meet the needs and common deficiencies of workers in Richmond.

Courses of Study.

Mathematics: In this course emphasis should be laid upon that application of geometrical principles which is of practical value in such work as, for example, the construction of hipped or gabled roofs, and the determination of angles, heights, lengths, and surfaces.

Blue-print reading: This course should enable the boy to read and to work from architects' plans and specifications.

Free-hand and mechanical drawing: In this course training should be given in making free-hand sketches and mechanical drawings of building plans, tracings, and blue prints. Architectural drawing is also very necessary for the worker who wishes to go far in his trade.

Business practice in the trade: This course should cover such topics as the law of business contracts, building codes, liens, notes, and discounts; the statute of limitations; the legal regulation of labor conditions; business English; bookkeeping; and the kinds, grades, and markets of lumber.

Modern methods: An advanced trade course providing for shop talks on modern methods of construction, on tools and materials, and, in general, on modern practice in the trade.

BRICKLAYING.

Processes.—The bricklayer in Richmond is commonly expected to do any kind of brickwork, whether plain or ornamental, required in the construction of buildings, including the setting of window sills and caps of cut stone or other material. Cut-stone doorsills and ornamental belts are, however, as a rule, set by stonemasons, while sheet-iron cornices and cement brackets are set by men employed by the manufacturers of these products.

The bricklayer is essentially a wall builder, and a first essential of his trade is a knowledge of the various methods of bonding employed in the construction of walls. Bonding is the art of binding brickwork together so that it will stand up well, by properly alternating stretchers and headers, taking care that each joint is covered by a solid center above and below and that enough transverse brick are laid to bind together the back and front wall. There are many different kinds of bonds, but that most used in Richmond is called "4-inch bond." It consists of six or seven courses of stretchers and then a course of headers, care being taken to break joints properly. English and Flemish bonds are also used in Richmond to some extent. The English bond consists of alternate courses of stretchers and headers; the Flemish bond of alternate stretchers and headers in the same course breaking joints with the courses above and below.

The bricklayer must be proficient not only in the building of straight walls, both inside and outside, but also in the raising of inside and outside corners; in the carrying up of chimney flues; in the building in of window frames; in the construction of arches and gables, and in the laying of pressed brick, terra-cotta trimmings, and other ornamental materials. All of this work requires skill in handling the tools of the trade, which include trowel, chisel, hammer, plumb rule, level, line and pins, scutch, jointer, brick saw and chopping block, and in manipulating the various materials which are used—the brick and mortar.

Product or specialties.—Bricklaying includes any kind of brickwork required in the construction of buildings, whether plain or ornamental, the laying of machinery foundations, the construction of tunnels and sewers, the putting up of power-plant chimneys, the setting of boilers, construction of bake ovens and of brickwork in blast and open-hearth furnaces.

Importance of the trade.—A conservative estimate places the number of bricklayers in Richmond at about 300.

Conditions of employment.—The bricklayer is usually strong and healthy. The very nature of his work and the fact that it is mostly outdoor work are factors favorable to the maintenance of a vigorous constitution. It is customary to allow an hour for dinner, and, as the work does not involve either eyestrain or nervous strain, or any special dangers from machinery or from handling poisonous materials, the occupation may be classed as an extremely healthful one. There is nothing in the trade that tends to narrow or restrict the mental development of the worker. On the contrary as the work is of a varied character it is calculated to stimulate the worker's interest.

Economic conditions.—The maximum wage reported for journeymen in this trade on the survey schedules is $31.20 per week; the minimum wage $29.25. The union rate is $30.80. Apprentices receive a wage of $4 per week during the first year, $5 in the second year, $6 in the third year, and $7 in the fourth year. Apprentices' wages are usually increased 50 cents per week every six months.

Bricklayers in Richmond work from 44 to 48 hours per week, working 8 to 9 hours per day, and from 4 to 5 hours on Saturday. On account of the fluctuations in the building industry only a comparatively small number are constantly employed. The busy season is from March to November, inclusive, and the slack season from December to February, inclusive. The bricklayers in Richmond are completely organized.

Age of maximum productivity.—The workers in the trade enter at 17 or 18 years of age as apprentices and are required to serve four years. It takes a journeyman from two to five years after his apprenticeship to reach the point of maximum productivity. On the average this is then maintained until he has attained approximately the age of 55.

Demand for labor.—The number of bricklayers in Richmond is adequate to meet the demand, which is at present stationary. Boys entering the trade come from the lower grades of the grammar school.

Educational and technical requirements.—The bricklayer should have at least a complete grammar-school and prevocational training, and it may be noted that as a rule he can not advantageously enter the trade as an apprentice until his sixteenth year.

Tools and Materials.

In the practice of the trade manipulative skill is required in the handling of the tools and materials described in the following paragraphs:

Trowels: The trowel is a tool having a thin triangular steel blade fitted with a crank-shaped handle. The trowels most commonly used are of two kinds—the large brick trowel, with a blade about 12 or 14 inches long, used for handling mortar in laying brick; and the pointing trowel, having a blade about 4 inches long, used for finishing or pointing the mortar in the joints. The pointer is made in two styles—one with a wide blade for pointing ordinary brick joints and one with a narrow blade for finishing the joints in work where such materials as pressed brick or terra cotta are used.

Chisels: Brick chisels are of the following kinds: The bolster or broad chisel is made of one piece of hard steel and consists of a short handle about 5 inches long and a blade between 2 and 3 inches wide by 2 inches long. This chisel is used in cutting brick to size. The broad chisel is made in two styles—one with a cutting edge, which is called simply the chisel, and the other with the edge a bevel, about one-fourth of an inch wide and with very little angle. This chisel is called a "set." The cutting chisel is round and made in any length which is desirable, usually from 12 to 14 inches. The cutting edge is ground from both sides. This chisel is used for cutting holes in brickwork.

Hammer: The bricklayer's hammer has a hard steel head about 6 inches long, with a driving face on one end and a sharp peen for dressing brick on the other. The head is fitted with a handle about 10 inches long and is used for breaking and dressing brick to size.

The plumb rule or level: The plumb rule consists of a piece of wood about seven-eighths of an inch thick, 4 inches wide and 4 feet long, perfectly square and straight. A straight line is marked in the middle lengthwise of the piece, a string being fastened at one end of this line. On the other end of the line is a plumb bob which hangs opposite a hole cut through the rule near the end. When the rule is placed against the wall if the string hangs along the line through the middle of the rule the wall is plumb. The plumb rule, however, is now usually made on the principle of a level, having small vials filled with liquid containing an air bubble. When held in a perfectly horizontal position the bubble stands in the middle between two small lines marked on the vial. These vials are mounted both in the sides and ends of the rule so that it may be used either as a plumb or level and without the use of the line and plumb bob.

The line and pins: Pins are made of steel about 6 inches long, with a thin, wedge-shaped point for sticking into the joints at the corners. Between the pins the line is stretched, the brick being laid to this line.

Scutch: The scutch is a modified hammer, having a blade on one end of the head and a pick on the other. It is used in dressing brick for arches, and in other work.

Jointer: The jointer is a round, curved piece of steel used to dress the joints in brick-work, giving the mortar in the joint a convex surface. One end is larger than the other to suit the different kinds of joints.

Brick saw: This is a frame saw having a cutting edge made of two twisted steel wires. It is used to cut soft brick for irregular work.

Chopping block: The chopping block used by bricklayers is a block of wood, with a right-angled groove about the size of the brick cut in the top. The brick is laid in this groove for dressing.

The principal materials used by the bricklayer are the following:

Lime: Lime is calcium oxide made usually by heating limestone, or shells, thus drawing off the carbonic acid. It has the property of hardening when mixed with sand and water.

Cement: The cement used in Richmond is usually either Portland or Rosendale, the Portland being much the better grade. Rosendale is a natural cement made by calcining impure limestone containing sand and clay. Portland cement is a manufactured product made by grinding and mixing chalk and clay, drying and calcining the product, thus forming a dark-colored mass. It is then ground to a fine powder, which is slate gray in color. This cement has the property of hardening under water as well as in air.

Brick: Bricks are rectangular blocks of clay usually 8½ by 4½ by 2 inches in size, molded into shape, and burned to give hardness and durability. They are, however, made in a variety of shapes as well as colors, and may be rough, pressed, faced, or enameled.

Mortar: The mortar usually used for laying brick consists of 1 part Portland cement, 2 parts of lime, and 6 parts of sharp sand. If the mortar has to be colored red, venetian red, a dry color, or more often a liquid color called Pecora, is used. If a dark mortar is desired, Rosendale or Portland cement is mixed with lampblack. The color is put in after the mortar is cool, otherwise it will bleach.

The following implements are used by the laborers who prepare and deliver materials to the bricklayer:

The brick hod and mortar hod: The laborers in Richmond are all Negroes, and they very seldom use the brick or mortar hod. They carry the brick on a board and the mortar in a small wooden tub on their heads, thus leaving their hands free for climbing ladders.

Mortar board: The mortar board, which is from 2½ to 3 feet square, is used in carrying the mortar to the bricklayer.

Mortar bed: The mortar bed, large or small as may be required, is constructed of strong boards firmly fastened together. It should not be over 2 feet deep. The bed is used to hold the mortar while mixing.

The sand screen: The sand screen is a coarse wire net upon a frame about 2 feet wide by 6 feet long, used at an angle of 45°. The sand is thrown against the screen and sifts as it rolls down.

The bricklayer should be not only skillful in handling the tools of his trade, and well informed regarding the composition and qualities of the materials which he uses, but should in addition be capable of working from blue prints of plans and specifications. He should have a knowledge of building construction which will enable him to determine, for example, the proper thickness and structure of walls, flues, and foundations, the formation of arches—upright or inverted segmental, circular, flat, or gothic—and the design of cornices, gables, pilasters, panels, and fireplaces. It will be apparent that these practical requirements presuppose a thorough training in certain branches of applied mathematics and in other systematic subjects.

What the industry gives.—In most cases the only knowledge the boy acquires during his apprenticeship is the manipulative skill required in the actual laying of the brick. The boy receives some help in acquiring facility in practical work from the foreman and journeymen on the job. During the first six months the apprentice works on straight inside work, such as partitions. Then if he has become proficient in this, he is allowed to do outside straight work, with the exception of front walls. By this method he learns the use of the trowel, the handling and spreading of mortar, working to the line, using line and pins, and pointing and finishing his work. During the second year, besides doing work similar to that done in the first year, the apprentice does "plumb work," learning to raise inside corners, as door and chimney jambs, and to carry chimney flues. After he has mastered the raising of inside corners he will be allowed to work on outside corners. Besides becoming more familiar with the tools used the first year, this year he will become familiar with the use of the plumb rule and level, and will also learn to use his eye in keeping his work straight. In his third year the apprentice will be given work building in window frames, the different kinds of arches and gables, and any kind of brickwork not involving pressed brick or other ornamental material. In his fourth year he will be given pressed-brick fronts, setting cut-stone window sills and caps, and terra-cotta trimmings. There is, however, no provision made in the trade for the systematic instruction of either apprentices or journeymen.

Deficiencies of workmen.—The common deficiencies of the bricklayers relate to the practical requirements which have been specified. According to their own reports, the workers feel that they are deficient in mathematics of the trade, in architectural drawing, in ability to read architects' plans and specifications, and in general education.

What the school ought to give.—In the way of general preparation for his work the bricklayer should have a complete elementary-school education. The character of continuation work indicated by the results of the survey as needed by those who have entered the trade is shown in the following topical outlines for instruction:

Practical work: Mixing mortar, spreading mortar, building the different kinds of walls with return and intersection and with the different kinds of bond. Work on corners, angles, fireplaces, chimneys, windows, building in window frames, brick cornices, and the different kinds of arches and gables. Along with this work the boy should learn the tools, their kinds and uses, and the kinds, preparations, qualities, and uses of the various materials. In general, this knowledge should be acquired outside the school while at work, but when it is not so acquired the opportunity to acquire it should be provided by the school.

Mathematics: Shop mathematics, consisting of that part of arithmetic, algebra, geometry, and trigonometry which can be applied to the trade in such problems as arise in building construction and in the work.

Drawing: Both free-hand and mechanical drawing, the different kinds of bond, building plans, details, etc.; the making of tracings and blue prints. Architectural drawing is also necessary to the worker who wishes to go far in the building line.

Physics and chemistry: Physics and chemistry applied in a practical manner to the strength, qualities, placing, and manufacture of materials used in the trade.

Shop lectures: On the tools, problems, and modern practice in the trade.

STONECUTTING.

Processes.—The processes of stonecutting, as the trade is carried on in Richmond, can best be described under the following headings: Granite cutting, soft-stone cutting, and block cutting.

Granite cutting: The granite cutter, as the name implies, is a worker and finisher of granite or other hard stone, which is secured from the quarries by blasting and shipped to the stoneyards or the building site. The stone block, as it comes from the quarries, is of irregular shape, and the first processes in stonecutting have to do with making it straight and true, i. e., with lining it up. The cutter lines up the stone by cutting on its face or edge, with a machine or hand chisel or drill, a line which, being straight and true, becomes his working mark. The stone is then pointed or roughed off by the use of the peen hammer or a pointing machine tool. After being roughed off or pointed as near the line as possible, the stone is smoothed up with the hand or machine bush. The hand bush is a hammer whose face is composed of 4, 6, 8, 10, or 12 sharp pyramidal points, or cutters, the number being generally specified in the agreement between contractor and builder. The stone is first worked down with a coarse bush and is then finished with a fine bush.

If the stone is to be polished, it is placed under a grinding mill and ground down with chilled shot, after which it is ground with carborundum. It is then ready for glossing or polishing, which is accomplished by rubbing the surface with putty and water.

If the stone is to have any inscription or design cut on, this work is then done, after which it is ready to erect. The finished stone is set in mortar and the joints pointed with a jointer or trowel. In monument work the bottom and top base are worked as described above and then the shaft. Sometimes a cap is used, which is placed between the top base and the shaft. These parts are placed one upon the other, the bottom base first, then the top base, then the cap, the last to be placed in position being the shaft. The several parts are set up without being tied together in any way. In a monument of the cross design the lower end of the shaft has a shank cut on and the base has a slot cut for the shaft to fit in; in some cases a hole also is drilled in the base and shank and a galvanized-iron pin placed therein to help hold the pieces together.

The granite cutter generally has no knowledge of lettering or designing, and this class of work is done by some one who has perfected himself in this special line.

Soft-stone cutting: Soft-stone work is all done by machine tools. The stone is lined up or marked off to straighten it and get out of the wind, and is then sawed by a machine saw, planed by a machine planer, and is finally shaped up to form with either a shaper or a slotter.

Block cutting: In getting out stone blocks for paving the stone is first drilled and a line traced on both faces by the use of tracer and hammer. The block is then struck with a hammer, broken along the traced line, and the joint faced off either with a drill or side hammer, shaping it sufficiently to be set in sand for paving.

Product or specialties.—Very little block cutting is done in the city at the present time, although this line of work has in the past given employment to a considerable number of men. The product of the stonecutter is in the form of dressed stone, hard and soft, for buildings and for ornamental monuments. The work includes the cutting of letters and designs in stone, and it may be noted that the stonecutters of Richmond do also a certain amount of marble working.

Importance of the trade.—The occupation gives employment at the present time to approximately 70 men, although the census of 1910 returned the number of stonecutters as being in that year 101. At the date of the census a considerable number of block cutters were employed who have since left the city.

Conditions of employment.—The work of the stonecutter is physically exacting, and in operating the compressed-air machines the noise is a condition tending to cause nervous strain. In the relatively unskilled processes, moreover, such as roughing off the stone, where the worker is kept continually on this work, there is little that is calculated to appeal to the worker's interest; where, however, the work is sufficiently varied and of a high grade the occupation is one which provides some opportunity for the development of a high degree of skill. The stonecutter in Richmond does not, however, under present conditions normally develop, in consequence of the experience which he acquires in the practice of his trade, into a fine letterer or stone carver.

Economic conditions.—The hours of labor for the stonecutter are 8 hours per day, 44 hours per week, and 4 hours on Saturday.

The apprentice enters the trade at the age of 17 and serves an apprenticeship of three years. The apprentice's wage for the first six months is $3 per week, and for the second six months $4.50 per week. There is no regular apprentice wage for the next two years, but the wage is increased from $4.50 to $12 per week, according to the apprentice's ability.

The trade is about 75 per cent organized and the journeyman's wage is from $18 to $21 per week, the union scale being $3.60 per day of eight hours. The busy season for stonecutters is from March to October, inclusive, and the slack season from November to February, inclusive.

Age of maximum productivity.—The period of maximum productivity is between the ages of 20 and 55.

Demand for labor.—The supply of labor is adequate to meet the demand, and in the block-cutting occupation the demand for labor in this locality is decreasing. The trade is recruited from the lower grammar grades of the public schools.

Educational and technical requirements.—The apprentice to this trade should receive a complete grammar-school education and some industrial training. He should receive instruction in free-hand drawing, design, and blue-print reading. The boy should be specially adapted, have dexterity, patience, and be mentally alert.

What the industry gives.—The industry gives to the worker an apprenticeship of three years, the manipulation of the tools of the trade, both machine and hand, and a knowledge of the different classes of work with which he comes in contact. There is no provision made in the trade to give the apprentice or journeyman anything but the practical part of the trade.

What the school ought to give.—The school should give the worker an elementary industrial education, special courses covering the trade and technical requirements of the occupation, free-hand drawing and design, and modern practice in working hard and soft stone.

STRUCTURAL STEEL AND IRON WORK.

Processes.—All structural iron and steel work belongs to one of two classes—ornamental or structural—and the workers are known as ornamental or as structural steel workers.

Ornamental work: Under the head of ornamental work comes the manufacture and erection of outside and inside stairs, fire escapes, grill work, elevator inclosures, balcony railings, fences, cellar caps, vault lights, and all forms of ornamental work of a like character. In selecting the metal to be used, cold-rolled steel is always chosen for work requiring sharp corners and clear lines, as balcony railings, doors, and grill work, while iron is used for rougher work and on jobs that do not require sharp edges. Sometimes castings are used, and in some jobs steel, iron, and castings are necessary.

When an order for a piece of work is sent to the factory, detail drawings are made in the drafting room and checked and then sent to the foreman of the ornamental department, who divides the work among the workers. Some men can do one class of work better than another, and the foreman picks these specialists for their line of work.

The layer out prepares the work for the other workers. He selects the iron of the proper size and kind, lays out from the drawing the proper lengths of stock, marks off all rivet holes, half-lap joints, drill holes, and all other laying out necessary for the information of the helpers and mechanics. After the stock has been selected, cut, and laid off, it goes to the helpers or mechanics in the various parts of the shop. All punching is done on a punching machine, which punches the various-sized holes for riveting, and the operator of this machine is classed as a mechanic. Other holes that can not be punched are drilled either on the drill press or by portable hand drills, and other work sawed and slotted on the backsaw and the slotter. Castings are ground and filed by helpers. Curved and bent work is sent to the blacksmith, who shapes it up according to forms or templates. If many duplicates are to be made, a form is forged or cut to the exact size and shape of the finished product, and all pieces are forged into shape around this form. Pieces of pipe are often needed for railings, and they are bent to shape and the ends threaded by the blacksmith or the helpers.

After all work has been punched, sawed, filed, drilled, and forged, it goes to the finisher for assembling. From the detail drawing he is able to place the different parts in their proper places and to fasten them together with screws, bolts, or rivets. When the finisher has properly assembled the job, he passes it on to a helper, who paints it. It is then ready for delivery to the customer or for erection. As a rule most of the men employed as layers out and finishers are foreigners.

Structural-steel work: In structural-steel work after the draftsman has completed the detail drawings they are sent to the foreman of the structural department, who assigns the work to the layers out. The proper I-beam or channel iron is selected and cut to lengths and the places for the rivet holes marked off. If any cutting to a certain shape is required, this is marked on the steel. The work, after it is laid off, is sent to the punchers, cutting-off machines, or drill presses, where the pieces are cut to size and shape, holes punched or drilled, and everything done to put the work in shape for the assemblers. When the parts are ready to be assembled, they are riveted by means of riveting machines operated by compressed air. After the ends have been faced off the work is ready to be painted and erected. Men known as steel erectors put the beams in place and supervise the riveting of them by the riveters. In structural work all layers out, punch hands, assemblers, and erectors are classed as journeymen, and all riveters, drillers, heaters, and helpers are classed as helpers.

Product or specialties.—Structural-steel work in Richmond is not unlike that in other cities. The same class of work is done, and practically the same methods are employed.

Importance of the trade.—Because of the fluctuations in the building trades no figures can be given for the number of people employed that will cover conditions the entire year. It is safe to say that the average is about 26.

Conditions of employment.—There seem to be no unhealthy conditions in structural-steel work unless it be the cold, bad weather that the erectors are subjected to at times. This is rather inconsiderable, since very little work can be done during the winter months. The erector is, however, exposed to the danger of falls and the worker in the shop to the danger that attaches to all heavy machine work. There are no occupational diseases and very little strain caused by heavy lifting, for most of the lifting of the beams is done by cranes and hoists.

The work of the layer out, finisher, and assembler is especially stimulative because of the very nature of it. They must have initiative to plan the work from the drawings, furnish work for the helpers, and see that the finisher's job is satisfactory. There is a certain amount of stimulative influence in punching and drilling, but less in such work as heating rivets, grinding castings, and in general laborer's work.

Economic conditions.—There is no organized apprenticeship system in the structural-steel plants in Richmond, although a few helpers are employed at a lower wage than the ordinary helper, with the understanding that they be given a chance to learn the trade if they prove satisfactory. Such helpers or learners are given about 15 cents an hour, which is increased from time to time. There is, however, no regular scale of increase of wage. Helpers are paid from $1.50 to $2 per day, and may earn more if they advance from one grade of work to another. Riveters and punchers are paid from $2 to $2.25 per day; assemblers, erectors, finishers, and layout hands from $3 to $3.50.

Most structural workers work 55 hours per week, 10 hours per day, and 5 on Saturday. The busy season is generally from April to August and the dull term from November to February. At times it becomes necessary to lay off most all workers and the fluctuation is considerable. The trade is not organized, with the exception of the erectors, who have a strong organization over the entire country.

Age of maximum productivity.—The entrance age is generally 18 years and over. This is somewhat higher than other trades, but the work at times is heavy and a well-developed boy is needed. No organized system of apprenticeship exists, but it takes at least four years to learn the trade thoroughly, if the time has been served under instruction. The age period of maximum productivity varies, of course, with the man, but in general it seems to be from 30 to 45.

Demand for labor.—The supply and demand of labor is about the same except at times in the case of erectors. These have to be brought to Richmond from other cities when much work is being done. Because of the demand for structural-steel buildings, the demand for workers in this trade is apt to increase in the future. The journeymen are recruited from the ranks of the helpers in the shops who may be given the chance to become mechanics, and from other cities.

Educational and technical requirements.—It is very essential that all workers have a good general education with a working knowledge of arithmetic. The layer out, finisher, assembler, and erector should have a working knowledge of mathematics, strength of materials, riveted joints, mechanics, and free-hand drawing and design in order to understand the reasons for using bars, I-beams, and channel iron of specified sizes, and to be able to lay off and measure accurately for rivet holes, half-lap joints, and the like on straight and curved work and to lay off forms for irregular shapes.

A knowledge of mechanical or architectural drawing and design is absolutely necessary for an efficient skilled worker. This is especially true of the layer out, finisher, assembler, and erector. A knowledge of riveted joints and strength of materials would be of much value to the erectors, and a knowledge of mechanics would be of value to all workers. For the ornamental worker a knowledge of free-hand drawing and design is necessary. The ability to distinguish steel from iron and a knowledge of the chemical and physical properties of both are very essential.

The manipulative skill required is the ability to quickly manipulate the various machines in the shop, to handle with ease the heavy work, to properly fit and adjust the pieces for assembling in ornamental work, and the manipulation of all the hand tools not included in the above work. All mechanics must be very accurate and possess some initiative. They should be careful in the work around the machinery.

What the industry gives.—No organized system of apprenticeship exists in Richmond, but a few helpers are taken with the understanding that they will be given a chance to learn the trade. No provision is made for the systematic training of these helpers. The industry gives very little in trade and technical knowledge. Some men learn to tell the difference between iron and steel, something of the strength of material and a little of drawing, but no instruction is given in the shop in this work. Whatever manipulative skill is necessary to do certain classes of work, at least, can be learned in the shop, but much of the theory can not. Helpers are promoted from one class of work to another, at times, until they can run the various machines and some of them become mechanics. There is no promotion for a journeyman unless he becomes a foreman.

Deficiencies of workmen.—The most common deficiency of the workers is a lack of common-school education, especially in arithmetic. One drawback is the number of men who drink and are not to be depended upon. This fault, however, is no more common among steel workers than among other mechanics.

What the school ought to give.—All workers in the structural-steel work should have an education through the common school, with prevocational courses to help them decide what line of work they like best. Special emphasis should be put on arithmetic and on the possibilities of the trade, and some work in drawing should also be given. After the worker enters the shop, he should have instruction during his apprenticeship in mechanics, strength of materials, drawing, design, and mathematics applied to the trade. After he becomes a journeyman, he should continue the same studies and take up such work as the new processes in the trade, advanced ideas in the building trade, and any other work bearing on his trade. If possible, continuation courses for the apprentices and helpers should be offered, and night classes for the journeymen, where the subjects mentioned above could be taught.

CEMENT FINISHING.

Processes.—Cement finishing consists of "floating" and "troweling" the surface of cement to the desired finish. The cement finisher, however, does a great variety of work not indicated in the above description. In concrete floor, sidewalk, coping, steps, and similar work the "finisher" lays out the work, watches the composition of the concrete mixture, "strikes off" the surface of the concrete with a straightedge, and "floats" and "trowels" the same. In concrete construction such as buildings, bridges, subways, arches, etc., the finisher supervises the mixing of the concrete, sees that the forms are properly set, and in general acts as a foreman. In the embellishing of concrete buildings the finisher applies the cement mortar to its walls, runs cement base, molding, and caps, and does all composition and plastic work. Owing to the relatively large proportion of helpers and laborers to each cement finisher and the lack of trade knowledge on the part of the latter, the cement finisher acts more or less in the capacity of a foreman.

Importance of the trade.—Based on the best available data it is estimated that there are approximately 50 cement finishers in Richmond.

Conditions of employment.—The cement finisher is subject to no peculiar nervous strain, but the work requires considerable physical strength and endurance, especially in some work where the finisher must work in a stooping position for long periods. Cement working is comparatively a new trade, and as cement finishing is the most skilled occupation in the trade all of the work done by the finisher should stimulate the interest, and the better grades especially so. So far as known there are no peculiar occupational diseases, and the liability to accident on structural work is inconsiderable.

Economic conditions.—Fluctuation in the demand for cement finishers is governed more or less by the activity of building operations, but so far as the fluctuation is seasonal the temperature is the governing factor. In this climate the period between November 15 and March 15 is generally too cold for carrying on the work to the best advantage. In very cold weather practically all work ceases. Cement finishers work 9 hours per day, 54 hours per week. In some few cases 8 hours on Saturday. A cement finisher's apprentice, generally called a helper in Richmond, receives $9 to $12 per week during his first year's work and $12 to $18 during the second year. Journeymen receive from $21 to $30 per week. The trade is not organized and therefore there is no union scale.

Age of maximum productivity.—Boys enter the trade between the ages of 18 and 20, and serve an apprenticeship of two to three years. There are no available data in regard to the period of maximum productivity.

Demand for labor.—The demand for labor is increasing, especially for efficient skilled finishers, and the supply does not meet the demand. Workers are recruited from unskilled laborers.

Educational and technical requirements.—A complete grammar-school education, together with prevocational courses, should meet the requirements of the cement finisher as to general education. The trade and technical knowledge required is not of a very complicated or abstruse nature, and includes knowledge as to the kinds and properties of cement; materials used in the aggregate, such as sand, gravel, and crushed stone; the various methods of finishing, of setting forms and of reinforcing; and some knowledge of architectural drawing and specifications. In the manipulative processes a nice degree of skill is required in handling the float, trowel, and other special finishing tools. Dexterity, mental alertness, initiative, and a fair degree of accuracy are prime requisites of the successful finisher.

What the industry gives.—Owing to the fact that the cement finishers are not organized, there is no definite term of apprenticeship, but the trade should be learned in from two to three years. Boys learning the trade are not called apprentices, but helpers. A three-year apprenticeship should give the boy a high degree of manipulative skill, but the trade and technical knowledge gained would be almost entirely dependent on the individual efforts of the worker, as there is no provision made for the instruction of either the apprentice or journeyman. The line of promotion is from helper to journeyman and from journeyman to foreman.

Deficiencies of workmen.—The most common deficiency of the cement finisher is the lack of a general education and an all-round knowledge of the trade.

What the school ought to give.—Before entering the trade the boys should have received a complete grammar-school education, together with prevocational courses. Apprentices and journeymen should receive specialized courses covering the specific requirements of the occupation. These would include a course on the kinds and properties of cement and of the materials used in the aggregate, the setting of forms, and the methods and theory of reinforcing; a course in mechanical and architectural drawing, and a course in estimating.

TINSMITHING OR SHEET-METAL WORK.

Processes.—The work of the tinsmith or sheet-metal worker consists of the laying out of tin or other sheet-metal utensils, the forming and making of waterspouts, and the erecting of the same, the bending of lock joint by use of folder or brake, and the laying of tin on roof and the closing of the joint by use of the mallet and seamers or roofing tongs. The tinsmith or sheet-metal worker erects metal ceilings and side walls, furring and sheathing same, makes crestings, awnings, hollow circular moldings, and metal sash frames and skylights, and covers fire doors and windows.

Product or specialties.—The product of the tinsmith or sheet-metal worker in Richmond consists of all tin or sheet-metal work done in the building trades.

Importance of the trade.—There are about 140 journeymen and apprentices in this occupation in Richmond.

Conditions of employment.—There is no strain on the worker, either physical or nervous, but in some lines of work there is liability to accident. The high-grade work has a tendency to stimulate the intelligence of the worker.

Economic conditions.—The apprentice to this trade receives for the first year $3 per week, the second year from $4 to $5 per week, the third year $5 to $7 per week, and the fourth year from $6 to $9 per week. The wages of the journeymen range from $20.10 to $21 per week. The hours of labor are from 8 to 8½ per day—48 per week—and in some cases a short day of 5½ hours on Saturday. The seasonal activity is about the same as for carpenters and the fluctuation of employment is inconsiderable. In Richmond the trade is unorganized.

Age of maximum productivity.—The apprentice to this trade enters between the ages of 16 and 17 and serves an apprenticeship of four years. The period of maximum productivity for tinners is from 21 to 65 years of age.

Demand for labor.—The apprentices to this trade are recruited from the lower grammar grades of the public schools. The demand for this class of labor seems to be stationary and the supply is adequate to meet the demand.

Educational and technical requirements.—The apprentice to this trade should receive an elementary industrial education. He should receive instructions in pattern drafting and cutting, free-hand and mechanical drawing, a knowledge of architectural and geometrical forms and modern methods of the trade. Shop mathematics should be given, to accompany the problems of drafting and cutting.

What the industry gives.—The industry gives an apprenticeship of four years and a knowledge of the practical part of the trade, but there is no provision made for instruction in the theory, either for apprentices or journeymen.

Deficiencies of workmen.—The common deficiency of the worker seems to be a lack of general education and of knowledge of drawing, both free-hand and mechanical.

What the school ought to give.—The school should give the prospective apprentices to the trade a complete grammar-school education, supplemented by instruction in sheet-metal pattern drafting and cutting, and free-hand and mechanical drawing; instruction in shop mathematics, and courses covering the trade and technical requirements of the occupation.

PLUMBING.

Processes.—The plumber's work in Richmond consists of the installation of all fixtures for gas, water, sewerage, and drainage purposes and the making of necessary pipe connections for the same. The joints most commonly used by plumbers are the wiped and screw joints. The wiped joint is made by scraping and fitting the parts together and then pouring molten solder upon the place. This solder while still in a plastic condition is wiped by hand with a moleskin or cloth pad around the joint, making a neat and reliable connection. The screw joint is made by cutting threads upon the pipes with stock and dies, painting the threads with white or red lead to make the joint tight, and then turning each piece of pipe half through a coupling by means of pipe wrenches.

Product or specialties.—In Richmond the work in the plumbing trade covers all work on water, gas, and sewer systems from the street main to and beyond the house line. This consists of setting up in buildings and residences all plumbing fixtures and their appurtenances, such as water filters, water meters, hot-water tanks, suction tanks, sump tanks, cold-water tanks, bathtubs, showers, washbasins, sinks, water-closets, and urinals; all water, gas, and waste piping for laundry machines; all compressed-air work; also all toilet and bathroom auxiliaries, such as paper holders, glass shelves, medicine closets, towel racks, and soap and sponge holders. This also includes all waste-water leaders, soil and vent lines, and sewerage drains within and beyond the house line to the street main; all pipe for hot and cold water supplies used for domestic purposes, cooling jackets, priming pumps, or for ice-machine work; all thermostatic work connected with plumbing; all pipe work connected with pneumatic vacuum-cleaning systems; all gas piping and connections for gas fire logs, stoves, furnaces, driers, boilers, and heaters; all assembling, hanging, and connecting of gas illuminating fixtures; all iron pipe for speaking tubes.

Importance of the trade.—The number of plumbers in Richmond at the present time is approximately 70.

Conditions of employment.—There is nothing in the work of the plumber which embodies physical or nervous strain, and as the work is extremely varied in character it should stimulate the intelligence of the worker.

Plumbing can not be termed an unhealthy occupation, although there is some danger from disease germs, gases, waste matter, dampness, etc., especially on repair work. This danger, however, can be practically eliminated by taking proper precautions.

Economic conditions.—Plumbers' apprentices are usually paid $4 per week during the first year of the apprenticeship. During the last three years the apprentice is paid according to the ability which he shows. The minimum wage in Richmond for journeymen plumbers is $3.25 per day, the maximum wage is $4 per day, and the union wage is $4 per day. The plumbers in this city work 8 hours per day, 48 hours per week. The busy season for plumbers is from March to August, inclusive, and the slack season from September to February, inclusive, but there is very little fluctuation in employment. About 50 per cent of the plumbers in Richmond belong to the organization.

Age of maximum productivity.—Workers usually enter the plumbing trade between the ages of 17 and 20. They serve an apprenticeship of four years and as junior journeymen for one year before becoming full-fledged journeymen. It takes the plumber from two to five years after he is out of his apprenticeship to reach the period of maximum productivity, which is usually between the ages of 21 and 45 years.

Demand for labor.—The supply of plumbers in Richmond is adequate to meet the demand, which is at present practically stationary. The workers in this trade are recruited from the grammar grades and enter the trade as apprentices.

Educational and technical requirements.—The workers in the plumbing trade should have at least a grammar-school education. They need to know mathematics, blueprint reading, and modern theory and practice of the trade, and to have skill in handling tools and wiping joints.

The tools most commonly used by plumbers are as follows: The shave hook, for cleaning the tarnish from pipe in preparation for wiping the joint; the ladle, for handling molten lead; the cloths, for wiping joints; the tap borer, used to tap pipe for branch lines; the calking tools, yarning iron, and right, left, and main facing tools; the asbestos joint runner, for running molten lead into horizontal pipe joints; tools for setting fixtures; 8, 10, 14, and 18-inch pipe wrenches; the strap wrench, for handling nickel-plated fixtures; level; plumb bob; screw driver; brace and drills; 1¼, 1½, and 2-inch springs for making bends in waste pipe; hammer and cold chisel, for cutting soil pipe; hack, compass, and tenon saws; gasoline furnace, for heating lead; and stock and dies, for threading pipe. The worker should also have strength, endurance, initiative, and special adaptability if he is to be successful.

What the industry gives.—During the apprenticeship the training received is about as follows: The first year and part of the second the apprentice serves as a handy man, helping on the work in any way possible, and thus learning the tools and their uses and the sizes and uses of the various kinds of pipe. In the last part of the second year he will be allowed to calk soil pipe and do some little lead work. The third year the apprentice will do any work of this kind of which he is capable, and the fourth year he is put out on jobs by himself. The fifth year he serves as a junior journeyman, doing regular journeyman's work, and if this work is satisfactory he becomes a journeyman at the end of this time.

Deficiencies of workmen.—The common deficiency of workers in this trade is lack of general education and knowledge of mathematics, drawing, and modern theory and practice of the trade.

What the school ought to give.—The worker before starting to serve his apprenticeship should have at least a grammar-school education and, as the only training he gets while serving his apprenticeship is the actual practice in doing the work, this should be supplemented by school courses as follows: Shop mathematics applied to the trade, estimating, drawing, mechanical drawing of drainage systems, architects' specifications, etc., sanitary methods of installing drainage systems, etc., chemistry of the trade.

STEAM FITTING.

Processes.—The work of the steam fitter consists of the running of lines of pipe, the cutting to length and threading of pipe in preparation for the necessary joints and connections, the fitting together of these joints, and the placing and screwing on of fixtures.

Product or specialties.—The work of the steam fitter in the city of Richmond consists of the installation of steam and hot-water heating plants, the running of all lines of pipes for ice refrigerator plants, all piping for pump and other power generators, the installation of all piping for power plants of every description, and all thermostatic work connected with steam heating and power plants except where lead is used.

Importance of the trade.—There are approximately 100 steam fitters employed in Richmond.

Conditions of employment.—The occupation is a healthy one, but there is some danger of pneumonia from becoming overheated and then cooling off too quickly, or of burns and scalds from accidents. These, however, can not be said to be occupational. There is nothing about this work to cause either physical or nervous strain, and as it is of an extremely varied character and presents many problems to be solved, there is nothing in it to narrow and restrict the mental development; all of it because of this should stimulate the intelligence and interest.

Economic conditions.—The employment in this trade is steady, most of the workmen being employed practically the entire year. The fluctuation, which is small, corresponds to that in the building trades, the busy season being from March to August, inclusive, and the slack season from September to February, inclusive. The union men in this trade work 8 hours per day, 48 hours per week. The nonunion men work 9 to 10 hours per day, 54 to 55 hours per week, and 5 to 9 hours on Saturday.

Journeymen's wages range from a minimum of $13.44 per week to a maximum of $24 per week. The union wage is $24 per week. The workers in this trade are about 30 per cent organized.

Age of maximum productivity.—The workers in this trade enter as apprentices usually between the ages of 16 and 19, and serve an apprenticeship of four years. The period of maximum productivity is between the ages of 21 and 45.

Demand for labor.—The supply of workers meets the present requirements. The demand, however, is increasing because of the growing need for steam and hot-water heating in private homes. The workers enter as apprentices and are boys recruited from the lower grammar grades.

Educational and technical requirements.—The workers should have grammar-school education and prevocational training, knowledge of blue-print reading, modern practices, and the technical requirements of heating, refrigerating, and power-plant installation. They require manipulative skill in the handling of tools and equipment, also strength, endurance, and special adaptability.

What the industry gives.—The apprentice to this trade serves an apprenticeship of four years. During this period the first two years are spent in helping the journeymen on the job and making himself generally useful, and in this way becoming familiar with the tools and their use and the names and use of all material used. After this period, if the apprentice has been observant and has "caught on," he is given some of the less skilled work, such as running a straight line of pipe and making joints and connections for same. After the third year of his apprenticeship, the apprentice should be profitable to his employer by being able to do any of the ordinary work of the steam fitter that does not require a great amount of experience and initiative.

There is no provision made in the shop for the systematic instruction of either journeymen or apprentices, and practically the only knowledge the worker gains is that acquired in the actual performance of the work. He also acquires the manipulative skill necessary to perform the work.

Deficiencies of workers.—The workers in this trade are deficient in general education, blue-print reading, mathematics, and the technical knowledge required for the installation of heating, refrigerating, and power plants.

What the school ought to give.—The workers before entering the trade should have a complete grammar-school education and prevocational training. After entering the trade the workers should take school courses covering blue-print reading of architects' plans and specifications, mathematics of the trade, and the technical requirements for the installation of heating, refrigerating, and power plants.

ELECTRICAL WORK.

Processes.—The electrical worker in Richmond performs perhaps a wider variety of operations than any other trade worker. Electrical work may be roughly divided into three general classes—electrical apparatus work, outside wiring, and inside wiring.

Electrical apparatus work: Under electrical apparatus work is included the manufacture of all electrical machines, instruments, and devices. This work is so varied and widely differentiated that no brief description can cover it in full detail; in general, however, it may be said to consist of all the skilled electrical work required to be done in the manufacture or repair of all forms of electrical apparatus, such as generators, motors, electric meters, rheostats, telephones, switchboards, and testing and signal apparatus.

Outside wiring: Outside wiring consists of the installation of all outdoor lines and includes such work as general electrical power transmission lines, street lighting, telephone, telegraph, and signal lines. There are two general types of outside wiring—aerial, in which the wires or cables are supported high in the air on poles or other suitable devices, and underground, in which the wires or cables are laid in conduits.

Inside wiring: Inside wiring consists of the preparing for and putting up of electric wires for all purposes, so long as the work is done within the confines of some structure. The installation of the appliances and fixtures for which the wires are run is also generally included in the inside wireman's work. This includes such work as lighting, heating, power, telephone, bell, and signal installation. There are four general types of inside wiring—open work, in which the wires are exposed to view and are mounted on cleats or knobs; molding work, in which the wires are run in a special molding, made either of wood or metal; concealed work (knob and tube), in which the wires are run in partitions and other places not exposed to view and are insulated by means of knobs and tubes; and conduit and armored cable work, in which the wires are run in metal pipes called conduits or are themselves protected by an integral metal coating or armor. The above classification does not include all forms of electrical work, as there are some specialized occupations which do not fall under the above heads, such as power-house work, for instance.

Importance of the trade.—According to the Federal census of 1910 there were in Richmond at that time 239 electrical workers, including electrical engineers. It is estimated that there are about 260 inside wiremen in the city at the present time.

Conditions of employment.—In general, electrical work does not involve any peculiar physical or nervous strain, though work with high-tension currents may induce nervous strain. Practically all electrical work stimulates the interest in a more than ordinary degree. This is due particularly to the newness of the trade, it being yet in the formative stage.

So far as known there are no peculiar occupational diseases. Working with live wires is dangerous, as is also line work on poles, but the majority of accidents due to these causes are generally traceable to carelessness on the part of the worker.

Economic conditions.—There is very little seasonal fluctuation in the demand for workers in the electrical trades. The busiest season is from August 15 to December 15. Inside wiremen work 8½ hours per day, 48 hours per week, and a short Saturday of 5½ hours. An inside wireman's apprentice, generally called a helper in Richmond, receives $5 per week during his first year of apprenticeship, and $7.50 per week during the remaining three years. Journeymen receive from $16 to $22 per week, the union scale being 43¾ cents per hour, or $21 per week. The trade is about 20 per cent organized.

Age of maximum productivity.—Boys enter the trade between the ages of 16 and 18, and serve an apprenticeship of about four years. The electrical workers at present engaged in the trade in Richmond are all young men, and there are no available data in regard to the period of maximum productivity.

Demand for labor.—The demand for labor is increasing, especially for conduit workers. The supply of labor seems adequate except that of highly skilled licensed workers. Workers are recruited from the grammar grades.

Educational and technical requirements.—The worker in the electrical trades requires a fairly good general education. In addition to an elementary-school education he should have either a high-school education or special prevocational courses in mathematics, physics, chemistry, and mechanical drawing.

A very considerable amount of trade and technical knowledge is required by the electrician. Electric wiring, requiring as it does careful insulation from all surrounding material which might under any circumstances become a conductor of electricity, has necessitated the establishment of certain definite and fixed rules for the installation of all wires and appliances which are to convey electrical current. It is of more than ordinary importance that these rules (electrical code) should be understood and observed by the worker, since not only his business integrity and reputation are affected by poor or slipshod work, but the safety of property and even life are dependent on the proper installation of electric wires and appliances.

As an illustration, the following are some of the details of which an inside wireman must have ready and definite knowledge: The methods of installation of electric wires and conduits, the making of electrical connections, fixture wiring, the installation of electrical appliances, the testing of circuits, the methods of computing the sizes of wires, connections and fuses required for specific electrical currents, as well as estimating the amount of current required for the specified work. This work presupposes a thorough knowledge of the code, together with some knowledge of the theory of electricity, with emphasis on the definition of terms and electrical measurements. Some knowledge of building construction is also necessary.

The manipulative skill required of an inside or outside wireman is not of a very difficult nature. The tools most commonly used are pliers, connectors, the screw driver, brace and bit, hammer, knife, and soldering torch. Conduit and pipe work require the use of pipe fitters' tools. Dexterity in handling tools and fittings, accuracy in all the work done, and initiative in attacking the many difficult problems that arise are among the qualities especially desirable.

What the industry gives.—Due to the fact that the electrical workers' trade is not organized sufficiently in Richmond, or perhaps due to the comparative newness of the trade the conditions of apprenticeship are very indefinite. There seems to be a general understanding that the period of apprenticeship should be four years. In general, boys learning the trade are not called apprentices, but helpers. A four years' apprenticeship should give the boy a very fair degree of manipulative skill and some trade and technical knowledge.

The amount of knowledge acquired, however, depends very considerably on the worker himself as there is no provision made in the shop or on the job for the systematic instruction of either apprentices or journeymen. The line of promotion is from helper to journeyman, to foreman. There is also a very considerable tendency for the electrical worker to go into business for himself, doubtless due to the fact that only a small capital is necessary.

Deficiencies of workmen.—The majority of electrical workers have a fairly good elementary education, but are deficient in advanced and technical education.

What the school ought to give.—Before entering the trade the boy should have received a complete grammar-school education and either a high-school education or special prevocational courses in mathematics, physics, chemistry, and mechanical drawing. Apprentices and journeymen should receive specialized courses covering the specific requirements of the occupation. These would include a course in the theory and practice of electrical wiring, mathematics, physics, and reading of architects' drawings and specifications.

PLASTERING.

Processes.—Plastering consists of placing plaster upon walls, ceilings, and other surfaces, using to do this the hawk, trowel, and other tools of the trade. Plastering covers both the plastering of plain surfaces, such as walls and ceilings, and ornamental work, such as cornices, moldings, panels, etc. Patent or prepared plaster is almost entirely used in Richmond.

Three-coat work is usually used upon flat surfaces. The first coat consists of plaster containing hair. This coat is put on, well "scratched," and roughly smoothed. When the first coat is dry the second coat, which is like the first, except that it contains no hair, is put on and floated. The third or finish coat, which consists of lime and plaster of Paris, is put on very thin and the surface smoothly finished.

Cornice, molding, and other ornamental work is usually run in place, using plaster consisting of lime and plaster of Paris, stucco, or other material.

Product or specialties.—Plastering covers all work, both plain and ornamental, when done with stucco, cement, lime mortars, or patent materials, artificial marble work, and compo work in all its branches.

Importance of the trade.—The number of plasterers in Richmond at present is estimated at about 50 white and 180 colored.

Conditions of employment.—Plastering is considered an extremely healthful occupation, as the work is not excessively heavy and does not involve eyestrain or nervous strain; neither is there danger from machinery nor from handling poisonous materials. Nothing in modern plastering tends to narrow or restrict the mental development, as the work is considerably varied in its character and the best class of work stimulates the intelligence.

Economic conditions.—The maximum wage for journeymen plasterers in Richmond is $24 per week and the minimum $18 per week. Apprentices start at $3 or $4 a week and usually get an increase of 50 cents each succeeding six months. Nine and one-half hours per day, 54 hours per week, and 6½ hours on Saturday is the prevailing time worked in Richmond. The busy season is from March to November, inclusive, and the slack season from December to February, inclusive. The plasterers in Richmond are at present unorganized.

Age of maximum productivity.—Apprentices and learners usually enter the trade at the ages of 16 to 18 and serve an apprenticeship of four years. The age period of maximum productivity is usually from 25 to 55.

Demand for labor.—The supply of ordinary plasterers appears sufficient to meet the demand, but there is a lack of competent skilled workers, caused by the lack of education and of a good apprenticeship system. The apprentices and learners are from the lower grammar grades. The demand for plasterers is at present stationary.

Educational and technical requirements.—Plasterers should have a grammar-school education and training in mathematics, drawing, and blue-print reading as applied to the trade, manipulative skill in the use of the materials and the handling of the following tools:

Trowel: The plasterer's trowel is made of light springy steel, rectangular in shape and about 4½ inches wide by 12 inches long. It has a crank-shaped handle fitted on to one face.

Hawk: The hawk is made of wood and is from 13 to 14 inches square, flat on top but tapered from one-quarter of an inch thick at the edge to three-quarters of an inch in the middle of the bottom. In the middle of the bottom is fastened a handle about 5 inches long and 1½ inches in diameter.

Darby: The darby is made of wood one-half inch thick, 4 inches wide, and 3 feet 4 inches long. It has a handle similar to that on the hawk, fitted near one end, and another made of a strip of wood usually about 8 inches long near the other end.

Float: The float is of wood about 5 inches wide, 12 inches long, and three-quarters of an inch thick. The handle is a curved one, fastened at each end to the back of the float.

Straightedge: The straightedge is of wood and consists of a piece about 2½ inches wide by 6 feet long. In the middle is a handle 5 inches wide, tapering to 1 inch at the end and fastened by the edge to the long piece.

Scratcher: The scratcher is made of wooden slats sharpened at one end and nailed about 1 inch apart on two strips. The middle slat is left long, to be used as a handle.

Long rod: The long rod is of wood 1 inch thick, 6 inches wide, and about as long as the ceiling is high in the room in which it is to be used. It must be perfectly straight.

Pointer: This is a small trowel like that used by brick masons, having a blade 4 or 5 inches long.

Brush: The plasterer's brush is made of good bristles and is about 8 inches wide.

Paddle: The paddle is of wood, about 5 inches long by 2 inches wide, with one edge sharpened to an edge.

Molds: Plasterers' molds are made in many kinds and shapes to suit the kind of ornamental work for which they are to be used.

Trammel: The trammel consists of a cross and beam of wood and is used to lay out ornamental plastering.

Mitering tools: Mitering tools are made of wood and steel in many sizes and shapes.

The following tools and appliances are used by the laborers in the trade:

Mortar hod: The mortar hod consists of two pieces of board about 1 foot wide by 2½ feet long, nailed together at right angles, forming a trough. One end of this trough is closed by nailing on a triangular piece and the other has the boards rounded toward the angle. A round handle about 3 feet long and a pad are attached near the middle on the under side.

Mortar board: The mortar board is about 3½ feet square, made of boards nailed close together upon two cleats placed far enough apart to permit the head of a barrel to fit between them.

Mortar bed: The mortar bed is made of a size to suit the job, and about 1 foot deep, of boards strongly fastened together.

Sand screen: The sand screen consists of a frame about 2 feet wide by 6 feet long, covered with wire net.

Other qualities necessary to a worker in this trade are initiative, accuracy, and dexterity.

What the industry gives.—During the apprenticeship the learner progresses from rough to ornamental work as his ability will permit. All that the boy acquires during this time is the manipulative skill necessary to apply the plaster, no provision being made for the systematic instruction of either journeymen or apprentices.

Deficiencies of workers.—The plasterers are deficient in general education, trade mathematics, and drawing, all of which are necessary for them to become efficient workers and enable them to advance in their trade.

What the school ought to give.—The schools should give a grammar-school education and some training before the boy enters the trade. After entering the trade the boy should be given mathematics of the trade, drawing and blue-print reading applied to the trade, history and theory of the trade, and modern methods.

WOODWORKING (BENCH AND MACHINE).

Processes.—The machine work consists of operating band and circular saws, jointers, planers, lathes, machines for making moldings, tenons, and mortises, and for sandpapering. The more simple processes consist of "knocking out cores," which is cleaning the mortises made by the mortise machine; wiring slats on rods for blinds with hand-power machines; running small molding machines making slats and small moldings for door paneling; and operating boring machines, which "core out" holes for blind slats. The bench work consists of the fitting and putting together of sash, doors, frames, blinds, ornamental pieces, stairways, and other house finishings, by means of hand tools and using glue, screws, and brads.

Product or specialties.—This work covers all kinds of building material, such as timbers for the frame, shingles, weatherboarding, sash, doors, blinds, window and door frames, molding, flooring, ornamental pieces, stairways, and all other kinds of interior and exterior finish.

Importance of the trade.—There are in Richmond 15 establishments engaged in the manufacture of building materials. These plants employ approximately 309 journeymen and apprentices.

Conditions of employment.—This is not a healthful occupation, owing to the fact that there is always much dust from the saws, planes, and other machines, which is constantly inhaled by the worker, and also the machines are extremely dangerous, owing to the high speed at which they are run. There are very few men who have worked at this trade for any considerable length of time who have not lost fingers or been otherwise injured. There is some physical strain involved in the handling of heavy material, but all of the work should stimulate the intelligence except in cases where the worker is kept constantly upon one kind of rough work.

Economic conditions.—The journeymen's wage in this trade ranges from a minimum of $12.60 per week to a maximum of $20.62 per week. The apprentice's wage for the first year ranges from $3 to $6 per week; for the second year, from $6 to $7.25 per week. After the second year there is no regular scale, the apprentice's wage being increased as his ability increases. Those employed in this trade work 9½ to 10 hours per day, 54 to 55 hours per week, and from 5 to 6½ hours on Saturday.

The busy season in this trade is from April to October, inclusive, and the slack season from January to April. There is, however, very little fluctuation of employment, the establishments working short hours instead of laying off men during the slack season. The men in this trade have no organization of their own at present, but some few belong to the carpenters' and joiners' union.

Age of maximum productivity.—The beginners in this trade usually enter between the ages of 16 and 18, and usually serve an apprenticeship of four years. Some of the occupations, however, are easily learned and not all workers are required to serve specified periods of time, but are advanced at any time their services seem to justify it. The period of maximum productivity for these workers is between the ages of 30 and 45.

Demand for labor.—The supply of labor in this industry is at present sufficient to meet the demand. This demand, however, seems to be increasing. The workers are recruited from the lower grammar grades and from the ranks of unskilled labor.

Educational and technical requirements.—Workers in this trade should have a complete grammar-school education and technical knowledge of the different kinds of wood and their uses, the process of seasoning, the causes of warping, a knowledge of drawing and mathematics applied to the trade, and manipulative skill in the use of the hand and machine tools. This requires accuracy, patience, and extreme carefulness.

What the industry gives.—The apprenticeship is generally four years, although in the case of specialty men, who run only two or three machines, no formal apprenticeship is served. Where the worker serves a four-year apprenticeship he starts first at cleaning up shop, knocking out cores, wiring slats on rods for blinds, gradually advancing to the more difficult hand and machine work as his ability increases. There is no provision made in the shops for the systematic instruction of apprentices or journeymen, and because of this about all the knowledge that is acquired by the worker is the manipulative skill required in handling the hand and machine tools. The line of promotion is from apprentice to journeyman, to foreman.

Deficiencies of workers.—The workers in this trade are deficient in general education, drawing, mathematics, modern methods, knowledge of materials, and the history and theory of the trade.

What the school ought to give.—The worker before he enters this trade should have a complete grammar-school education and two years of prevocational training. After entering the trade he should take school courses covering drawing and mathematics of the trade, modern methods, materials used, and history and theory of the trade.

CABINETMAKING.

Processes.—In practically all of the establishments in Richmond the material for cabinetmaking is cut to approximate size by machines. It then goes to the cabinetmaker to be made up into all kinds of fixtures for stores, offices, and buildings. In the building of such fixtures the cabinetmaker makes all joints and parts, using such tools as the plane, chisel, saw, hammer, and spoke shave. The shaped parts are glued, assembled, sandpapered, and scraped, and the completed work is stained, filled, and varnished. In large establishments the finishing is a separate occupation.

Product or specialties.—Hardwood, bank, office, and store fixtures, cabinets, and furniture.

Importance of the trade.—There are approximately 64 journeymen and apprentices employed in this trade in Richmond.

Conditions of employment.—The work involves neither physical nor nervous strain, and owing to the variety practically all of it should stimulate the intelligence of the worker.

Economic conditions.—The wages of journeymen in this trade range from a minimum of $10 per week to a maximum of $18.20 per week. Those employed in this trade work from 9½ to 10 hours per day, 54 to 55 hours per week, and from 5 to 6½ hours on Saturday. The busy season is from January to October, and the slack season from October to January. Cabinetmakers have no separate organization of their own, all being members of the carpenters' and joiners' union.

Age of maximum productivity.—The workers in this trade usually enter at about 16 years of age and serve an apprenticeship of four years. The age period of maximum productivity usually covers the years between 30 and 45.

Demand for labor.—The supply of cabinetmakers is at present sufficient to meet the demand, which is, however, increasing. The workers in this trade enter as apprentices and are recruited from the lower grammar grades.

Educational and technical requirements.—The worker needs a complete grammar-school education with two years of prevocational training in woodwork. He should have a knowledge of woods and finishes, ability to work from drawings and sketches, instruction in modern theory and practice of the trade, and in cabinet and furniture design. He needs a high degree of manipulative skill in handling of the tools and equipment and along with this the qualities of accuracy, patience, initiative, and artistic sense.

What the industry gives.—The apprentices in cabinetmaking generally serve for four years. The first two years the boy helps in various ways around the shop, spending most of his time in helping on and learning the use of the various machines. During the last two years the apprentice works gradually into the bench work, beginning on such work as gluing up and getting better work as his ability increases. There is no provision made for the systematic instruction of either apprentices or journeymen, and about the only part of the trade which is learned in the shop is the manipulative skill required in the use of the tools and the making and assembling of cabinetwork. The line of promotion in this trade is from apprentice to journeyman, to foreman.

Deficiencies of workers.—The deficiencies of the workers in this trade are in general education and a knowledge of mathematics and drawing of the trade, of cabinet and furniture design, and of modern theory and practice of the trade.

What the schools ought to give.—The worker in this trade should have a complete grammar-school education with two years of elementary industrial training in woodworking. After entering the trade the worker should take courses covering drawing and mathematics applied to the trade, cabinet and furniture design, and modern theory and practice in the trade.

PAINTING.

Processes.—The painter performs a variety of operations, some of which are only indirectly or remotely related to the work of laying on coats of oil paint, varnish, water color, stain, or kalsomine. These operations may be characterized briefly as follows: Preparation of wood, plaster, and metal surfaces to receive the finishing coats; removal of old finishes; preparation and mixing of spirit or oil vehicles, and lead, zinc, and color pigments; rubbing down coats; and in certain classes of work, graining, laying gold leaf, gilding, lettering, free-hand drawing, stenciling, rigging scaffolds, and setting glass with putty or moldings in windows, doors, and skylights, constructed of wood, metal, or stone. These processes, which must be performed under a variety of conditions—in the paint shop, in manufacturing plants of miscellaneous character, or on the outside or inside of dwellings or other buildings—can best be considered with reference to each of the several classes of work which the all-round painter must be prepared to undertake.

House painting: House painters may be divided into two classes—brush hands, who do only rough outside work, and whose only trade qualification is ability to cover extensive surfaces; and skilled artisans, who understand the mixing of paints and can do any sort of inside or outside work.

The first step in house painting, as in other painting, is preparation of the surface to be covered. In new work this consists in cleaning and smoothing the surface with sandpaper and duster. In old work the first step is removal of old finishing coats of paint or varnish, which is commonly done by burning with a Bunsen burner and scraping, or by applying paint or varnish solvents and scraping. Surfaces from which old finishes have been removed must then be sandpapered until perfectly smooth. When the wood has been laid bare, smoothed, and cleaned, it is ready for the priming coat of white lead, ocher, or other pigments mixed with linseed oil to the proper consistency. The color is selected for the priming coat with reference to the color of the coats that are to follow.

The priming coat is worked well into cracks and nail holes to protect these broken surfaces and is allowed to dry, after which cracks and holes are filled with putty, which adheres well to the paint. Two or more coats of the required color are then applied, the number and composition of the final coats depending upon the class of work.

Staining, filling, and varnishing: Dyes dissolved in water, oil, or spirits are applied to the bare wood to give color and to bring out the grain. Another method of staining is that of exposing the surface to ammonia fumes in a closed receptacle, the fumes by chemical action turning the wood nut brown.

The pores of the natural or stained wood are filled with a liquid or paste filler, liquid fillers being used on close-grained woods, such as pine, and on large surfaces; paste fillers on coarse-grained woods, such as oak or chestnut. A coat of filler is applied evenly, allowed to stand 24 hours, and then sandpapered lightly. On fine cabinet work in close-grained wood white shellac is often used as a filler, since shellac makes a good foundation and does not darken the wood as does varnish. Paste fillers, the best of which are made of ground rock crystal mixed with raw linseed oil, japan, turpentine, and some color suitable for the wood, are applied to the surface, worked into the pores, and left in a thin layer on the wood. When the filler has become dull and chalkish, it is rubbed off at once, rubbing first across the grain to fill the pores thoroughly, and then with the grain to bring out the high lights. Twenty-four hours are then allowed for the filler to harden. One application is usually sufficient, but two are sometimes necessary.

Copal or oil varnish is usually flowed on, the brush being dipped deeply and flowed on in a heavy coat. The surface is then gone over lightly with the brush as free from varnish as possible until the work is left with only a thin coating. Three or four coats are generally applied, allowing time after each coat for drying. The first coats are rubbed with haircloth or curled hair. For a dull finish the last coat is rubbed until smooth with powdered pumice stone and water, and the pumice removed with a damp sponge and chamois skin. When a gloss finish is desired, the last coat is not rubbed. For a polished finish the last coat is rubbed with pumice stone and water, then with water and rottenstone, and, if a very fine surface is desired, it is finished with oil and a little rottenstone rubbed with a soft flannel or even with the bare hand.

Shellac or spirit varnish, made by dissolving shellac in alcohol, does not flow freely. It must be applied thin, with long, even strokes of the brush. A surface finished with shellac varnish is given five or six coats, each coat being rubbed down with fine steel wool, curled hair, or oiled sandpaper.

These processes are performed in the order in which they have been described, the stain being applied first, then the pores of the wood being closed with filler, and last the varnish coats being put on according to the finish desired.

Kalsomining: In kalsomining the first process is that of cleaning and preparing the walls. All grease or lime spots are scraped and smoothed, and all nail holes and cracks filled with a putty or whiting or plaster of Paris. The walls are then given a sizing of thin glue, which causes the kalsomine to hold well to the wall, and at the same time prevents it from striking in. Sometimes a coat of oil paint or hard oil is used for this purpose, and also to prevent dampness from striking through the walls and discoloring the kalsomine.

Kalsomining mixture, which consists of dissolved glue, whiting to give body, and some coloring material, such as is used in oil painting, to give the desired color, must be prepared with reference to the work to be done, more glue being required, for example, on side walls to prevent rubbing, than is required on ceilings.

In fresco painting the kalsomine is applied while the wall is still damp, making the color a part of the fresco work, but in cases where the walls are not decorated they are allowed to become thoroughly dry before the kalsomine is applied.

Any desired color may be obtained by the mixing of the primary colors, red, yellow, and blue, lampblack being added in some cases. Kalsomine is applied with a large brush, working the ceiling first and then the side walls.

Sign painting: Sign painting, which includes all kinds of advertising painting, from small lettered signs on cardboard or wood to large pictorial work on walls and large signboards, requires on the part of the painter a special aptitude for fine color work, designing, free-hand drawing, and lettering. Some classes of work are done in the shop, but much of the work must be done away from the shop.

In small lettered signs the ground is prepared by laying on several coats, usually of white paint consisting of white lead mixed with equal parts of turpentine and oil. When these coats have dried thoroughly the letters are sketched off with white chalk and are then carefully traced with charcoal. The surface is then brushed over, leaving only a dim layout, and the letters cut in, by outlining with lampblack mixed with linseed oil, using for fine work a small red sable pencil brush, and for large work a small bristle brush. When the surface to be lettered is of metal it is first pickled with vinegar in order to make the paint hold well, the other processes being the same as in the case of wooden surfaces.

The letters are then filled in with paint—black paint being most commonly used on a white background—or are further prepared for gold leaf.

In gold-leaf work the letters are coated over with a good oil gold size which is allowed to stand usually about 24 hours until it has reached that degree of dryness which is called "tacky," in which state the gold leaf will adhere to it strongly. The gold leaf is then applied, as much of a leaf being uncovered as is necessary to go on a certain part of the letter, and then cut by running the finger nail across it. Then, without removing the leaf from the book and keeping the rest of the leaf covered, the portion cut is pressed firmly against the size on the part of the letter to be covered. The gold leaf adheres to the size when the book is withdrawn. When all of the letters have been covered in this manner they are cut in with a size made of fat oil, lamp-black, and a little white lead. Generally, to complete the work, the sign is laid in a horizontal position and smalt or ground black glass is sifted on. When the size has dried enough to retain the smalt the sign is raised to a vertical position and the superfluous smalt is brushed off with a soft brush.

In sign painting where there are several signs of the same kind to be made stencils are used. The letters or designs are first drawn on a sheet of stiff heavy paper and then carefully cut out. The sheet of paper is tacked to a light wooden frame and well coated with shellac. Where the sign is to be made in two or more colors several stencils are made, one for each color. After the sign has had two coats of ground color and has thoroughly dried the stencil is laid upon the sign and the paint applied through the opening cut in the stencil. The paint used is mixed with benzine and is applied with a stiff bristle brush. After the letters are dry they are all second-coated without the use of the stencil.

Gold lettering on glass: In gold lettering on glass the letters are first outlined with chalk on the outside of the glass. They are then covered on the inside with a size made by placing in cold water Russian gelatin, sometimes called Russian isinglass, and boiling for about three minutes. The size will become "tacky" in from 15 minutes to 3 hours. The gold leaf is then put on by handling it with what is called a "tip," which is a brush consisting of a thin layer of camel's hair glued between two pieces of cardboard. The hair of the tip should be slightly oily, so that the gold leaf will adhere to it until placed against the size on the letter. After the gold leaf is placed on the letters, the chalk lines which show through the gold are carefully outlined on the inside with black paint. When this paint is dry the gold leaf which projects beyond the lines is removed with a piece of cotton and water. The letters are usually outlined with paint in such a manner as to give them the appearance of thickness. After this work is dry the whole is given a coat of varnish.

Graining: In imitating the grain of various woods the surface is first given at least two coats of paint, tinted according to the kind of wood to be imitated. The second coat of ground color is made to dry with a gloss, so that the graining mixture will not, by being absorbed, make the grain appear dingy. After the ground color is thoroughly dry the graining mixture, of a color to suit the kind of wood to be imitated, is applied, and before drying the coarse grain is made by drawing a graining comb of leather or gutta-percha over the surface. The surface is then worked over with a fine steel graining comb in the same direction. The heavier figures of the grain are made by wiping out the graining mixture with the thumb covered by a piece of cloth. A fine bristle brush is finally passed lightly over the surface to blend or soften the heavy lines, imitating as nearly as possible the grain of the natural wood.

Railway-car painting: In Richmond railway-car painting constitutes a branch of the trade of sufficient importance to warrant separate treatment.

Car painting is classified under two distinct heads—i. e., passenger-car and freight-car painting. Passenger-car painting is a very high grade of work, requiring much experience and skill in all the processes of painting, varnishing, and finishing, while freight-car work can be done by any ordinary painter, since no special skill is required for painting freight-car bodies and trucks.

Passenger-car painting may be subdivided as follows: Exterior painting of new cars, interior finishing, and refinishing of old cars.

New cars when brought into the shop are first rubbed down with coarse and then with fine sandpaper. After this is done the wood filler is applied, the filler being a pigment mixed with oil and turpentine to the consistency of a thick cream.

After the coat of filler come three coats of body color, each one being rubbed down with pumice stone and water. The exterior decorations, such as lettering and striping, are then applied and the entire car revarnished.

In interior finishing the new interior woodwork is rubbed down with sandpaper and a coat of clear shellac applied. This forms a foundation for the three coats of varnish which follow. The interior varnish coats are each smoothed by rubbing with pulverized pumice stone and water.

The first process in refinishing old cars is the removal of all old paint by heating it with the flames from a Bunsen burner, gasoline being mostly used for this purpose. This having been done, the entire car is scraped, scrubbed down with water, and sandpapered. Wood filler is not applied to old work, as the pores of the wood are already filled. Each body coat is rubbed down with pumice and water and the decorations and varnish applied, as in the case of new cars.

It requires about six days to paint a car completely, much of this time being, of course, consumed in allowing the several coats of paint and varnish to dry.

All window and door glass is put in in the car shop, although this work does not come directly under the supervision of the foreman of the paint shop and is not done by the car painters.

With the introduction of steel cars a new method of applying paint has been found. This method consists of spraying paint upon the surface with a spraying machine. At the present writing this method has not been introduced in Richmond, all of the paint being applied by hand.

The steel-car painting done in Richmond is all repainting and refinishing. The car is given five or six coats of a body color, each coat being rubbed down with pumice, and then decorated and varnished.

Freight-car and truck painting requires no special comment, as this is the most common form of painting done in the car shop and does not differ from other rough painting.

Product or specialties.—The work of the painter in Richmond is not materially different from that done by painters in other communities, although railway-car painting may be designated as a line of work employing a considerable number of men. In general, the work of the trade embraces inside and outside painting of buildings; decorating, sign painting, painting of wagons, carriages, automobiles, steam and street railway coaches, painting of bridges, tanks, and structural-iron work, of agricultural implements, and of furniture.

Importance of the trade.—According to the Federal census of 1910, there were in Richmond in that year 543 painters, glaziers, and varnishers, of whom 447 were employed in the building trades and 96 in factories. Of the painters in the building trades, 421 were white and 26 were colored. The number of painters in the city at the present time is estimated to be approximately 600.

Conditions of employment.—The work of the painter is not generally such as involves any peculiar physical or nervous strain beyond that involved in any sort of manual labor. Moreover, the work of the all-round well-trained painter is sufficiently varied to stimulate interest, much of it requiring the exercise of high-grade skill and of artistic sense. In some Richmond shops, however, the work is to a very considerable extent specialized, one man doing the rough work of burning and scraping off old finish, sandpapering and putting on body coats, another filling, staining, and varnishing, and another striping and lettering. In house painting, also, one set of men may be employed entirely on rough work. For the relatively unskilled men who are kept on the rough work, there is comparatively little in the occupation that is stimulative, although there is in some cases a chance of promotion to the finer work of inside painting and decorating, sign painting, lettering, and finishing. In some classes of work there is danger of accident from imperfect construction or rigging of scaffolds.

Hygiene of the occupation.—The condition of employment which most seriously involves the welfare of the painter is that which exposes him to the danger of poisoning. It has been scientifically demonstrated that many of the materials with which the painter works are poisonous, and it is true that many of the processes are such that it is difficult, especially under certain conditions, to avoid contact with the poisons. There are, however, certain simple precautions by which much of the danger can be avoided. A brief summary of the findings of scientific investigations and of the present survey as regards the hygiene of the trade follows. In general, it may be said that the returns on the schedules of the survey, and the information gathered in personal conferences with painters, are entirely consistent with the findings of scientific research as regards the injurious effects which follow the use of certain materials and which result from carelessness or improper procedure in various lines of work.[1]

Either or both the pigment and the vehicle of paint may be poisonous and either or both may be perfectly harmless. The higher-priced paint usually contains white lead, linseed oil, and turpentine. Both the white lead and the turpentine are poisonous. The pigment in cheap paint may be something perfectly harmless, as chalk or barytes, while the vehicle may contain so great a percentage of petroleum compounds that it is extremely poisonous, especially when used on inside work in inclosures poorly ventilated.

The pigments which cause poisoning are the lead salts, white lead, or basic carbonate of lead, sublimed white lead or basic lead sulphate, chrome yellow, or yellow chromate, chrome green (a mixture of chrome yellow with Prussian blue), red lead and orange mineral. Lead carbonate and lead sulphate are used in the higher-priced paints, usually separately, but sometimes together, and the carbonate much more commonly than the sulphate. Chrome yellow is used for tinting in house painting and in coach painting; chrome green for painting window shutters; red lead in painting structural-iron work, and orange mineral for painting wagons.

Of these constituents lead carbonate is considered the most poisonous; but when sandpapering, mixing, or chipping off old paint, the red lead is the most dangerous because it is lighter and floats in the air more easily. Chrome yellow is considered to be about as harmful as the red lead. Lead sulphate is not as dangerous as the lead carbonate, red lead, or the chrome yellow. It has been determined by scientific experiment that in human gastric juice the lead carbonate is a little more than twice as soluble as the sulphate; that the lead carbonate is distinctly more toxic than the sulphate, and that both produce acute lead poisoning.

Experiments conducted to determine the effect which milk, when combined with the gastric juice, has upon the amount of lead dissolved brought the conclusion that when the milk and gastric juice are in equal proportion the hydrochloric acid of the gastric juice is so completely fixed by the milk proteins, or neutralized by the carbonates in the milk, that the mixture has virtually no solvent action on the lead salts.

On the basis of scientific investigations three practical suggestions have been made for safeguarding painters against poisoning: (1) That since lead carbonate is so much more toxic than the lead sulphate, lead workers as well as the State should aim at the elimination of the use of the carbonate in all the industries where this is possible; (2) that since basic lead sulphate, or sublimed lead, is poisonous, none of the precautions usually advocated for the protection of workers in lead be neglected by those handling lead sulphate; (3) that, in addition to taking other important prophylactic measures, workers in lead salts should drink a glass of milk between meals (say at 10 a. m. and

[1] As regards the nature and physiological effects of paint and varnish poisons, the following text is largely summarized from Bulletin No. 120, U. S. Bureau of Labor Statistics, by Alice Hamilton, M. D.

4 p. m.) in order to diminish the chances that the lead they have swallowed be dissolved by the free hydrochloric acid of the gastric juice, as in some persons there is c nsiderable secretion of gastric juice in the empty stomach.

Dust from the sandpapering of lead-painted surfaces is one of the most important causes of lead poisoning. The dust thus raised is inhaled and lodges on the nasal and pharyngeal mucous membrane and is then swallowed. Investigation has shown that the great bulk of this dust finds its way into the stomach and not into the lungs. This causes the poisoning of the workman, as the lead in the dust is dissolved by the free hydrochloric acid in the gastric juice and is easily absorbed. This dust is dangerous not only to the man doing the sandpapering but also to the others working near. The danger can be entirely eliminated by the use of pumice stone and water in rubbing down coats, or, if it is a first coat where this is apt to raise the grain or on metal where it may cause rust, by moistening the sandpaper with some cheap mineral oil. Sandpaper so oiled lasts as well as when used dry, and the results so far as the work is concerned are as good when oiled paper is used as in dry sandpapering.

When metal surfaces are to be repainted they are usually chipped clean, and often the work is done by a machine using compressed air. This work is very dangerous, and a much better way, whether on wood or metal, is to burn the paint, causing it to curl and shrivel up, after which it can be easily scraped off. Some authorities speak of lead poisoning being acquired by the use of the burning method; but this is not apt to happen unless the painter should hold the flame long in one place, and thus cause considerable smoke which might carry mechanically small particles of lead. The boiling point of lead is so high that the danger from evaporation from the heating required is very slight. Danger of poisoning from this method arises, however, when the burned paint is allowed to lie upon the floor of the shop until ground to dust. This dust is stirred up by the feet of the workmen or by moving materials, and is constantly inhaled and swallowed by the workmen. The scraps of paint should in every instance be cleaned up before they become dry.

The painter should be extremely careful in handling his food or tobacco, and should avoid wearing dusty and paint-soaked clothing.

The dangerous vehicles are turpentine, benzine, naphtha, benzol, wood alcohol, and amyl acetate. Turpentine used as a dryer and for thinning is a constituent of many paints and varnishes. It sometimes makes up the entire vehicle. The inhaling of much turpentine-laden air causes headache, dizziness, and irritation of the throat and of the urinary system. If the workman is exposed for long periods to turpentine fumes, it often causes chronic inflammation of the bladder and kidneys. These fumes cause also inflammation of the skin and often affect the nervous system, as is evident in the typical symptoms of staggering and in extreme cases loss of consciousness.

Benzine and naphtha are used in hard oils as dryers, and very often constitute a large percentage of the vehicle in cheap quick-drying paints. Fumes from these liquids affect the nervous system much as does alcohol, causing staggering, defects of memory, and disturbance of sight and hearing. Where the workman is long exposed to these fumes, chronic poisoning takes place, causing skin diseases, weakness, nervousness, and sometimes even impaired mentality.

Benzol is used in priming and as a paint and varnish remover, because of its penetrating and solvent qualities. The benzol fumes are very dangerous and may be fatal. They cause changes in the blood, hemorrhages of the organs and mucous membranes, and degeneration of the organs. The symptoms of this poisoning are a flushed face, dizziness, and headache followed by a blue appearance of the skin, nervous excitement or stupor, accompanied by sickness. If the poisoning is chronic, ulcers appear on the gums and lips.

Wood-alcohol poisoning comes mostly from inhaling the fumes while using varnish. This causes headache, hoarseness, twitching of the muscles, weak heart, unconsciousness, and temporary or permanent impairment of sight, even to the point of complete blindness.

Amyl acetate, derived from fusel oil and acetic acid, is used in varnishes, gilding fluids, and as a paint solvent. The fumes cause headache, uncertain movements, difficulty in breathing, sleepiness, bad heart action, and poor digestion.

Poisoning from the various paint vehicles may be avoided in most cases by insuring good ventilation, either natural or artificial, of shops or rooms where work is being done. When this is not possible the men should be changed as often as possible on work, so that no one of them will become enough poisoned for permanent injury.

Although the vehicles in the various leadless paints are usually much more poisonous than those used in lead paint, the introduction of these paints into the industry is a great help toward the betterment of hygienic conditions in the trade, as it is much easier to avoid poisoning from the vehicle than it is from the various lead pigments in the paint.

It may be noted that the paints used in railway-car painting are almost entirely the new leadless or almost leadless kind. The smoothing of all paint surfaces is done either by the use of pumice stone and water, or with oiled emery cloth or sandpaper. All paint is removed by burning and scraping, and the work is done in large open buildings where the ventilation is such that there is very little, if any, danger from the volatile substances in the paint. Railway-car painting in Richmond is, therefore, to a very large extent free from the dangers of poisoning above cited.

Economic conditions.—House and sign painters are to a very considerable extent free lances, working first for one contractor, and then for another, or independently on their own account. The character of the work done by them varies greatly from job to job, and partly because of the miscellaneous character of their work, and partly because of the nature of the climate in Richmond, employment is not markedly seasonal. The slack season is from the first of January to the end of February, and the men are employed on the average about 10 months during the year. The sign painter, when weather does not permit outside work, usually has on hand work which can be done in the shop. As regards painters in the car shops and in manufacturing plants, employment is generally steady, and the seasonal fluctuations inconsiderable. Hours of labor range from 8 to 9 hours per day, or 48 to 54 hours per week, full time being worked on Saturdays. Skilled journeymen earn $3 to $5 per day, the minimum wage for unskilled labor being $1.50. Wages are low as compared with wages paid in other trades. The trade is about 10 per cent organized.

Age of maximum productivity.—Boys enter the trade between the ages of 16 and 18, and serve a four-year apprenticeship. The age period designated as the period of maximum productivity is from 22 to 55.

Demand for labor.—House painting is a field in which the demand for labor is increasing, but the occupation is, nevertheless, somewhat overcrowded, especially with semiskilled workers. The demand for sign painters is increasing, and there is a scarcity of skilled high-grade workmen. In the car shops and in manufacturing plants the demand for labor is fairly stationary. In general the supply of medium-grade labor seems adequate for the present demand; the supply of high-grade labor is insufficient to meet the increasing demand in special lines. Workers are recruited from the lower grammar grades and from casual labor.

Educational and technical requirements.—In the way of general education, the occupation of the painter makes no special demand upon the worker, beyond that degree of general education required for all workers to insure to them advancement in proportion as they acquire, in practice, trade and technical excellence.

The trade and technical knowledge required by the skilled artisan is, however, very considerable. The nature of this knowledge will be apparent from the foregoing account of the processes and hygiene of the occupation. Some trade knowledge pertains even to the simplest processes, as, for example, to the process of rubbing down surfaces, where sandpaper of a proper grade of fineness must be selected, or some other material, such as ground pumice stone, rottenstone, fine steel wool, or curled hair. The painter must know which of the many varieties of fillers, sizes, or foundations should be used on woods of different qualities, and in different classes of work. He must know something of the preservative qualities of different finishes. He must know how to mix oils, pigments, and varnishes, for body coats, for flat and for glass finishes, for inside and for outside work. In all color work he must have a knowledge of color mixing and harmony.

The degree of manipulative skill required by the painter varies from the small amount required to lay on rough body coats to the very considerable amount required for flowing on varnishes, and for the fine work of striping, lettering, and decorating. The characteristic tool of the painter is the brush, which varies from the small round pencil and sash tool of camel's hair, to the large, round or flat brush of hog bristles. In the handling of these tools a very high degree of manipulative skill is required for certain classes of work. In all classes of work the skilled hand economizes time, labor, and material.

In addition to the above qualifications, the painter should possess an accurate color sense; an artistic sense, which will enable him to harmonize colors in inside decorating, and to do original work in designing; a knowledge of alphabets for lettering; and a natural talent and skill in free-hand drawing. Finally, it is vitally important that the painter shall have a thorough knowledge of the hygiene of his occupation.

What the industry gives.—The workers in the skilled class enter the trade through an apprenticeship, usually of four years. During this four years the apprentice is occupied as follows: In the first year he helps by running errands and cleaning brushes, and picks up such information as he can from observing the workmen; he learns to mix paints, and to rig scaffolds; he does inside and outside painting, and learns to remove stains by the use of lime and acids. In his second year the apprentice is put on the scaffold, and works with the journeymen putting on finishing coats; he learns how to remove old finish by burning and scraping, or by the use of solvents, and how to prepare work for new finish. In his third year the apprentice is put on inside work, such as graining and varnishing, and is in general allowed to do such work as he is able to do. During his fourth year he is given such work as he has not already done, and by constant practice becomes more proficient in all lines of work. This apprenticeship gives the boy a small amount of trade knowledge, and enables him to acquire a fair degree of manipulative skill.

No provision is made in the shops for systematic instruction either of apprentices or of journeymen. The line of promotion is from apprentice to journeyman and from journeyman to foreman. The skilled painter may go into business on his own account.

Deficiencies of workmen.—The deficiency most commonly acknowledged by the painters is in the general education which they believe to be a condition of advancement in their trade. Nearly all painters have a very inadequate knowledge of the hygiene of their occupation. Few possess the trade knowledge necessary for estimating costs and qualities of material, and few possess an adequate knowledge of the principles of color mixing, color harmony, or design.

What the school ought to give.—Before entering the shop the painter should have received in the public school a complete elementary general education and prevocational training in drawing, design, and color harmony.

A serious obligation rests upon the school as regards instruction of apprentices and journeymen in the shops. This obligation arises from the fact that a thorough knowledge of the hygiene of the occupation is absolutely essential as a safeguard against poisoning. Such instruction, it would seem, should take precedence over every other sort of continuation work. Assuming, however, that this instruction is given, the school may properly undertake to give instruction organized with reference to the technical requirements of the painter, by offering courses covering free-hand drawing, lettering, design, color harmony, composition of paints, varnishes, and other materials, and modern practice in special lines of work.

These courses may be grouped under the following heads:

Trade hygiene: Diseases and dangers of the trade.

Art: Color harmony, free-hand drawing, and design.

Chemistry: Chemistry of color pigments.

Mathematics: Estimating.

Business practice: Methods of doing business; bookkeeping.

PAPER HANGING.

Processes.—In papering a room which previously has been papered all old paper should be removed, unless there is only one thickness and in good condition, in which case the new paper is put on over the old. After old paper has been removed and the wall scraped all cracks and depressions are filled and smoothed up with a mixture of plaster of Paris and patent plaster, and all angles pointed up; the wall is sized by covering with a coat of thin liquid glue, which is allowed to dry before the paper is hung. Preparation of the new paper is first made by cutting off the blank space along the edge of the paper with a machine knife in the case of cheap papers and with a small hand knife and straightedge when heavy expensive paper is used.

The new paper is now laid on a table and the paste applied with a paste brush. This paste is made of cheap wheat flour, alum, and water. After the paper is pasted it is folded and allowed to soak for a short time. If this is not done, the paper will blister when put up. The paper is now placed in position on the wall and pressed down smooth with a dry brush, beginning at the top and working toward the bottom. The paper on the side wall is cut a little long so that it may be cut off neatly at the baseboard and also be allowed to project over the space covered by the border; that on the ceiling is allowed to run down the side walls a short distance; then when the border is put on it makes a good joint with both.

Product or specialties.—This trade includes the hanging of all paper or other fabrics used for covering walls, the preparation of walls to receive the same, and the placing in position of finished wall moldings.

Conditions of employment.—Paper hanging is considered a healthful occupation, although there is some danger from working on scaffolds and handling poisonous colored papers. Because of its varied character it in no way narrows or restricts mental development.

Economic conditions.—At present there are about 70 paper hangers in Richmond, about 60 per cent of whom are members of the local organization. This is not what could be called a seasonal occupation, for although the busiest season is from May to October the work holds fairly steady throughout the year. Paper hangers in Richmond work 8 hours per day and 48 hours per week. The maximum wage is $27 per week and the minimum $18 per week. The union scale is $3.50 per day.

Age of maximum productivity.—The workers in this trade enter as apprentices usually between 16 and 18 years of age and serve for four years. The period of maximum productivity is usually between the ages of 21 and 55.

Demand for labor.—The field for this work is growing and at present is not overcrowded. The workers in this trade enter as apprentices and are recruited from the lower grammar grades.

Educational and technical requirements.—The paper hanger should have a complete grammar-school education with two years of elementary training, a knowledge of the proper tools and methods used, color harmony and design, estimating and mathematics of the trade. He needs color and artistic sense, special adaptability, keenness of sight, dexterity, and accuracy. Manipulative skill is necessary in applying paper and handling the following tools:

Tools.

Paste brush: This is a large flat brush used to apply the paste to the paper.

Dry brush: This brush is thin and flat and from 10 to 12 inches wide, used for smoothing and pressing the paper to the wall.

Seam roller: This is a handled roller from 1 to 3 inches wide, which is used to press down the paper at the seam or lap.

Knife: This knife has a curved blade about 3 inches long and is used for trimming edges, etc.

Scissors: These scissors have a 10 or 12 inch cut and are used for trimming.

Straightedge: The paper hanger's straightedge is of steel or wood, with a metal edging, and of various lengths.

Paper-cutting machine: This machine has two rollers, one to hold the roll of paper and the other to reroll as it is trimmed. Between these rollers are two circular knives which make a shearing cut, one pair for each edge. The machine is operated by a crank. When this crank is turned the paper is unrolled from one roller to the other, the knives in between cutting the blank strip from one or both edges as desired. Only cheap paper can be trimmed in this machine.

Other things which the paper hangers use are ladders, a plank for scaffolds, and a table with trestles to lay the paper on while pasting.

What the industry gives.—During his apprenticeship the worker does work as follows: During the first six months he will help on the job by cutting down seams, removing old paper, filling cracks in walls, sizing walls, and pasting paper. After this he will be allowed to hang cheap paper under the direction of a journeyman, gradually advancing to the better grade work as his ability increases, until about the beginning of the second year when he will be sent out on cheap jobs by himself. By the end of the third year the boy is able to measure the room and hang any kind of paper. Practically all that the worker acquires during this time is the manipulative skill required in performing the work.

Deficiencies of workmen.—The workers in this trade are usually deficient in general education, in knowledge of color harmony and design, in mathematics of the trade, and in modern theory and practice.

What the school ought to give.—The boy should have a grammar-school education and two years' prevocational training before entering the trade. The practical knowledge which the boy gains while working at the trade should be supplemented by the following courses in school:

Art: Color harmony and design covering the proper selection of paper to suit the kind of room to be papered and the person who is to use it.

Mathematics: Shop mathematics relating to the trade, on estimating, etc.

Modern practices in the trade.

UNSKILLED LABOR IN THE BUILDING TRADES.

Processes.—Under the head of building laborers are included hod carriers, cement laborers, saw and planing mill hands, carpenters' and stonemasons' helpers, structural-steel laborers, and all others in the building trades who do the rough, heavy, unskilled work.

Because of the character of the work a laborer may be with one contractor to-day and with another one in a different line of work to-morrow. The laborer goes from job to job and from one kind of work to another. The hod carrier, however, changes jobs and class of work probably less frequently than other laborers in the building trades. As long as there is a demand for that class of work, he generally sticks to it. This may be due to the fact that some degree of skill and training is required in his work. He mixes the ingredients for the mortar and carries the mortar in a hod to the plasterer or bricklayer. In Richmond most of the laborers carry the brick and mortar on a board on their heads.

In general, laborers are used around buildings under construction to do such heavy work as moving stones and heavy timbers, to do odd jobs for the carpenter and the structural-steel worker in so far as unskilled labor can be employed. In other words, the laborer around a building does the heavy unskilled work that would otherwise occupy the time and exhaust the strength of the mechanic.

In cement or concrete work the laborers mix the ingredients and haul it to the finishers in wheelbarrows. Other helpers assist in pulling the load up inclines, while others spread the concrete, working directly with the finisher.

In sawmills the logs and timber are moved to and from the saws and machines by laborers, who are employed also in stocking the timber in the yard and in hauling it to the customers.

There are other lines of work in the building trades that require laborers, but in all cases it is generally unskilled and heavy work.

Product or specialties.—The product or specialty of the building laborer is the same in Richmond as elsewhere, although the manner of accomplishing the result in some cases may vary. For instance, the Negro, whenever possible, carries his load or burden on his head instead of in his arms or across his shoulder.

Importance of the trade.—A close approximation of the laborers in the building trades of Richmond shows about 2,400. This includes the laborers in all the work mentioned above.

Conditions of employment.—Generally speaking, the work of the laborer is very healthful, as most of it is outside work. There is always the danger, however, of falling from ladders and walks on unfinished buildings and from lifting too much on heavy work. Laborers around saw and planing mills are also exposed to the dangers that always attend work about machinery.

There is nothing especially stimulative about the work of the laborer, but it can not be said that his mental development is stinted.

Economic conditions.—There is no regular wage for a laborer, but generally the wage is from $1.50 to $2 per day. In some classes of work the minimum may be lower and the maximum higher than the above rate. Hod carriers for brickmasons work from 44 to 48 hours per week, the regular working time being 8 to 8½ hours per day, and with a short Saturday of from 4 to 5½ hours; a plasterer's hod carrier generally works 54 hours per week, 10 per day, with a short Saturday of 4 hours; laborers in saw and planing mills work 55 to 60 hours per week, 10 hours per day, with, in some cases, a short Saturday of 5 hours.

The busy season for these laborers corresponds in general with that in building trades, extending from March to the end of September; the dull season is during the winter months; sawmill hands, however, generally have steady work through the year, with a reduction in the number of hours per week during the slack season.

The fluctuation in employment is considerable at times, for during the winter months, when outside work can not be done, the laborers are laid off unless they can be shifted to inside work. The laborers are not at the present time organized in Richmond, an organization of hod carriers formed at one time having gone out of existence.

Age of maximum productivity.—As a rule laborers are not employed under 18 years of age, because of the nature of the work, which requires more than any other quality fully matured physical strength. As the work is generally unskilled, but little time is occupied in learning the processes, although in the case of hod carriers some practical experience and instruction are necessary.

The age period of maximum productivity is indeterminate, depending in general on the individual. It is safe to assume, however, that it is relatively short, extending approximately from the ages of 25 to 40 or 45.

Demand for labor.—While there seems to be an abundant supply of laborers in all classes of work, it may be noted that the demand for laborers in brick and concrete work will probably be an increasing one in the future. The source of supply is generally the unskilled men who float from one job to another, working first for one contractor and next for another.

Educational and technical requirements.—Obviously the employments of the unskilled laborers in the building trades do not call for any special vocational training, if it be assumed that the workers are to remain permanently in the class of the unskilled. They, of course, should have received that degree of general education which is a common condition of good citizenship. To the extent that they are deficient in this respect it is true, also, that their efficiency as workmen is generally impaired. The obvious condition of any considerable increase in their efficiency as workers is, however, a course of training which will lead them into some class of relatively more skilled labor.

What the industry gives.—Because of the nature of the work there is no apprenticeship system, and whatever manipulative skill is necessary is soon acquired in practice. For these workers there is no regular line of promotion, although in some plants new workers are started on a minimum wage and are given an advance in wage as they become experienced, the maximum being, as has been noted, about $2 per day.

Deficiencies of workmen.—It seems the most common deficiency of the laborer is his desire to shift from one employer to another. In other words, the employer does not know from day to day how many laborers he may depend on, for they often quit without giving any notice. The excessive use of intoxicating liquors is reported as a common cause of irregularity and unreliability.

What the school ought to give.—As in the case of all workers, the building trades laborers need as a condition of practical well-being a good education. If possible, however, prevocational courses should be offered to them in order that some of those who would otherwise drift into unskilled work may choose some trade and be encouraged to follow it. Drift classes in general education would be of an advantage to these laborers and would undoubtedly increase their efficiency even in their unskilled occupation. Such courses might lead some to become interested in a higher grade of work and encourage them to fit themselves to undertake it.

FINDINGS ABOUT OCCUPATIONS IN THE BUILDING TRADES IN RICHMOND, VA.

[This chart is intended to summarize the statements and opinions of employers and employees in the trades in Richmond. The chart does not, therefore, necessarily represent the views of the Survey Committee, nor conditions and opinions of the trade elsewhere.]

ANALYSIS OUTLINE.	CARPENTER AND JOINER.	BRICKLAYER.	STONECUTTER.	STRUCTURAL-IRON WORKER.	CEMENT FINISHER.
1. Process	The carpenter-joiner puts in window frames, hangs sashes, doors, and blinds; does all kinds of inside woodwork on doorframes, jambs, trim, washboards, picture moldings, wainscotings, paneled ceilings, and mantels; builds staircases of simple construction and puts on all kinds of interior finish, both in hard and soft woods. The carpenter-framer builds frames for inclosing and holding concrete in place until hard. The carpenter-stair-builder builds the more difficult and ornamental staircases. A few men specialize in such lines of work as the laying of parquet floors and interior finishing of hard wood.	Laying brick as required in the construction of buildings, engine foundations, or for other purposes. In Richmond the bricklayer sets window sills and caps of cut stone. The more skilled work is required in building corners, window frames, arches, gables, pressed-brick fronts, and in ornamental work. In the construction of walls various sorts of bonds are used, the most common bond in Richmond being what is called locally the "four-inch bond"; English and Flemish bonds are used to some extent. In the characteristic processes of bricklaying skill is required in the use of the trowel, plumb line, and pin.	Hard-stone workers first line up the stone by cutting lines on face to work by in squaring up, straightening, and getting out the winds. The sequent processes are pointing or roughing off with peen hammer or pointing-machine tools, and smoothing up with hand or machine bush. After bushing, if it is to be polished, the stone is placed on the grinding mill and ground with chilled shot and rubbed down with putty and water. Soft stone is worked up to shape by machine tools entirely, the processes consisting of sawing, planing, slotting, shaping, and jointing. In block cutting for paving the stone is drilled and traced, broken to lines, and joints dressed off.	The work of the structural-iron worker consists of the laying out and cutting to proper length of angle iron, channel iron, and "I-beams" used in the construction of buildings, bridges, and viaducts; the erecting and fastening the same together by the use of bolts, rivets, and plates; the laying out and assembling of grills and other ornamental ironwork, the assembling and erecting of fire escapes, vaults for banks, advertising signs, smokestacks, ventilators, and all iron and steel construction work used in the building trades.	In sidewalk, pavement, and coping construction the "finisher" lays out the work, watches the subgrade work and the composition of the concrete mixture, strikes off the surface of the concrete with a straightedge, and floats and trowels the same; in building and other similar construction the finisher supervises the mixing of the concrete, sees that the forms are properly set, and in general acts as a foreman.
2. Product or specialties	Buildings and other structures of wood.	Buildings and other structures of brick.	Dressed stone, both hard and soft, for buildings and monuments; blocks cut for paving.	Construction and erection of ornamental and structural-iron work.	Concrete structures, pavements, sidewalks, and copings.
3. Importance of trade (number employed).	Approximately 600 in the building trades.	Approximately 300.	Approximately 70.	Approximately 20.	Approximately 50.
4. Conditions of employment: (a) That involve physical or nervous strain.	None.	None.	The constant noise of the machines causes nervousness.	Noise made when riveting causes a nervous strain on some workers.	In some finishing the worker is required to work in a stooping position, which induces considerable strain.
(b) That stimulate intelligence and interest.	Variety in high-class work.	Variety in high-grade work.	Variety in best class of work, especially monument work.	All high-class work is stimulative.	The better grades of work require skill and intelligence.
(c) That narrow or restrict mental development.	Unvaried rough work.	None.	Specialization in low-grade work, such as roughing.	None, if there is any variety of work.	None.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Danger of accident is considerable in some lines of work, from imperfect scaffolding.	Some danger of accident from imperfect scaffolding.	Inhaling the dust that arises, especially from the compressed-air machines, is injurious.	Liability to accident is considerable.	Practically none.
5. Wages: Apprentices— (a) Beginning wage	$4 to $5 per week.	$4 per week.	$3 first six months; $4.50 second six months.	No apprenticeship system.	$9 to $12 per week.
(b) Second-year wage	$5 to $6 per week.	$5 per week.	Increase from $4.50 per week to $12 per week, according to boy's ability.	No apprenticeship system.	$12 to $18 per week.
(c) Third-year wage	$6 to $7 per week.	$6 per week.			
(d) Fourth-year wage	$7 to $8 per week.	$7 per week; usually 50-cent increase every six months.			
Journeymen— (e) Minimum wage	$15 per week.	$29.25 per week.	$18 per week.	22½ cents per hour.	$21 per week.
(f) Maximum wage	$21 per week.	$31.20 per week.	$21 per week.	35 cents per hour.	$30 per week.
(g) Union scale	$18 per week.	$30.80 per week.	$3.60 per day.	Not reported.	No union.
6. Hours of labor (regular, per day; per week; on Saturday).	8½ to 9 hours per day; 48 to 54 hours per week; 5½ to 6 hours on Saturday.	8 to 9 hours per day; 44 to 48 hours per week; 4 to 5 hours on Saturday.	8 hours per day; 44 hours per week; 4 hours on Saturday.	10 hours per day; 55 hours per week; 5 hours on Saturday.	9 hours per day; 54 hours per week; 9, and, in some few cases, 8 hours on Saturday.
7. Seasonal activity: (a) Busy season	March to December, inclusive.	March to November, inclusive.	March to October, inclusive.	April to August.	Mar. 15 to Nov. 15.
(b) Slack season	January and February.	December to February, inclusive.	November to February, inclusive.	Winter months.	Nov. 15 to Mar. 15.
(c) Fluctuation in employment	Regulated somewhat by building activities, but men work on the average about 10 months in the year.	Other than the usual seasonal fluctuation depends upon building activities.	City contracts during dull season prevent any considerable fluctuation.	Considerable.	Very considerable.
8. Extent to which trade is organized.	About one-half.	Completely.	About three-fourths.	About four-fifths.	Not organized.
9. Entrance age	16 to 18 years.	17 to 18 years.	17 years.	18 years.	18 to 20 years.
10. Years required to learn trade	4 years.	4 years.	3 years.	No apprenticeship.	2 to 3 years.
11. Age of maximum productivity.	25 to 55 years of age.	25 to 55 years of age.	20 to 55 years of age.	30 to 45 years of age.	Not reported.
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	Supply of medium-grade workers is sufficient.	Supply reported adequate.	Yes; at present.	No; send to other cities at times for workers.	The supply of efficient skilled finishers does not meet the demand.
13. Is demand for labor increasing or decreasing?	Increasing for efficient, skilled workmen.	Stationary.	Not increasing in building; decreasing in the block-cutting industry.	Increasing.	Increasing for efficient finishers.
14. What is the source of supply?	Apprentices, recruited from the lower grades of the grammar schools and casual laborers.	Apprentices, recruited from the lower grades of the grammar schools.	Apprentices, recruited from the lower grades of the grammar schools.	Helpers in the trade and journeymen in metal trades.	Unskilled labor.

ANALYSIS OUTLINE.	SHEET-METAL WORKER AND TINSMITH.	PLUMBER.	STEAM FITTER.	INSIDE WIREMAN.	PLASTERER.
1. Process	The tinner's work consists of the laying out, forming, and assembling of tin or other sheet-metal utensils; the making of waterspouts and erecting the same; the roofing of buildings; the attaching of metal to ceilings and side walls, and furring and sheathing ceilings and walls; the making of cornices, awnings, hollow circular moldings, and metal sash, frames, and skylights, and the covering of fire doors and windows.	The work of the plumber consists of laying lines of pipes for water, gas, and sewer systems from the street main to and beyond the line of house; the installing in buildings and residences of plumbing fixtures and their appurtenances, such as filters, meters, tanks, bathtubs, showers, washbasins, sinks, water-closets and urinals, and all connections for toilets; fixtures and pipes for gas, sewerage, and drainage purposes. The pipe metal most commonly used in Richmond is lead, which necessitates a high degree of manipulative skill in wiping joints.	The work of the steam fitter consists of installing steam and hot-water heating, and refrigerating plants of every description. This work involves the cutting of pipes to length and the threading of ends, making connections and running lines of pipe, making connections for ice and refrigerating plants, installing power pumps and making all necessary connections.	The preparing for and putting up of electric wires for all purposes within buildings, and the installation of electric appliances and fixtures for which the wires must be run; this includes such work as wiring for lighting, heating, power, telephone, bell, and signal installations. In Richmond the inside wireman does the work which in some other communities is done by the fixture fitter; he also does some outside wiring and repairing.	Plastering of walls, ceilings, and other surfaces, by the use of the trowel, hawk, and other tools; the plasterer also does ornamental work such as cornices and moldings, with stucco, cement, and other materials. "Three-coat work" is generally done upon flat surfaces; the first coat, consisting of plaster containing hair, is well scratched and roughly smoothed; the second coat, which is like the first, except that it contains no hair, is put on and floated; the third, or finish coat, consisting of lime and plaster of Paris, is put on very thin and the surface smoothly finished.
2. Product or specialties	Tin and sheet-metal work in the building trades.	Complete pipe systems for sewerage, water, and gas.	Complete pipe systems for heating, refrigerating, and power plants.	Installations of electric wires in buildings.	Plain and ornamental plastering.
3. Importance of trade (number employed).	About 140 journeymen and apprentices.	Approximately 70.	Approximately 100.	Approximately 260.	Approximately 215 journeymen and 15 apprentices.
4. Conditions of employment: (a) That involve physical or nervous strain.	None.	Practically none.	Work is generally heavy and laborious, but does not necessarily cause physical strain.	In general none, though work with high-tension currents may induce nervous strain.	None.
(b) That stimulate intelligence and interest.	Variety in high-grade work.	All plumbing requires judgment and skill.	Practically all operations require judgment and skill.	Practically all work is stimulative.	Variety in high-class work.
(c) That narrow or restrict mental development.	None.	None.	None.	None.	None.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Liability to accident in some lines of work.	Possibility of contracting disease from germs in waste matter and from gases that arise from sewerage, especially on repair work.	Liability to burns and scalds from accident and danger of contracting pneumonia from exposure after becoming overheated.	Danger from working with "live" wires.	None.
5. Wages: Apprentices— (a) Beginning wage	$3 per week.	$4 per week.	$4 per week.	$5 per week.	$3 to $4 per week.
(b) Second-year wage	$4 to $5 per week.	No set wage for this period; depends on the ability of the apprentice.	No fixed wage; depends entirely on the ability of the apprentice.	$7.50 per week.	$4 to $5 per week.
(c) Third-year wage	$5 to $7 per week.				$5 to $6 per week.
(d) Fourth-year wage	$6 to $9 per week.				$6 to $7 per week.
Journeymen— (e) Minimum wage	$20.10 per week.	$3.25 per day.	$13.44 per week.	$16 per week.	$18 per week.
(f) Maximum wage	$21 per week.	$4 per day.	$24 per week.	$22 per week.	$24 per week.
(g) Union scale	No union.	$4 per day.	$24 per week.	$21 per week.	No union.
6. Hours of labor (regular, per day; per week; on Saturday).	8 to 8½ hours per day; 48 hours per week; 5½ to 8 hours on Saturday.	8 hours per day; 48 hours per week; 8 hours on Saturday.	9 to 10 hours per day (nonunion); 8 hours per day (union); 54 to 55 hours per week (nonunion); 48 hours per week (union); 5 to 9 hours on Saturday (nonunion); 8 hours on Saturday (union).	8½ hours per day; 48 hours per week; 5½ hours on Saturday.	9½ hours per day; 54 hours per week; 6½ hours on Saturday.
7. Seasonal activity: (a) Busy season	March to December, inclusive.	March to August, inclusive.	March to August, inclusive.	Aug. 15 to Dec. 15.	March to November, inclusive.
(b) Slack season	January and February.	September to February, inclusive.	September to February, inclusive.	Dec. 15 to Aug. 15.	December to February, inclusive.
(c) Fluctuation in employment	Inconsiderable.	Inconsiderable.	Inconsiderable.	Inconsiderable.	Fluctuation only as indicated in the busy and slack seasons.
8. Extent to which trade is organized.	Not organized.	About one-half.	About one-third.	Not over one-fourth.	Not organized.
9. Entrance age	16 to 17 years.	17 to 20 years.	16 to 19 years.	16 to 18 years.	16 to 18 years.
10. Years required to learn trade	4 years.	4 years.	4 years.	4 years.	3 to 4 years.
11. Age of maximum productivity.	21 to 65 years of age.	21 to 45 years of age.	21 to 45 years of age.	Not reported.	25 to 55 years of age.
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	Yes.	Yes.	Meets demand at present.	Yes; except licensed men.	Supply of ordinary plasterers is sufficient; of highly-skilled workers insufficient, owing to lack of a good apprenticeship system.
13. Is demand for labor increasing or decreasing?	About stationary.	About stationary.	Increasing.	Increasing, especially for conduit workers.	Stationary.
14. What is the source of supply?	Apprentices, recruited from grammar schools.	Apprentices, recruited from grammar schools.	Apprentices, recruited from the lower grades of the grammar schools.	Apprentices, recruited from the grammar schools.	Apprentices and learners, recruited from the lower grades of the grammar schools.

ANALYSIS OUTLINE.	WOODWORKER (BENCH AND MACHINE).	CABINETMAKER.	PAINTER.	PAPER HANGER.	LABORER.
1. Process	Operating band and circular saws, jointers, planers, lathes, machines for making moldings, tenons, and mortises, and for sandpapering. Logs are cut into timbers and boards and seasoned and worked into sash, doors, blinds, frames, stairs, and columns; timber is sensawed, if necessary, sawed on band saw, planed to proper thickness on planer, cut to size on circular saw, edges trued on jointer, mortises and tenons cut by machine, and work smoothed on sandpapering machine; turned work, such as columns and rails, is turned on lathe; grill and scroll work is done on jig-saw and saw table; parts are glued and assembled by bench hands.	Constructing furniture, bank, and office fixtures, cabinets, and similar work of a high grade. In larger establishments all material is cut to approximate size by machine hands and given to the cabinetmaker, who makes all joints and parts according to plans furnished. The cabinetmaker uses bench tools, such as planes, chisels, saws, hammers, and spokeshaves; the shaped parts are glued, assembled, sandpapered, and scraped, and the work is finished by staining, filling, and applying several coats of varnish. In large establishments finishing is a separate occupation.	Smoothing and cleaning new surfaces with sandpaper and duster; removing old finishes by burning and scraping, or with paint or varnish solvents. Where the surface is to be painted, a priming coat is laid on, all imperfections in the surface filled with putty, and the final coats applied, each being rubbed down; where the surface is to be stained and varnished the stain is applied, the pores of the wood filled, and the several coats of varnish flowed on and rubbed down. Other processes performed by the painter are graining, lettering, stenciling, gold lettering on glass, and kalsomining.	First the old paper is removed, the wall scraped, cracks and depressions filled and smoothed up with a mixture of plaster of Paris, and all angles pointed up; then the face is sized by giving it a coat of thin liquid glue; the blank margin of the paper is cut off, either by a machine or with a knife and straightedge, and the paper cut to the proper length; the paper is now laid on a table and pasted and folded; after it has "soaked" sufficiently it is placed in position and pressed down smooth with a dry brush.	Laborers in the building trades are constantly shifting as helpers from one occupation to another. They are employed carrying brick and mortar to the bricklayer, or plaster to the plasterer; mixing concrete by hand or machine, and carrying concrete from mixer to workers; handling heavy timbers and logs in sawmills and woodworking plants; lifting and moving stone in quarries or buildings; helping the carpenter on heavy work and in work requiring no skill; carrying ladders and paints for painters, and rigging up scaffolds; helping structural-iron workers handle beams, channel iron, and all heavy work.
2. Product or specialties	Stock sawed, planed, turned, smoothed, and assembled for buildings.	Hardwood, bank, office, and store fixtures, and cabinets and furniture for dwellings.	Inside and outside painting and decorating; sign, wagon, carriage, automobile, coach, implement, and furniture painting.	Hanging paper or other fabrics used for covering walls.	Unskilled heavy work in all branches of building trades.
3. Importance of trade (number employed).	Approximately 300.	Approximately 64.	Approximately 600.	Approximately 70.	About 2,400, mostly colored men.
4. Conditions of employment: (a) That involve physical or nervous strain.	Necessity for lifting and handling logs and heavy pieces of timber.	None.	Close, long-continued application to fine work, such as coach painting, lettering, and interior decorating.	None.	Some work in sawmills, quarries, and on buildings requires much heavy lifting which may cause strain.
(b) That stimulate intelligence and interest.	The making of moldings and high-grade millwork.	All high-grade work requires skill and is stimulative.	Decorating, sign painting, lettering, and finishing.	Variety in high-class work.	Little, if anything.
(c) That narrow or restrict mental development.	Constant application to one kind of rough work.	None.	Rough outside work or constant exterior painting.	Continuous employment at low-grade work.	None of the work requires skill.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Practically all woodworking machines are very dangerous, owing to the speed at which they are run; the dust from planes and saws is injurious.	None.	Danger from imperfect scaffold rigging; danger of lead poisoning from uncleanly habits and methods of dry sandpapering; danger from use in poorly ventilated spaces of some quick-drying flat-finish paints containing benzine and turpentine. Use of varnishes and shellac containing wood alcohol may cause blindness and even death.	Danger from imperfect scaffolds and of poisoning from colored paper.	Danger of accident in the work, which is heavy and often more or less hazardous.
5. Wages: Apprentices— (a) Beginning wage	$3 to $6 per week; $6 to $7.25 per week.	$3 to $6 per week; $6 to $7.25 per week.	$3 to $4 per week.	$4 per week.	No apprenticeship.
(b) Second-year wage	Increased as ability increases; no regular scale.	Increased as ability increases; no regular scale.	$5 per week.	$5 per week.	
(c) Third-year wage			$6 to $7 per week.	$6 per week.	
(d) Fourth-year wage			$7 to $9 per week.	$7 per week.	
Journeymen— (e) Minimum wage	$12.60 per week.	$10 per week.	$1.50 per day.	$18 per week.	16⅔ cents per hour.
(f) Maximum wage	$20.62 per week.	$18.20 per week.	$3 to $5 per day.	$27 per week.	25 cents per hour.
(g) Union scale	No union.		$3 per day.	$3.50 per day.	No union.
6. Hours of labor (regular, per day; per week; on Saturday).	9½ to 10 hours per day; 54 to 55 hours per week; 5 to 6½ hours on Saturday.	9½ to 10 hours per day; 54 to 55 hours per week; 5 to 6½ hours on Saturday.	8 to 9 hours per day; 48 to 54 hours per week; 8 to 9 hours on Saturday.	8 hours per day; 48 hours per week; 8 hours on Saturday.	8 to 10 hours per day; 44 to 60 hours per week; 4 to 10 hours on Saturday.
7. Seasonal activity: (a) Busy season	Millwork, April to October; furniture, January to October.	January to October.	March to December, inclusive.	May to October, inclusive.	In general, March to October.
(b) Slack season	Millwork, January to April; furniture, October to January.	October to January.	January and February.	November to April, inclusive.	The winter months.
(c) Fluctuation in employment	Very little fluctuation in furniture work; the mills work shorter hours in the dull season.	Very little.	Regulated somewhat by building activities, but men work on the average about 10 months in the year.	Inconsiderable.	Fluctuation in employment among laborers is very great from busy to slack season.
8. Extent to which trade is organized.	Not organized.	Not organized as cabinetmakers; belong to carpenters' and joiners' union.	About one-tenth.	About three-fifths.	Not organized.
9. Entrance age	16 to 18 years.	16 years.	16 to 18 years.	16 to 18 years.	18 to 30 years.
10. Years required to learn trade	4 years.	4 years.	4 years.	4 years.	Not skilled work; very little time required.
11. Age of maximum productivity.	30 to 45 years of age.	30 to 45 years of age.	22 to 55 years of age.	21 to 55 years of age.	Indeterminate.
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	Yes.	Yes.	Supply adequate for present demand for medium-grade workers, but the supply of high-class workmen is not sufficient to meet the demand.	Yes; except during the busy season.	Yes.
13. Is demand for labor increasing or decreasing?	Increasing.	Increasing.	Increasing, especially for efficient, skilled workers.	Increasing.	Increasing.
14. What is the source of supply?	Apprentices, recruited from grammar schools and unskilled laborers.	Apprentices, recruited from grammar schools.	Apprentices, recruited from the lower grades of the grammar schools and casual laborers.	Apprentices, recruited from the lower grades of the grammar schools and casual laborers.	Floaters and unskilled help.

FINDINGS ABOUT EDUCATION FOR OCCUPATIONS IN THE BUILDING TRADES IN RICHMOND, VA.

15. What does worker need to equip him properly for the trade? (a) General education	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.
(b) Trade and technical education.	Instruction in modern methods and in proper use of tools; in free-hand, mechanical, and architectural drawing and blue-print reading, and in mathematics of the trade.	Instruction as to different methods of bonding; the construction of arches, gables, cornices, and ornamental work; architectural drawing and blue-print reading, and shop mathematics.	Instruction in free-hand drawing, designing, and blue-print reading.	Instruction in mechanical and architectural drawing; mechanics; as to strength of materials and as to modern methods of steel construction in buildings, bridges, and other structures.	Instruction as to kinds and properties of cement, the materials used in the aggregate, such as sand and gravel; the various methods of finishing, of setting forms, and of reinforcing, and some knowledge of architectural drawing.
(c) Manipulative skill	Dexterity in handling a great variety of tools.	Skill in handling the trowel and other tools of the trade and in placing the bricks.	In the handling of stonecutting tools and machines.	Dexterity in laying out and erecting.	Dexterity in handling the straightedge, float, trowel, and other finishing tools.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Mental alertness; special adaptability; initiative; accuracy; patience; strength; endurance; keenness of sight.	Mental alertness; accuracy; patience; special adaptability; accuracy of eye.	Special adaptability, dexterity, patience, accuracy, and mental alertness.	Accuracy, carefulness, strength, and steadiness of head.	Dexterity, mental alertness, initiative, and accuracy.
16. What the industry gives: (a) Conditions of apprenticeship	Apprentices serve 3 years to become carpenters; 4 to become carpenter-joiners.	Apprenticeship period of 4 years.	Apprenticeship period of 3 years.	No apprenticeship system.	No regular apprenticeship; should learn the trade in 2 to 3 years.
(b) Provision made for systematic instruction of apprentices.	No provision.	No provision.	No provision.	No provision.	No provision.
(c) Trade and technical knowledge.	Knowledge of using tools, but practically none of the technical knowledge of the trade.	Very little beyond a knowledge of the common methods of laying brick.	The practical part of the trade so far as the work permits.	Very little.	Barely sufficient knowledge to make a profitably productive worker.
(d) Manipulative skill	Dexterity in handling tools.	All that is necessary to do the usual work properly.	In the handling of various tools.	All that is required.	The necessary manipulative skill.
(e) Extent to which trade can be learned in the shop.	Only the shop method of doing the work.	The manipulative skill needed in laying brick.	The special line of work being done.	The practical part, but very little of the technical.	Very limited, except the manipulative skill.
(f) Provision made in the shop for systematic instruction of journeymen.	No provision.	No provision.	No provision.	Very little.	No provision.
(g) Line of promotion	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Journeyman, foreman.	Helper, journeyman, foreman.
17. Common deficiencies of workers	Deficiency in general education, mathematics of the trade, drawing, and ability to read blue prints.	Deficiency in mathematics, ability to read architects' plans and specifications, and general education.	Deficiency in general education, designing, and drawing.	Deficiency in general and trade education, drawing, and mathematics of the trade.	Deficiency in general education and lack of an all-round knowledge of the trade.
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop	A complete grammar-school general education with 2 years' prevocational training.	A grammar-school general education and 2 years' prevocational training.	A complete grammar-school general education and prevocational training.	A complete grammar-school general education, and prevocational training.	A complete grammar-school general education and prevocational courses.
II. After entering the shop— (a) Trade and technical knowledge.	Specialized courses covering the trade and technical requirements of the carpenter.	Specialized courses covering the specific trade and technical requirements for bricklaying.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.
(b) Manipulative skill	Opportunity for acquiring skill in certain lines of work.	Opportunity for acquiring skill in certain lines of work.	Skill in free-hand drawing.	None.	None.
III. Nature of part-time courses needed.	Shop mathematics; blue-print reading; mechanical and architectural drawing; courses dealing with the qualities of woods; modern practice in building construction.	Mathematics of the trade, architectural drawing, blue-print reading of architects' plans and specifications; courses dealing with methods of bonding, ornamental work, and modern practice.	Mechanical and free-hand drawing; designing; hygiene of the trade; modern practice in working hard and soft stone.	Mechanics and steel construction; courses covering strength of materials and riveted joints; mechanical drawing.	Mechanical and architectural drawing and blue-print reading; courses covering estimating, the kinds and properties of cement and of other materials, and the methods and theory of reinforcing.
IV. Nature of evening-school courses needed.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern construction and practice, for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.

15. What does worker need to equip him properly for the trade? (a) General education	An elementary school education.	An elementary school education.	An elementary school education.	Elementary and high-school education; courses in mathematics, physics, chemistry, and mechanical drawing.	An elementary school education.
(b) Trade and technical education.	Knowledge of the tools of the trade; mathematics of pattern drafting and cutting; free-hand, mechanical, and architectural drawing; a knowledge of architectural and geometrical forms.	Instruction in mechanical and architectural drawing, as to methods of making joints, installing systems in accordance with legal provisions and with the requirements of modern plumbing hygiene; modern trade practice.	Instruction in mechanical and architectural drawing, and in modern practice; a technical knowledge of the requirements of heating, refrigerating, and power-plant installations.	Instruction in the handling and splicing of insulated wires, the installation of conduits, the making of electrical connections, fixture wiring, the installation of electrical apparatus and the testing of circuits; knowledge of the electrical code and the methods of computing the sizes of wires, fuses, and connections required for specific electrical currents; some instruction in the theory of electricity, with emphasis on definition of terms and electrical measurements.	Drawing applied to the trade; practice in reading blue prints of architects' plans and specifications.
(c) Manipulative skill	Much of the work requires a high degree of manipulative skill.	In handling of tools and in wiping of joints.	In the handling of tools and equipment.	In handling tools, splicing wire, installing conduits, and in "fishing" wires.	Best methods of handling tools and doing work.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Artistic appreciation of architectural and geometrical forms, accuracy, initiative, and dexterity.	Strength, endurance, initiative, accuracy, and special adaptability.	Strength, endurance, accuracy, and special adaptability.	Initiative, accuracy, and dexterity.	Dexterity, and accuracy of eye.
16. What the industry gives: (a) Conditions of apprenticeship	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.
(b) Provision made for systematic instruction of apprentices.	No provision.	No provision.	No provision.	No provision.	No provision.
(c) Trade and technical knowledge.	A knowledge of common trade practice.	Practice in solving problems that arise in practical work.	Trade knowledge in special classes of work; very little of the technical part.	Sufficient to make the worker a profitable producer.	Practically none.
(d) Manipulative skill	Some skill in handling the tools of the trade.	In the handling of some tools.	In the handling of tools.	The necessary manipulative skill required.	All that is required to do the work.
(e) Extent to which trade can be learned in the shop.	The practical part of the trade.	The practical part, but very little of the technical.	The practical part only.	The manipulative skill, some trade knowledge, but very little technical knowledge.	Only the manipulative skill required in the actual application of the plaster.
(f) Provision made in the shop for systematic instruction of journeymen.	No provision.	No provision.	No provision.	No provision.	No provision.
(g) Line of promotion	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.
17. Common deficiencies of workers	Deficiency in general education and free-hand and mechanical drawing.	Deficiency in general education.	Deficiency in general education.	Deficiency in technical knowledge.	Deficiency in general education, and inability to read drawings and specifications.
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop	A complete grammar-school general education and prevocational training.	A complete grammar-school general education and prevocational training.	A complete grammar-school general education and prevocational training.	A complete grammar-school education; high-school or prevocational courses in mathematics, physics, chemistry, and mechanical drawing.	A complete grammar-school general education and 2 years' prevocational training.
II. After entering the shop— (a) Trade and technical knowledge.	Specialized courses covering the trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.
(b) Manipulative skill	Opportunity for acquiring skill in the construction of certain conventional forms.	None.	None.	Manipulative skill in some special lines, such as switchboard and apparatus work.	None.
III. Nature of part-time courses needed.	Free-hand, mechanical, and architectural drawing; pattern designing, drafting and cutting; shop mathematics.	Blue-print reading of architects' plans and specifications; sanitation; courses covering legal provisions under which work is done.	Blue-print reading of architectural drawings and specifications; courses covering the technical knowledge required for installation of heating, refrigerating, and power plants.	Theory and practice of electrical wiring; mathematics; physics; chemistry; mechanical drawing; blue-print reading of architects' drawings and specifications.	Blue-print reading of architects' drawings and specifications; courses covering estimating, composition of materials, and modern practice.
IV. Nature of evening-school courses needed.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern methods, for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.

15. What does worker need to equip him properly for the trade? (a) General education	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.	Some elementary education.
(b) Trade and technical education.	Knowledge of trees and woods; of the process of seasoning; of the causes of warping; of the theory and operation of woodworking machinery; of drawing and of shop mathematics.	Knowledge of woods and finishes; ability to work from drawings and sketches; instruction in modern practice, and in cabinet and furniture designing; mechanical and architectural drawing.	Instruction as to proper rigging of scaffolds; how to keep brushes clean; proper method of spreading colors; neatness in application of colors, especially in inside decorating and lettering; color harmony and design; chemistry of colors and color mixing; mechanical and architectural drawing; sketching; estimating; hygiene of the trade.	Knowledge of the proper tools and methods used to do the work; of color harmony and design; of methods of estimating; mechanical and architectural drawing; hygiene of the trade.	Practically none.
(c) Manipulative skill	In handling of tools and in the operation of various machines.	All fine work requires a high degree of manipulative skill.	Dexterity in handling brushes in fine decorating and lettering.	Manipulative skill is required in handling the tools and in hanging the paper.	Enough to do heavy work with the least amount of strain.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Accuracy, and extreme carefulness in machine work.	Accuracy, patience, initiative, and artistic sense.	Artistic sense in decorative work; accurate color sense in matching colors; special adaptability; initiative; accuracy; patience; endurance; keenness of sight.	Color and artistic sense; special adaptability; keenness of sight; dexterity; accuracy.	Strength.
16. What the industry gives: (a) Conditions of apprenticeship	Apprenticeship period of 4 years generally; none for some employments.	Apprenticeship period of 4 years generally.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	None.
(b) Provision made for systematic instruction of apprentices.	Practically none.	Practically none.	No provision.	No provision.	No provision.
(c) Trade and technical knowledge.	Very little.	Very little.	Only enough trade knowledge to equip worker for immediate productivity.	Only that practical trade knowledge required to make the labor productive.	None required.
(d) Manipulative skill	In operating machines and in using tools; where shops are highly specialized the training is limited to one or two machines.	Dexterity in use of tools and in making and assembling cabinetwork.	Dexterity in handling brush.	Dexterity in the simple processes of the occupation.	The little skill needed.
(e) Extent to which trade can be learned in the shop.	Practical part but little of technical part.	Practical part; very little of the technical.	The trade knowledge required to make the labor productive, but very little of the technical knowledge of the hygiene of the occupation.	The necessary trade knowledge, but very little of the technical knowledge for artistic work.	Fully.
(f) Provision made in the shop for systematic instruction of journeymen.	No provision.	No provision.	No provision.	No provision.	No provision.
(g) Line of promotion	Apprentice, journeyman; in some semiskilled occupations from laborers or helpers to certain lines of work.	Apprentice, journeyman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	No regular line.
17. Common deficiencies of workers	Deficiency in general education and in all-round knowledge of the trade.	Deficiency in general education and in all-round knowledge of the trade.	Deficiency in general education, technical knowledge, and knowledge of hygiene of the trade.	Deficiency in general education, in knowledge of color harmony and design.	Not steady workers.
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop	Complete grammar-school education and prevocational work in woodworking.	Complete grammar-school general education and prevocational work in woodworking.	Complete grammar-school education, prevocational courses in free-hand drawing, color harmony and design.	Complete grammar-school general education and prevocational courses.	Some elementary education.
II. After entering the shop— (a) Trade and technical knowledge.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering the specific trade and technical requirements of the occupation.	Specialized courses covering specific trade and technical requirements of painting.	Theory and history of the trade; specialized courses covering the specific trade and technical requirements of the occupation.	Some little knowledge of materials used.
(b) Manipulative skill	Manipulative skill in the use of certain tools and machines.	Very little, if any.	Opportunity for acquiring manipulative skill in special work, such as lettering.	None.	None.
III. Nature of part-time courses needed.	Mechanical drawing; shop mathematics; courses dealing with modern practice in millwork.	Mechanical drawing; sketching and blue-print reading; shop mathematics; modern methods.	Hygiene of the trade; chemistry of trade; color harmony; design; reading of blue prints; mechanical, architectural and free-hand drawing; estimating.	Color harmony; design; estimating; hygiene of the trade.	General education.
IV. Nature of evening-school courses needed.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III.	Same as III.

APPENDIX D.—ANALYSIS OF OCCUPATIONS IN THE METAL TRADES IN RICHMOND.

SUMMARY OF THE INDUSTRIAL SURVEY OF THE METAL TRADES.

SCOPE OF THE INQUIRY.

The inquiry as regards the metal trades embraced 17 establishments, employing at the date of the inquiry 4,924 workers, exclusive of office help, or approximately 95 per cent of the total number of workers in these trades in the city of Richmond. The workers not covered by the survey are employed in small shops or in general manufacturing plants.

PRODUCT OR SPECIALTIES.

The principal products or specialties of these 17 metal trades establishments from which schedules were secured are as follows: Building of locomotives, repairing of locomotives and of passenger and freight cars; shot and shell for the United States Government; structural and ornamental ironwork; horse and mule shoes; bar iron; bolts; cookstoves, ranges, and heaters; cotton and tobacco machinery; steel plows; electric motors and generators, and general repair work.

SIZE OF ESTABLISHMENTS.

In the following summary table these establishments are classified according to size, the classification being based, as regards each establishment, upon the maximum number reported employed at any time during the year previous to the inquiry. The total number of workers in this table—6,904—does not of course represent the number employed by these establishments at any one time, but indicates approximately their aggregate capacity when running with a full force.

TABLE 71.—ESTABLISHMENTS CLASSIFIED ACCORDING TO REPORTED MAXIMUM NUMBER EMPLOYED DURING THE YEAR PREVIOUS TO THE INQUIRY.

Maximum number employed.	Establishments reporting.	Employees.
50 or less	4	104
51 to 100	5	451
101 to 300	2	298
301 to 500	2	811
501 to 1,000	2	1,540
1,001 to 2,000	1	1,200
2,001 to 2,500	1	2,500
Total	17	6,904

FLUCTUATION OF EMPLOYMENT.

The fluctuation of employment during the year previous to the date of the inquiry is shown in the following table, the general character of each establishment being briefly indicated.

TABLE 72.—NUMBER OF EMPLOYEES REPORTED BY 17 METAL TRADES ESTABLISHMENTS IN JUNE, 1914, AND MAXIMUM AND MINIMUM NUMBER EMPLOYED IN 1913, BY ESTABLISHMENTS.

Establishment No.	Character of establishment.	Number employed.			
		June, 1914.	Maximum during 1913.[1]	Minimum during 1913.[1]	Percentage the minimum is of the maximum.
1	General machine shop and foundry	27	35	25	71
2	Do	95	100	70	70
3	Electric machinery (motors and generators)	50	75	50	67
4	Bar iron, bolts, horse and mule shoes	200	400	200	50
5	Rolling mill, shot and shell, and horse and mule shoes	1,000	1,200	1,000	83
6	General machine shop	16	30	22	73
7	Steel plows	18	20	18	90
8	Structural and ornamental ironwork	148	148	75	51
9	Repairing locomotives and cars	411	411	394	96
10	Do	675	675	675	100
11	Cookstoves, ranges, and heaters	75	90	60	67
12	Repairing locomotives and cars	865	865	753	87
13	Cotton and tobacco machinery	60	85	55	65
14	Cookstoves, ranges, and heaters	125	150	110	73
15	Do	100	100	75	75
16	Structural and ornamental iron work	15	19	11	58
17	Locomotives	1,044	2,500	125	5
	Total	4,924			

[1] In the case of certain establishments the number reported as a maximum or a minimum is an estimate made by the reporting company.

The establishment which shows the most marked fluctuation is engaged in the building of locomotives, the minimum number employed by this establishment being only 5 per cent of the maximum. The corresponding percentage for the two establishments manufacturing structural and ornamental ironwork is 51 and 58, respectively, and for one establishment manufacturing refined bar iron, stay bolts, engine bolt iron, and horse and mule shoes, 50. The establishments showing least fluctuation in employment are the three car-repair shops and a steel plow manufacturing plant.

With reference to seasonal fluctuations of employment in the metal trades of Richmond, a great variety of conditions seems to prevail. In certain large metal trades establishments while there is from time to time considerable fluctuation in the number employed, this fluctuation is not really seasonal. For example, in the case noted above of an establishment building locomotives, in which the minimum number employed during the year was only one-twentieth of the maximum number employed, the fluctuation can not be regarded as seasonal, but rather as reflecting an abnormal condition in the industry. In the case of other concerns, however, the fluctuations are to a greater or less degree seasonal.

SUPPLY OF EFFICIENT JOURNEYMEN.

About one-half of the firms interviewed seem to experience no great difficulty in obtaining efficient journeymen. Those that do experience difficulty account for this shortage as due to the lack of any comprehensive apprenticeship system. In no case was the opinion expressed that the shortage in competent journeymen was due to conditions attributable either to the nature of the trade itself or to specific conditions under which the work is performed in Richmond establishments.

AGE OF MAXIMUM PRODUCTIVITY.

The lower age limit of the period of maximum productivity for workers in the metal trades of Richmond is almost uniformly given as 21 or 22; the upper limits specified on the survey schedules, however, vary from 45 to 65 years, according to specific occupations. Those that give the highest upper age limit are, for the most part, engaged in general machine-repair work. Employers are of the opinion that as a factor increasing output per hour in this line of work all-round experience is of far greater importance than manipulative facility in the performance of specific tasks. One of the employers expresses this opinion in the following words: "In our special line of work, even if a man is old his experience that he has had is a great asset. He may not be able to get around so fast, but he is so experienced that he makes every lick count."[1]

TIME REQUIRED TO REACH MAXIMUM WAGE-EARNING POWER.

Various estimates are given by informants as to how long it takes workers who have completed their apprenticeship to reach their maximum wage-earning power. As regards workers in machine shops, electric machinery works, and in establishments manufacturing plows and ornamental ironwork and structural steel, employers state the number of years necessary to be on the average between five and six. Two firms engaged in foundry and general machine work state it to be from three and one-half to four and one-half years.[2]

ESTIMATE OF DEMAND OF NEAR FUTURE.

Most of the firms interviewed seem to be of the opinion that in the near future a general expansion of business may be expected in the building of automobiles, in the manufacture of machine tools and instruments of precision, and in the building and repairing of steel cars. It seems probable from this common opinion that the demand for competent mechanics in the lines specified will be for some years to come an increasing one. Even under present conditions, the consensus of opinion among employers is that the supply of skilled labor in these branches of the industry is inadequate.[3]

---

[1] Six firms failed to give definite answers to the question "What is the age period of maximum productivity for workers?" expressing the opinion in each case that while the age limits of maximum productivity do depend largely upon the amount of physical and nervous exertion required by the specific occupation, they depend also upon the individual character of the workers.

[2] In detail the character of the firms answering the schedule inquiry "After how many years' experience as an apprentice and journeyman does a journeyman ordinarily earn his maximum wage?" is as follows: Of the three firms whose answers would seem to indicate that a period of from 7 to 10 years is required to reach maximum wage-earning power, two manufacture stoves and one is engaged in constructing and repairing freight and passenger cars. The six firms reporting that the time required is between 5 and 6 years include one machine shop; one plant manufacturing electric motors and generators; one, structural steel; one, plows; one, stoves; and one, locomotives. The firms reporting that workers reach their maximum wage-earning power in less than 5 years are engaged in general machine and foundry work and in the manufacture of tobacco and cotton machinery.

[3] In answer to the question "In what occupations is the demand for more workers likely to increase most rapidly during the next five years?" the following occupations are specified: Machine work, manufacturing of automobiles, molding and making of structural and ornamental steel, and boiler making. Increased demand is expected to arise from the general expansion and further development of the automatic-vehicle business and from the gradual extension of the use of structural-steel frames in building. The probable increase in the demand for boiler makers, according to the informants, will come as a result of the increased demand due to Government regulations for safeguarding of boilers, etc. Six firms failed to respond definitely to this question. One employer states, as a general proposition, the demand for "all-round machinists" will surely increase, as "our specialization has gone too far."

The specialties of the establishments whose representatives report that the supply of unskilled labor is growing less are general repair and foundry work, locomotive building, and the manufacture of stoves. The specialties of those establishments which report that the supply of unskilled labor is growing greater with reference to demand are foundry and blacksmith work and the manufacture of cotton and tobacco machinery.

As regards skilled labor, eight establishments report that skilled labor is, relatively to the demand for it, getting scarcer. Only one firm—engaged in the building of locomotives—takes the opposite point of view, maintaining that the supply of skilled labor is becoming greater with reference to demand for it. This is explained as due principally to the dull condition of business during the last couple of years. The following reasons are given by most of the informants as explaining the relative scarcity of skilled labor: Expansion of business, lack of desire on part of people to stick long enough to become skilled, lack of comprehensive systems for the training of apprentices, and the constant drafting of workers into new industries.

In the larger establishments which employ the majority of the men in the metal trades the regular line of promotion is from apprentice to journeyman, to working leader, assistant foreman, foreman, and inspector. In smaller establishments no well-defined line of promotion is recognized, but in these establishments the work is generally of a miscellaneous character and promotion takes the form of advancing men to more skilled work in proportion as they become proficient.[1]

The replies of the employers to the several schedule inquiries which called for a statement of opinion as regards the possibility of learning specific trades thoroughly in the shop are not entirely consistent. The explanation would seem to be that employers are disposed to emphasize the value of practical shop training, and when asked if a trade can be learned in the shop they frequently answer yes. In considering the requirements for all-round efficiency, however, they freely admit that the workers can not thoroughly learn any of the more skilled trades by the pick-up process. This inconsistency will be apparent in the following paragraphs considering the schedule returns in answer first to the simple inquiry, "What trades can a boy learn in your shop thoroughly?" and secondly to the inquiry, "Can untrained beginners be used?"

TRADES THAT CAN BE LEARNED IN THE SHOP.

According to the returns on the survey establishment schedules in answer to the first question noted above, the following trades can be learned thoroughly in the shop: Molding, blacksmithing, electric-motor construction, puddling, rolling, horseshoe making, pattern making, woodworking, carpentry, boiler making, tinning, pipe fitting, stove mounting, nickel plating, flask making, sheet-iron working, and the specific branches of the machinist's trade.[2] As regards these occupations it is generally true that a fair opportunity is given for the untrained beginner to acquire some practical experience. However, no systematic provision is made generally in the shops for instructing men in the trades specified beyond the practical needs of the shop, and in the case of some establishments apprentices are required to take industrial or other school courses at their own expense.[3] Aside from such requirements imposed upon apprentices, a beginner has to get his training in the daily performance of his duties, and, as is shown by their answers to the second question noted above, as to what trades can be learned by the so-called "pick-up" process, employers are agreed that there are comparatively few, if any, such trades. One concern, however, is positive

[1] The question "Are promotions frequently made in your establishment from one occupation to another?" is answered by seven firms in the negative and by three firms in the affirmative; three make no report; two answer "Only to foremanships"; one, "No, except apprentices"; one, "Machinists change machines frequently." Five firms report that there is no usual line of promotion for a journeyman; one that the line of promotion "varies"; two, that while there is no usual line, promotion is according to experience; five report that promotion is to foremanships; one firm failed to answer the question. Eight firms answer "Yes" to the question "Are individual workmen frequently shifted from one process, or machine, or occupation to another?"; four, "No"; two, "Occasionally"; two, "Only in some departments."

[2] According to the schedule replies, the number of metal trades establishments affording opportunity for learning the occupations noted in the text is as follows: Molding, 8 firms; blacksmithing, 7; electric-motor construction, 1; puddling, 1; rolling, 2; making horseshoes, 1; wood pattern making, 4; metal pattern making, 1; woodworking, 1; carpentry, 3; boiler making, 5; coppersmithing, 1; tinning, 1; pipe fitting, 1; car building, 1; stove mounting, 2; nickel plating, 3; flask making, 1; sheet-iron working, 2; the machinist's trade, 9.

[3] As regards the amount of instruction received in the shop, on 13 establishment schedules the answer is in the affirmative to the question "Does the worker receive any instruction or training in your establishment more than he can pick up on the job?"; on 2 schedules the answer is negative, and on 1 it is, "No, unless he is an apprentice." In answer to the question "Who gives it to him?" the reply is, in 12 cases, foremen; in 1 case, foremen and inspectors; in 1, superintendent; in 1, manager; and in 1, "trained workers." One shop reports that apprentices attend shop school 40 minutes each day. The informal character of the training may be inferred from the following typical characterizations: "Individual instruction necessary"; "Show him how to do things"; "Observation by helpers"; "Practical instruction."

that "all trades can be learned by contact" and a few employers state that in their opinion relatively unskilled trades, such as winding of motors, loading, sorting, and packing, can be learned in the shop.[1]

FOREIGN AND AMERICAN TRAINED WORKERS.

In the opinion of those interviewed, foreign-trained workers, on account of the thoroughness of their training, are superior to workers trained in this country. Aside from the lack of occupational training other deficiencies are specified as characteristic of the native workers, such as idleness and lack of education, lack of ambition, dislike for manual labor, and lack of willingness to start at the bottom. It should be noted, however, that in Richmond the proportion of foreign born and trained workers is relatively very small.

STEADY WORK FOR COMPETENT HELP.

A majority of the establishments report that they are generally able to retain their more competent and efficient workers throughout the entire year. This means that such workers are kept on the rolls of the establishments as regular employees, but does not mean that they are constantly employed throughout the year.

APPRENTICESHIP.

In the majority of the metal trades establishments no regular indenture system of apprenticeship exists. Of the 17 firms returning schedules only 3 report indentures by written agreement. Employers seem to be divided in their opinion as to whether or not the regularly indentured apprentice maintains with reference to his work a different attitude from that of the unindentured apprentice.[2]

In reply to the questions "What conditions especially stimulate the intelligence of the workers?" and "What conditions, if any, narrow and restrict the mental develop-

---

[1] Nine firms reply to the question, "What occupations in your shop can be learned in the shop with little or no instruction," that "nothing" can be learned that way in their shops. One firm says, "Only certain kinds of repetition work."

[2] Nine of the firms answered "None" to the question, "What are the terms of any agreement of apprenticeship under which apprentices are now working in your shop?" apparently meaning that they have no definite systems of apprenticeship in operation in their establishments. Three firms report that they have written agreements, and attach copies of same to their answers. Five firms report verbal agreements, under which, in one case, it is understood that the term of apprenticeship is to be four years; in another case that wages of pattern-making apprentices shall be raised every 75 days; and in another that apprentices shall be "worked and advanced according to a standard schedule."

None of the forms of written agreement with apprentices specify in detail what training is to be given. The agreements, or provisions for agreements, submitted by the three companies reporting written agreements, are as follows:

Company A: Apprentices are taken on the following terms: They serve at the trade agreed on until they are 21 years old, and are paid for the time actually worked, as follows: $4 per week for the first year; $5 per week for the second year; $6 per week for the third year; $7 per week thereafter until they are free. They must not be absent except from sickness, or other unavoidable cause, and must obey strictly all the company's shop rules. The company reserves the right to discharge at any time any apprentice whose deportment or progress in learning his trade is not satisfactory.

Company B: Apprentices shall serve the time of four years and will be paid in accordance with the company's schedule of rates for apprentices. Apprentices to be given every opportunity to learn the trade.

Company C: The time of machinist apprentices will be divided as follows: Three months in storehouse, handling and issuing material; 6 months in tool room, repairing and issuing tools; 18 months on bench work, including repairing air pumps, lubricators, and other bench work; 12 months on machines, to be given a show on all class machines in shops; 9 months divided between roundhouse work and erecting shop work. If after the expiration of 6 months any apprentice does not show proper interest in his work and is not progressing satisfactorily, he will be dismissed from the service, as we feel that there is absolutely no use in keeping apprentices in the service who do not take proper interest in their work. (Similar agreements are provided for paint-shop, car-department, blacksmith, boiler-maker, and tin-shop apprentices.)

ment of the workers?" it is almost uniformly insisted that variety is stimulative and that monotony is restrictive of mental development. One informant states that "recognition of ability and energy is stimulative." The following are some of the most frequently mentioned causes restricting mental development of workers: Confining worker to one job, employment at work involving constant repetition of the same operations, routine work, specialization, "too much watching."

CONDITIONS UNDER WHICH WORK IS PERFORMED.

While employers admit the possibility of conditions existing in their shops which might cause physical or nervous strain, they are inclined to the belief that no such conditions beyond those which necessarily pertain to the occupation are to be found in their own shops.

KIND OF SCHOOLING REQUIRED.

Employers are of the opinion that their workers are lacking in general education, especially in ability to understand, read, and write the language of the shop and to interpret correctly written and oral instructions given, and this fact more than any other, except deficiency in trade training, prevents workers from acquiring a high degree of efficiency. Instruction beyond the seventh grade is favored by almost all of the employers for almost all of the occupations to be found in their establishments. Shop mathematics, mechanical drawing, metallurgy, and chemistry are the systematic subjects most generally indicated as required in a large number of occupations. With reference to kind of schools to be established—night or part-time day schools—employers seem to be about equally divided in their opinion. Seven of them favor night schools and seven suggest part-time day schools. While the subjects suggested, in addition to those already mentioned, are of an industrial nature, the returns on the schedules do not go into detail as regards specific occupations, but use such general terms descriptive of the work to be given as "steps of the trade," "whys of the trade," and "theory of the trade."[1]

EMPLOYERS WILL COOPERATE IN ESTABLISHMENT OF PART-TIME SCHOOLS.

Five employers express a willingness to let apprentices attend such schools during the daytime. Five employers were unwilling to commit themselves at the time the schedules were filled out and prior to the formation of a definite scheme, and were also of the opinion that the extra training to be gotten should be at the expense of the employees exclusively. The number of hours suggested for such schooling ranges from 5 to 10 per week, but the majority of employers suggest from 6 to 8 hours per week.

EFFICIENCY TESTS AND RECORDS.

In very few instances are methods employed to determine the fitness of applicants, nor are any written records of efficiency of individual workers kept or any systematic tests applied for promotion.

EMPLOYERS WILL COOPERATE IN SYSTEMATIZING SHOP PRACTICE.

Without any qualification, out of the 17 employers, 14 express a willingness to assist the public school authorities in an effort to systematize shop practice in their establishments with a view to providing all-round training for apprentices and to develop greater efficiency in their journeymen.

[1] Eight firms reply in answer to the question, "What kind of school would most help workers in the various occupations during the apprenticeship period?" that they favor night schools, six that they favor part-time day schools. One firm replies that no school is required, "because if educated they will leave the work which is unskilled."

In the two tables following statistics are presented showing for the 4,924 workers employed in the 17 metal trades establishments covered by the survey: (1) The number of journeymen, apprentices or beginners, and semiskilled workers in each occupation; (2) the regular hours of labor per day; and (3) the regular hours of labor per week:

TABLE 73.—NUMBER OF JOURNEYMEN, APPRENTICES OR BEGINNERS, AND SEMISKILLED WORKERS IN 17 METAL TRADES ESTABLISHMENTS, BY OCCUPATIONS, JUNE, 1914.

Occupation.	Journeymen.	Apprentices or beginners.	Semiskilled helpers or laborers.	Total.
Blacksmiths	143	10	63	216
Boiler makers	469	42	66	577
Car repairers	226	17	8	251
Coach painters	40	5	19	64
Core makers	15	5	....	20
Draftsmen	10	1	....	11
Electricians	7	15	....	22
Stationary engineers	7	....	....	7
Erectors and mounters	17	10	69	96
Helpers	....	....	732	732
Machinists	1,011	95	59	1,165
Millworkers, wood	97	6	3	106
Motor testers	3	....	....	3
Molders	285	44	89	418
Pattern makers	44	6	....	50
Pipe fitters	50	2	9	61
Platers and polishers	23	8	....	31
Rollers, puddlers, or heaters	41	....	147	188
Upholsterers	6	1	....	7
Laborers	....	....	899	899
Total number	2,494	267	2,163	4,924
Per cent	50.6	5.4	43.9	100.0

TABLE 74.—REGULAR HOURS OF LABOR IN 17 METAL TRADES ESTABLISHMENTS.

Hours per day (except on Saturday).	Number of shops reporting specified number of hours.[1]	Employees.		Hours per week.	Number of shops reporting specified number of hours.[1]	Employees.	
		Number.	Per cent.			Number.	Per cent.
8 hours	1	175	3.6	48 hours	1	175	3.6
8½ hours	1	9	.2	50 hours	1	181	3.7
9 hours	11	[2] 2,490	50.6	51 hours	1	9	.2
9½ hours	2	191	3.9	53 hours	1	16	.3
10 hours	7	[3] 2,059	41.8	54 hours	10	[2] 2,341	47.5
				55 hours	4	1,013	20.6
				58¾ hours	1	95	1.9
				60 hours	2	[3] 921	18.7
				Not reported	1	173	3.5
Total	17	4,924	100.0	Total	17	4,924	100.0

[1] Three shops are included twice, 1 shop 3 times, different hours being reported for different groups of workers.

[2] As regards 675 workers in 1 establishment classified as working 9 hours, the statement is made that the regular-time wage is based on a 9-hour day, but that the shop has been running only 8 hours during the past 2½ years.

[3] In the case of 1 establishment the statement is made that although 10 hours is the standard working day, 8 hours is worked on all Government orders, and that rollers, heaters, and horseshoe iron workers, working by piece or task, finish a day's work in from 8½ to 9½ hours. This comment applies to 821 workers classified as working 10 hours.

ANALYSIS OF OCCUPATIONS IN DETAIL.

PUDDLING.

Process.—Puddling is the process of converting pig iron into wrought iron in a reverberatory furnace by oxidizing and burning out the carbon, silicon, phosphorus, manganese, and sulphur. The furnace is oblong in shape, being about twice as long as wide, built of brick, and well braced with iron rails or equally strong supports. The types of furnace differ, but the two principal divisions are single and double furnaces, the latter being by far more economical, as very little more fire is required for the double than for the single furnace. At one end is a grate, consisting of movable bars upon which a fire of soft coal is kept. At the other end is the stack. Between them is a pan or hearth in which the iron is melted. It is usually made oval, sometimes round, and about 8 inches deep. The roof is built about 2 feet high at the fire end, gradually sloping to the other end where it is about 1 foot high. By this means the hot gases and flames are deflected upon the metal in the pan causing it to melt. The bottom and sides of the hearth are lined with iron scrap and slag saved from around the mill, all of which is set by melting at a high temperature. At the sides are charging doors which may be swung open or sometimes lifted by suitable means. They are made of sheet iron having a small opening about 6 inches square at the bottom through which the charge is worked.

In Richmond iron is made by the boiling process instead of by puddling. The only difference between the two is that in puddling the furnace is tapped for slag, while in boiling no slag is drawn off at all; otherwise the process is exactly the same. In the boiling process pig iron is used, but cast iron in the shape of broken car wheels and other masses of cast iron makes up part of the charge. Eleven hundred pounds of iron constitute a charge. A "puller in and beater up," who is the puddler's helper, takes care of the iron, pulling it and beating it up to prevent the pieces from sticking to the bottom and to crumble up the pieces so that they will melt more easily. From 20 to 30 minutes are required to melt the charge. When in a molten condition it is "scaled up," which consists of shoveling scale or slag into the furnace to make the charge work more easily. The iron is then "worked to a boil" at which time the puddler takes the work himself. Boiling then takes place until the cinder is boiled off. During this period the metal swells up to about four times its original height, some of the impurities escaping as a gas and burning. Especially is the escape of carbon noticeable as it mixes with oxygen forming carbon monoxide which burns with a blue flame. As the cinder burns off the iron begins "to make." It is pulled and worked until it "comes to nature," at which time the iron should be balled up. Out of the charge seven balls are made, which are taken from the furnace and carried to the squeezer one at a time. At this stage either a steam hammer or the squeezer may be used, but the squeezer is preferable for puddled iron as it is liable to crumble under the hammer. The scrap furnace charge can better be handled under the hammer.

Puddler's helper: The assistant to the puddler is called a puddler's helper. His work consists of keeping up the fire, assisting in lining and charging the furnace, and taking care of the metal until it begins to boil—always under the direction of the puddler. Sometimes two puddlers work "level handed," dividing the duties and the pay equally between them.

Busheler: The duties of a busheler are like those of a puddler, with the exception that scrap wrought iron, and steel and cast-iron turnings make up the charge. This is never melted (except the cast iron), but worked to a plastic state, in which condition it is carried to the squeezer.

Buggy runner: After the balls have been made up by the puddlers or bushelers they are taken by the buggy runners to the squeezers. The buggy consists of an iron basketlike affair with a long handle suspended from an overhead track, so that the ball may be carried quickly to the squeezer.

Squeezer man: The man whose duty it is to tend the squeezer is called a squeezer man. He puts the balls in when received, working them through with a bar when necessary. This operation squeezes the liquid slag out of the ball and rolls it into shape, called a bloom, so that it can be handled in the rolls.

The squeezer is a heavy machine consisting of a vertical shaft having a large cylinder with a corrugated face revolving in a casing, having the same kind of a face, set eccentrically so that the space gradually decreases from the starting place to the place of leaving.

Bloom runner: When the iron leaves the squeezer it is called a bloom. The man who handles it now is called a bloom runner. His work is to catch the bloom in a long pair of tongs suspended from an overhead trolley, carry it to the muck rolls, and start it through the first groove.

Product or specialties.—The product of the puddler is pure iron or muck iron in the plastic state.

Importance of the trade.—There are about 80 puddlers, puddlers' helpers, and scrap heaters in Richmond.

Conditions of employment.—For the workers who must rabble the charge there is much strain caused by the heavy work in the intense heat. There is also much danger of getting burned from constant working of hot iron. There is considerable work about the furnace requiring close observation of the chemical changes taking place which should stimulate the intelligence, but for the reason that the work is exhausting and unvarying in its character it tends to narrow and restrict the mental development.

Economic conditions.—The workers employed in this trade work by heats, and their wages range from a maximum of $18 to a minimum of $10.50 per week. The workers in this trade are unorganized. There is no regular busy or slack season, the fluctuation in employment being small and irregular.

Age of maximum productivity.—Beginners in this trade enter between the ages of 16 and 25, requiring about two years to learn the trade. The age period of maximum productivity for these workers is between the ages of 25 and 55.

Demand for labor.—The demand for workmen in this trade is at present stationary and the present supply is adequate to meet the demand. These workers in Richmond are recruited from casual labor and to a considerable extent from other sections of the country.

Educational and technical requirements.—The puddler should have an elementary-school education. He should have instruction in mechanical drawing and in the construction, lining, and charging of furnaces, the processes of boiling, metallurgy and chemistry of the trade, and theory of iron making. He requires manipulative skill in working the boiling metal into a plastic ball and in handling the ball. This also requires strength and endurance.

What the industry gives.—There is no apprenticeship in this trade, the beginners entering as scrap heaters or puddler's helpers, and working at this until they acquire sufficient knowledge to do the work of the puddler. They acquire in this manner all the knowledge which is necessary for the practice of the trade.

Deficiencies of workmen.—The workers in this trade are deficient in general education, metallurgy, mechanical drawing, mathematics, and history and theory of iron making.

What the school ought to give.—Puddlers should have a complete grammar-school education and prevocational courses in metal working, and after entering the trade, they should take courses in metallurgy, mechanical drawing, mathematics of the trade, and history and theory of iron making.

HEATING.

Process.—The work of the heater consists of heating muck bars of iron for rolling. Muck bar iron is seldom used for industrial purposes until it has been refined. In this process the muck bar is cut into lengths, which are bound with iron wire, together with pieces of scrap iron, to secure the proper weight. These bundles are placed in a furnace on a bed of sand and carefully heated to the required temperature for rolling.

Heater's helpers.—There are usually two helpers to a heater, known as first and second helpers. Their work consists of helping the heater by making fires, charging and drawing the iron and carrying it to the rolls.

The requirements are nearly the same as the heater's, but as much skill is not required. The helper becomes familiar with the heating, and he is the next man to take a heater's job.

Cobblers.—Occasionally the work will get cold on the heaters, and pieces will break from the bloom. The man who takes care of these and returns them for reworking is called a cobbler.

Product or specialties.—The heated muck bar iron for rolling in the process of refining.

Importance of the trade.—There are about 17 workers, including heaters and helpers.

Conditions of employment.—This work imposes a considerable physical and nervous strain, because the work is heavy and is performed in an extreme heat. There is also danger from accidents and burns in the handling of hot iron. There is very little work in this trade to stimulate the intelligence and interest; in fact, it is more apt to narrow and restrict the mental development, because of the exhausting routine of hard labor while exposed to intense heat.

Economic conditions.—The workers in this trade do not work by the hour, but by heats, the day's work being done when the heat is finished. Journeymen's wages range from a maximum of $32 to a minimum of $12 per week. The workers in this trade are unorganized. There is no regular busy or slack season in this trade, and the fluctuation in employment is small and irregular.

Age of maximum productivity.—The heaters usually enter this trade between the ages of 16 and 25, and require from two to three years to learn the trade. The period of maximum productivity for these workers usually covers the years between the ages of 25 and 55.

Demand for labor.—The supply of labor is adequate to meet the demand, which is at present stationary. The workers are recruited from the ranks of unskilled labor.

Educational and technical requirements.—A heater should have an elementary-school education. He should have also some instruction in mechanical drawing and in the construction and operation of the furnace and the processes immediately involved, in the chemistry and metallurgy of the trade, and the theory of iron making. The worker needs strength and endurance and also sufficient skill to avoid accident.

What the industry gives.—There is no apprenticeship system in this trade. The workers first enter the trade as second heater helpers and advance to first helper and then to heater, acquiring while serving as helper the knowledge required to perform the duties of the heater. This trade, so far as the actual handling of the work is concerned, can be learned entirely in the shop.

Deficiencies of workmen.—Few workers in this trade possess the physical strength and endurance required, or sufficient general education or knowledge of metallurgy, mechanical drawing, and mathematics to enable them to advance in their trade.

What the school ought to give.—The workers in this trade should have a complete grammar-school education with two years of prevocational training before entering the trade. Then to supplement the knowledge gained in the trade the schools should give courses as follows: Specialized courses covering the trade and technical requirements of iron making, metallurgy, mechanical drawing, shop mathematics, and the history and theory of iron making.

ROLLING.

Processes.—The roller has charge of the rolling crew; he makes adjustments and supervises the actual work done by the roughers and catchers.

Roughers and catchers: The roughers work on the side of the rolls where the stock first enters; the catchers work on the other side passing the stock back through the rolls at the proper place. There is practically no difference between the roughers and the catchers.

Hotbed men or draggers out: As the bar passes out through the last roll it is caught by the hotbed man or dragger out and drawn down to the hotbed, where it is carefully rolled out and straightened.

Scrap pilers: After muck bars are made they are cut up into the required length. A number of pieces are piled together with wrought-iron scrap, care being taken to secure, approximately, the proper weight, and securely fastened together with heavy iron wire.

Product or specialties.—Bar, stay bolt, horse and mule shoe, railroad spike, and fishplate iron.

Importance of the trade.—There are about 12 rollers and 40 roll hands employed in Richmond.

Conditions of employment.—There is constant danger from the handling of hot bars of iron in passing them through the rollers, and also the liability of being caught in the rolls. This work causes physical and nervous strain when running the rolls at a high speed in working heavy bars of heated iron. This requires constant alertness, but owing to the automatic character of the work it is apt to narrow and restrict the mental development.

Economic conditions.—Rollers work by heats and the day's work is done when the heat is finished. They are paid by the piece, according to a sliding scale based on the iron market. The wage ranges from a maximum of $39 to a minimum of $30 per week, paid by tonnage. There is no regular busy or slack season and the fluctuation in employment is small and irregular. The workers have no organization in this trade.

Age of maximum productivity.—The workers in this trade enter at the ages between 16 and 25 and require about two years to learn the trade. The age period of maximum productivity covers the years between 25 and 55.

Demand for labor.—The supply of workers is adequate to meet the demand, which is at present stationary. Workers are recruited from the ranks of unskilled labor.

Educational and technical requirements.—The roller needs an elementary-school education, some instruction in mechanical drawing, and in the construction, adjustment, and operation of the rolls, in allied processes, and the theory of iron making. Manipulative skill, strength, endurance, and quickness are required in handling the iron and passing it through the rolls.

What the industry gives.—There is no apprenticeship system in this trade, the workers entering first as roll hands, progressing through the work of catcher and rougher roller, by which time they are ready to take up the work of the roller when the chance comes. All the knowledge and manipulative skill required in the practice of the trade can be learned in the shop.

Deficiencies of workmen.—The workers in this trade are deficient in general education, metallurgy, mechanical drawing, mathematics, history and theory of iron making, and few possess the necessary strength and endurance required to perform the work.

What the school ought to give.—In order to enable the roller to become thoroughly efficient and to advance in his trade he should, before he enters the trade, have a complete grammar-school education with prevocational courses in metal working, and after he enters the trade he should take courses covering the history and theory of the trade and the technical part of iron making, metallurgy, and mathematics of the trade.

WOOD-PATTERN MAKING.

Pattern making is the art of making wooden forms from which the molder obtains the necessary impressions in sand for securing castings in iron or other metals. A pattern is a replica of an article made to size of wood, iron, or other metals, from which a mold is formed in wax, plaster, or sand. The cavity corresponding to the pattern is subsequently filled with fluid molten metal, which on cooling retains the shape of the original pattern.

Processes.—The first step is the making of a full-size working drawing. This is necessary in large or complicated patterns because it helps the mechanic to determine how to make the pattern to the best advantage. Next comes the selection of the proper wood, which should be of the best grade and well seasoned because of the hard usage the pattern undergoes in the foundry. After the material is selected it is run through a planer, then cut to size and shape by a band saw, crosscut, or ripsaw, and if necessary the lathe is used for turning up the necessary parts. After being cut to shape and close to size, the different parts are assembled by the use of brads, screws, and glue; the hand tools then come into use and the job is made to size and shape. The pattern is then sandpapered all over to a finished surface and the core prints are placed in position. The pattern is then varnished with gum shellac cut with alcohol. One coat is applied and then sandpapered off with a piece of partly used sandpaper, after which two other coats are applied to make a hard, slick surface. Core boxes are made next and must be constructed to the advantage of the core maker, and also with regard to their durability. The core box corresponds to the interior of the finished casting, and must be made accurate, or else the casting when finished will not have the proper thickness of metal.

Patterns are usually made from seasoned white pine, except where there is much repetition work, when mahogany or cherry is used. Sometimes the wooden pattern is made with a double shrinkage, and iron duplicates cast therefrom. These duplicates, after being finished, are used as patterns in the foundry. Mahogany is a material which, having a hard, dense surface, is invaluable for small, fragile patterns or for patterns which are in constant use. It is more difficult to work than pine, but will stand more abuse. Cherry is another wood of value in making durable patterns; it is cheaper than mahogany and preferred for some kinds of work.

Product or specialties.—The product of the wood-pattern maker consists of patterns, and, where necessary, core boxes, made of wood for castings of every description in iron, brass, bronze, aluminum, or other metals.

Importance of the trade.—The number employed in this line of work in Richmond is about 50 journeymen and apprentices.

Conditions of employment.—The work of the pattern maker involves no peculiar physical or nervous strain, except in shops that are not well lighted, which condition would tend to impair the eyesight. The work as a whole tends to sitmulate the intelligence of the worker. In some shops there is a lack of safety devices which makes the worker liable to accidents, and where there is no provision made to carry off the dust from the machines, the worker inhaling the dust becomes, because of the continued irritation, especially liable to infection of the throat and lungs.

Economic conditions.—The apprentice gets as a beginning wage from $4 to $7.26 per week for the first year. This wage is increased the second year and the range is from $5 to $8.57. The third year his wage is from $6 to $9.45 per week, and the fourth year from $7 to $11.09 per week. The journeymen's wages range from $18 to $22.50 per week and the union scale is 40 cents per hour.

The hours worked in the various shops are practically uniform, being 10 hours per day and 55 hours per week, with 5 hours on Saturday. There seems to be neither a seasonal period of activity nor a seasonal slack period, but there is considerable fluctuation in employment. The average employment for pattern makers for the past three years has been about nine months in the year.

The pattern makers' organization includes about 75 per cent of those actually engaged in the trade in this city.

Age of maximum productivity.—The apprentice enters the trade between the ages of 16 and 18 and serves a period of four years. After this period the apprentice, if he has applied himself to the trade, should be able to handle any work in the shop, but because of the fact that he has not applied himself he does not reach his maximum period of productivity until he is 25 years of age. In one shop in the city there is a pattern maker over 90 years of age who is at present giving good service, but generally when a journeyman reaches the age of 55 he begins to go back instead of ahead, and the average age of productivity can be said to be from 25 to 55.

Demand for labor.—The supply of this class of labor is adequate to meet the demand; in fact, there seems to be an oversupply, as for the past three years the average of employment has been about nine months in the year. The supply is secured from the grammar grades of the city schools, through a four-year apprenticeship system.

Educational and technical requirements.—The apprentice to this trade should have a grammar-school education, and this should include mechanical drawing and geometry (at least, geometrical figures); he must have a thorough knowledge of mechanical drawing, as the pattern is made from a blue print, and to execute the work properly he must be able to understand the meaning of every line and be able to make full-size working drawings of the work in hand. Mistakes are often made in the drawing room, and unless discovered mean a loss to the employer. Second, it is necessary for him to have a fair knowledge of molding, as it becomes necessary to confer with the molder frequently in regard to the proper molding of different patterns. Third, a knowledge of the different metals is necessary to be able to allow for the shrinkage. Fourth, a knowledge of machine-shop practice and of the construction of the whole product of which this special piece becomes a part is necessary to enable the pattern maker to allow finish where parts fit together.

A knowledge of the proper working of glue is necessary in the construction of the pattern. Animal glue is in more general use and answers the pattern maker's purpose to better advantage than any other because of its durability. The proper sandpapering of the pattern is necessary after it is finished with the hand tools; then a good shellac varnish is used to give the pattern a hard, slick finish, thus filling the pores, which helps the pattern to withstand the damp sand and hard usage in the foundry. The construction of the pattern is the most important part of the job, because it must be made to give the molder the least trouble and still retain its strength and durability.

To become a thorough mechanic the pattern maker must be proficient in the use of the different machine tools; viz, lathe, band saw, rip and crosscut saw, jig or scroll saw, planer, and jointer. Generally there is a machine hand employed in the pattern shop for the purpose of keeping the different machines in order and brazing the band saws; but the pattern maker should be able to do this work, as this knowledge helps him to determine whether the machines are in proper condition. It is necessary for him to become skillful with his bench tools, as the pattern must be finished up after it is worked out roughly by the machine. This trade generally requires a high degree of intelligence and therefore attracts the better class of apprentices.

Pattern construction.—Patterns being entirely inclosed in sand, provisions must be made for drawing them out; this involves draft or taper, which is a thinning down of certain parts, divisions into sections, and provisions for loosening by rapping. Molding sand is always used damp, and patterns must be strongly constructed, as they are subject to rough usage; also, they must be coated, so as to resist any tendency to change their form and size from the absorption of moisture. Most metals shrink or contract in passing from the molten to the solid state, therefore patterns must be made larger than the required castings.

What the industry gives.—An apprentice is accepted in the pattern trade between the ages of 16 and 18. Generally the first work given him would be helping around the machines, sandpapering, varnishing, and possibly the turning of simple work in the lathe, such as core prints. After becoming familiar with the machines and their use he would be allowed to use them under the direction of a mechanic to get out rough stock for some large pattern. By applying himself, the apprentice becomes proficient in the use of the different machines; and by observing and helping the mechanic on the job he becomes familiar with the construction of the different patterns. He is allowed to help finish the pattern, by sandpapering, varnishing, and the marking off of cores. This period of helping would probably cover two years of the apprenticeship, after which the apprentice would at first be given the more simple patterns and later those that are more difficult. All the knowledge acquired in the trade he gains in the pattern shop; but owing to the lack of training in the fundamentals of the trade his training must be supplemented by courses in evening schools where instruction is given in mechanical drawing and shop mathematics.

Deficiencies of workmen.—The common deficiencies of the workers seem to be a lack of knowledge of mechanical drawing and shop mathematics, and lack of ability to apply the knowledge they really have.

What the school ought to give.—The school should give the apprentice a grammar-school education, including geometry, instructions in blue-print reading and mechanical drawing, instructions as to foundry practice, in the selection of woods for different classes of pattern work, shrinkage of metals, and in the proper construction and methods of finishing a pattern so as to resist the moisture and hard usage in the foundry.

What the apprentice needs.—If, after having received the required education in the school, the apprentice should pursue the following plan there would be no question of his productiveness at the end of his apprenticeship. The first six months of the apprenticeship should be spent in the drawing room, where the boy would acquire a knowledge of the making of working drawings and the reading of blue prints. This knowledge is necessary because the pattern is made from a blue print, and if very difficult a full-size working drawing must be made. The second six months should be spent in the core room and foundry. While there the apprentice would see the necessity of constructing the core box so that it would be durable, and at the same time made to facilitate the work of the core maker. The time spent in the foundry would be of value because of the knowledge acquired in regard to the shrinkage of metals and the allowance for same in the patterns, the necessity for draft, so that it may be drawn from the sand, and the setting of cores, which would give the apprentice a knowledge of the different parts of the whole core.

Three months should be spent in the machine shop to familiarize the apprentice with the different castings, the use and finishing of same. This preliminary training is necessary because of the knowledge the apprentice acquires. The apprentice now starts in the pattern shop and is given the sandpapering and varnishing of patterns. This teaches him the necessity of finishing the job with a smooth surface to procure a good casting, and if observant he becomes familiar with the construction of the different patterns and core boxes, the laying off and marking of cores, and the placing of core prints. For a period of three months he is given work at the lathe and helps on machines, which teach him the proper manner of building and turning up jobs in the lathe and the cutting of stock to shape and size. The apprentice is then placed with a full-fledged mechanic, where he receives practical instructions in general work and the making of working drawings. During the last year of apprenticeship the boy should be given an opportunity to apply the knowledge acquired in the past three years, and the foreman should be able to judge by the boy's past work what he is competent to do, and promote him accordingly.

METAL-PATTERN MAKING.

Processes.—Metal-pattern making is the fitting up and finishing of a metal casting for use as a pattern. The original pattern is generally made of wood, an allowance being provided for shrinkage both in the master pattern and working pattern. From the original pattern a casting is made, generally of some white metal, which is called a master pattern. This master pattern is necessary, because the original pattern of wood will shrink and change its shape and form. In stove molding, the castings being of uniform thickness, the original pattern must be made of thin material, which necessitates a follow or pattern board. Stove pattern work is very intricate, because of the scroll design and carved work. The follow or pattern board must be made to support the pattern and leave a margin outside the pattern for the flask and sand. After the master pattern has been cast it is finished by filing and scraping and then varnished. Then a follow board is made which fits the underpart of the pattern, which helps the pattern to retain its shape. The master pattern is now ready to place in the sand to secure the necessary number of ordinary working patterns. As many of these patterns are made as is necessary, depending upon the number of castings to be made and the time allowed for making same. These working patterns are finished the same as the master pattern, viz, by filing and scraping the casting and then varnishing same, and a follow board made for this pattern also, and same allowance made around the pattern to provide for sand and flask. Pieces of soft wood are fastened to this board and cut to fit the underside of the pattern to keep the pattern from springing while it is being rammed up.

In small work, when it is possible to get a number of pieces in one flask, the working patterns are corded together; that is, a runner, which is a piece of copper or brass the proper length and wide enough to provide for proper flow of the metal, is secured, and on each side of this runner the small metal patterns after being finished are spaced, about equal distance from each other. Cross runners are made of the same material and one end of each of these runners is brazed to the pattern and the other end to the main runner or cord. In this way a large number of small castings can be made at once.

Product or specialties.—The product in Richmond consists mostly of patterns for stove work; however, some small patterns are made for a woodworking plant, which consist of attachments for ice-cream freezers and washing machines.

Importance of the trade.—The trade is restricted because of the limited field in Richmond. There are only eight metal-pattern makers engaged in this work, and they are employed in the stove foundries.

Conditions of employment.—The work is very light, and therefore no physical or nervous strain is involved. All of the work tends to stimulate the intelligence of the worker, except possibly where there is continual scraping, which while important requires no high degree of skill. The metal-pattern maker is liable to infection of throat and lungs from inhaling the fine dust that arises from the filing and scraping of the metal pattern.

Economic conditions.—The apprentice to this trade serves a period of four years and receives the first year a wage of $4 per week; for the second year he receives $5 per week, the third year $6 per week, and from $7 to $9 per week for the fourth year. The metal-pattern maker works 60 hours per week, 10 hours per day, including Saturday, and receives $15 per week as a general wage, but in a few cases receives $18 per week. These journeymen are eligible to membership in the local branch of the Pattern Makers' League. There is no period of seasonal activity, as work is found in the dull season to keep the men employed the full year. In fact there is no Saturday half holiday, as can be seen by noting that the work day on Saturday is the same length as on other days of the week.

Age of maximum productivity.—The apprentice enters the trade between the ages of 14 and 16. He is required to serve a period of four years, and he seems to reach his age of productiveness at 20 years of age, as the period of maximum productivity is from 20 to 40 years of age.

Demand for labor.—The supply of labor appears to be adequate to meet the demand, there being practically no demand for this class of labor except in the stove foundries where all of the patterns are of metal. The supply is from the grammar grades of the public schools, through an apprenticeship system.

Educational and technical requirements.—The metal-pattern maker is required to have the knowledge and the manipulative skill necessary to finish the metal pattern to secure the best casting. He is required to braze, solder, fill, blow and shrink holes, and be able to coat the casting with shellac or wax when necessary. Mechanical and in some cases free-hand drawing is a necessary requirement, also a certain amount of shop mathematics. The handling of the tools in use is the most essential part of the trade, because of the skill required to use them successfully.

What the industry gives.—The industry gives a four-year apprenticeship period, and during this time the apprentice is supposed to get all the practical part of the trade in the manipulation of the tools, the handling of the work, and the best methods to be used. The apprentice gets a certain amount of theory in the shop by coming in contact with the work, but there is not enough theory to make the mechanic as efficient as if he had the proper training and instruction in mechanical and free-hand drawing and shop mathematics.

What the school ought to give.—The apprentice to the trade should have had first a grammar-school education through the sixth grade, and prevocational training in metal work, mechanical and free-hand drawing, and mathematics as applied to the trade.

IRON MOLDING.

Processes.—The first essential in the process of molding is to select the proper kind of sand for the mold. In selecting sand the weight of the casting should be taken into consideration. Molding sand is a mixture of sand and clay or other binding material that aids the sand in retaining its shape under pressure. Sand is said to be sharp when its grains are angular, and dull when grains are round. Sand is strong when a body of it manifests a disposition to retain any shape that may be given it, and weak when it tends to fall apart and will not retain its shape. For light castings the sand should be of a fine grain, because there are less gases created in light bodies of molten metal than heavy bodies, and the sand being fine and close offers more resistance to venting than coarse, open sand. Molds for heavy castings are made of sands of coarse, open-grain texture.

A flask, which is an open box or frame, of wood or metal, generally of two parts or more (the top part the cope, and the bottom part the drag), large enough to allow 2 or 3 inches space all around the pattern, is then secured. A board or plate called a follow board is then used to place the drag part of the flask upon. The pattern is then placed face down upon this board, and facing sand is placed around and above the pattern to a thickness of about 1½ inches. Then the rest of the flask is filled in with unriddled sand (not sifted) and rammed properly. Sometimes gaggers, cast rods with projections are embedded in sand to help hold same together. A board is then placed on the top of the flask and clamped and the flask rolled over. Flasks, which may be classed as tools or accessories, may be made in different sizes and shapes and of any number of parts.

The molding board is then removed and the face of drag sleeked over firmly with a trowel to make the face smooth and firm. A gate pin is then embedded in the face of the mold about 1 inch deep, or enough to help it retain an upright position, and a groove cut from this pin to the pattern. Parting sand, a mixture of burnt sand and charcoal, is then dusted over this face, the cope half of pattern placed on the drag and centered by dowel pins in cope half and dowel holes in drag half of pattern. The drag part of flask is then placed in position and the pattern covered to a thickness of about 1½ inches with facing sand, after which the flask is filled with unriddled sand and same rammed until it is compact. A riser pin is embedded in this half of mold until it touches the pattern. This riser helps to carry off the gases and also causes any foreign matter that may have accumulated in the mold to flow out; also it warns the molder when he has his mold full of metal. The mold is then vented by inserting one-eighth inch rods into the sand about 2 inches apart until they hit the pattern, and then withdrawing same, leaving small holes in the mold by which the gases escape. A cover board is then placed over the flask and clamped on; the cope lifted and dressed up; the gate pin and riser pin withdrawn, and both parts of the pattern are rapped and withdrawn from the sand. Then the mold is washed down with a solution of lampblack and molasses to form a slick face on the mold. If necessary, the drag part of the mold can be vented by forcing one-eighth inch rods from the inside of mold to side of flask, but this is not always necessary. The core, a body of sand baked hard, is then placed in its proper position and fastened by wire or nails to keep it stationary. This core, which is made in the core room, forms the inside of the finished casting and in some cases is very frail and must be handled with care. Some cores are of necessity made in half a dozen parts and care must be taken to fit the parts together properly. The cope is then replaced and the two parts are clamped together. The mold is then ready for pouring, which is done either by a hand or crane ladle, a frustum-shaped vessel of wrought iron, lined with fire clay.

The cupola.—There are two distinct kinds of cupolas used in the melting of iron—one called a cupola furnace, in which the iron and fuel are charged together, and the other called an air furnace, in which the iron and fuel are charged in separate chambers. The cupola furnace, or cupola, is the most convenient and economical one for the melting of iron. This style of cupola is made of sheet iron from one-fourth to one-half inch in thickness and from 2 to 8 feet in diameter, and the height is generally about three times its diameter. The cupola is set on legs or bricked above the ground level to allow the opening of the drop doors, which are constructed in the bottom of the cupola, for the purpose of dropping the slag and other refuse matter after the heat is run off. The metal and fuel are placed in the cupola by means of a charging door hinged to the outside of the cupola. That portion of the cupola above the charging door is used as a stack to carry off the gases, smoke, and sparks from the heat. A wind belt is constructed around the lower portion of the cupola and a series of tuyères or holes open from this belt into the cupola proper to convey the draft to the fuel to retain the proper heat. This wind belt has openings opposite the tuyères, which permit the cleaning of same and also allow the watching of the process of melting. Slag holes are made in the lower portion of the cupola to allow the running off of slag that may accumulate around the spout opening and stop the flow of clear metal. The interior of the cupola is provided with angle irons which support the fire brick which lines the cupola. The interior of the cupola is lined with fire brick laid in fire clay to resist the flame and gases under the influence of the heat. When heats are of long duration, or dirty or burned iron is used in charging the cupola, it becomes necessary to use a flux; that is, some mineral substance that is lighter than iron is placed in the charge and when melted floats on the liquid iron and absorbs and liquefies the nonmetallic residue of the iron and the ash of the fuel, so they may be drawn off by means of the slag holes before the heat is run off.

The foundry trade involves some knowledge of almost every operation required in the making of machines, and those versed in the mechanical arts assert that the art of founding demands greater mechanical skill, caution, and good judgment than any other of the allied trades.

There are three branches of molding, termed, respectively, green-sand, dry-sand, and loam molding.

Green-sand molding involves the making of castings in molds that are composed entirely of sand in a damp state, or that have their surfaces "skin dried"; that is, dried by building a fire in the mold to harden the surface of same without baking the mold its entire thickness.

Dry-sand molding involves the making of castings in molds that are made of sand in a damp state, after which the mold is dried in an oven, or otherwise, so as to remove all moisture and leave the body of the mold dry and firm.

Loam clay and rock sand are mixed with charcoal and cow hair to give cohesive power and porosity. In loam-sand molding castings are made in molds constructed with sweeps and skeletons of patterns. A mixture of loamy sand and other material is used to form the surface of the mold. Brickwork forms the outer and inner supports of this mold. This class of work, like dry-sand molding, requires thorough drying before it is ready to receive the melted metal.

The practice of some shops embraces all three branches, but most foundries make only green-sand molds. There is more risk in making medium and large castings in green-sand molds than in dry-sand or loam molds. In many cases a poor class of molders or inexperienced men may be employed for making dry-sand molds, but it is seldom wise to trust other than skilled workmen with the construction of green-sand molds, especially in heavy work. Loam work varies greatly in the degree of skill required. Some classes of loam molds permit the employment of inferior workmen, while others demand extraordinary experience, skill, and good judgment in their production.

While the finished product is entirely different, as outlined, in size, shape, and use, the method of obtaining the product is practically the same in green-sand molding. The same procedure would apply to dry-sand molding, except that molds made of dry sand would be dried in an oven, or otherwise, so as to remove all moisture and leave the body of the mold dry and firm.

Product or specialties.—Foundry work in Richmond is of a diversified nature, consisting of job shops which handle any ordinary casting, railroad shops which make castings for their own use, and locomotive shops which make complete engines.

The Richmond Foundry & Machine Co. handles small machine parts, gas and water fixtures and connections, gears and other castings for ice-cream freezers, washing machines, etc. The stove-plate molding is handled by three firms, the Richmond Stove Co., Southern Stove Co., and Cameron Stove & Range Co. These firms make wood, coal, and gas ranges and wood and coal heaters. The Tredegar Co. makes a specialty of shot and shell and car wheels and does a general jobbing business. This firm supplies the local shops of the Chesapeake & Ohio Railway with castings for their repairs. The Southern Railway maintains a foundry at its local plant to supply its needs. The Richmond, Fredericksburg & Potomac Railroad Co. lets its work out to jobbers in the city. The Richmond branch of the American Locomotive Co. has the largest foundry for machine work in the city. Its work consists of large and small castings of iron and brass for the manufacture of locomotives.

Importance of the trade.—There are about 300 journeymen and apprentices engaged in the trade of iron molding.

Conditions of employment.—The molder's work requires continual bending and lifting of patterns and flasks, which have a tendency to cause backache. In some cases where the work is a continual repetition and becomes monotonous, causing the worker to become careless and disinterested, it has a tendency to narrow and restrict mental development, but when the work is of a diversified nature it should stimulate the intelligence. The molder suffers from infection of the throat and lungs, caused by floating dust from the mineral facing used on the molds, from exposure to the dampness from the sand and to the heat from the molten metal, and from poor ventilation and sanitary conditions. Throat and lung affections and lumbago constitute about 30 per cent of the molders' ailments. The liability to accident from burning can be overcome by proper precautions.

Economic conditions.—The apprentice receives in wages the first year from $3 to $8 per week, the second year from $4 to $10 per week, the third year from $5 to $12 per week, and the fourth year from $6 to $14 per week. The journeyman receives from $16.50 to $30 per week. The molders in the machine casting shops working daywork receive 35.7 cents per hour, and piecework about 46.7 cents per hour. The stove-plate molders receive a minimum rate of 50 cents per hour. In the machine casting shops the hours of labor are 9 hours per day, 50 hours per week, and 5 hours on Saturday. In the stove-plate shops, of which there are 3 in Richmond, the hours of labor are from 8 to 10 hours per day, 40 to 60 hours per week, and from 5 to 10 hours on Saturday in the busy season, but generally there is no work done in the stove foundries on Saturday. The busy season in the foundry trade of Richmond is from April to December, inclusive, and the slack season from January to March, inclusive. This affects the foundry trade in general, but as a matter of fact the stove foundries have been working on short time (no work on Saturday) for the past two years. About 75 per cent of the journeymen engaged in the molders' trade in this city are members of the iron molders' union.

Age of maximum productivity.—The apprentice usually enters the trade between the ages of 16 and 18, and he is required to serve an apprenticeship of 4 years. The age period of maximum productivity is from 22 to 45.

Demand for labor.—The supply of labor is sufficient to meet the demand, and there seems to be no reason to believe that such will not be the case for some years to come as there is an apprenticeship system and this is ample to meet the demand.

Educational and technical requirements.—The molder needs an elementary-school education, instruction in the use of all hand and machine tools, the selection of the proper sand for molds, the use of all necessary equipment, metallurgy and chemistry of the trade, including a knowledge of the mixture of metals, some shop mathematics, and mechanical drawing. Because of the laborious class of work the molder should have strength and endurance.

What the industry gives.—There is no general scheme followed in the training of apprentices, but in some shops during his four years' apprenticeship the apprentice is supposed to follow this routine:

The apprentice in his first six months, by helping and observing the work done by the mechanic, acquires a practical knowledge of methods pertaining to the trade, such as the kind of sand to use on different molds and the proper ramming and reinforcing of same by the use of crabs or gaggers; the making of partings, and the finishing of the mold, the venting of same, and the pouring of the metal. This work with a few variations would practically cover the whole four years' time of his apprenticeship, except in a few special cases.

After serving for six months, helping in the foundry, the apprentice is sent to the core room to finish his first year in his trade. In the core room the boy is taught the method of making different cores—why some are of more advantage to different kinds of castings. He acquires a knowledge of venting cores to prevent core from blowing, rodding cores to help them retain their shape, the proper method of ramming so it may be vented easily, and the proper placing of hooks or fastenings so that the core may be held in its proper position in the mold. By his work and observation in the core room he becomes familiar with all kinds of cores and the proper handling of same, and as this was the reason for placing him in the core room, he returns to the foundry to begin a period of six months' training to acquire a knowledge of the cupola.

During this period the boy gains a working knowledge of the cupola, its use and construction. The next three months he is given light work on the bench, or floor, such as snap-flask work, which can be handled alone, and while this work is small and light, the method is the same and by the practice he gains confidence in himself. As a knowledge of molding machines is necessary because of their extensive use in foundry practice the apprentice is then given a machine. It requires very little knowledge and the boy soon becomes proficient in its use.

The apprentice is then placed on the floor and worked with a journeyman on all classes of molding to give him a thorough and wide range of knowledge of the class of work done by that particular establishment. This later period is usually of two years' duration and when completed the boy should have become a competent workman because of his all-round training.

Deficiencies of workmen.—The molder's most common deficiency seems to be a lack of general education. The majority seem to have had very little training educationally. They are also deficient in the most essential subjects of their trade, namely, shop mathematics and blue-print reading. There is no provision made for instruction to the journeyman in the shop and what he gets in theory must be acquired outside.

What the school ought to give.—The apprentice before he enters the trade should receive an elementary-school education, and prevocational training; instruction in the proper handling of all tools; courses covering the trade and technical requirements of molding; instruction in metallurgy and chemistry as applied to the trade, and shop mathematics and blue-print reading. After the apprentice has entered the trade he should be given continuation courses covering the work in which he is actually engaged.

BRASS FOUNDING.

Processes.—In brass molding the lighter and finer the casting the finer the sand. If a coarse sand is used, the melted brass is sufficiently fluid to find its way into the openings among the grains, making the casting rough and pitted; therefore it is advisable to use the finest grade of sand the casting will permit. It is important to have the sand for brass molds as free from all foreign material as possible, as anything that will tend to coarsen the sand used will give a rough surface to the casting. The facing sand used in brass work is secured by drying thoroughly the coarser sand ordinarily used in iron molding, and sifting it in a fine sieve. That portion of sand which passes through the sieve, after it has been tempered, is used to face the mold by being sifted over the pattern, and the rest of the mold is made from the unsifted sand.

If the form of the casting is so intricate as to make it inadvisable to risk the green sand supporting itself in the delicate parts, or the mold so deep that it will not support itself at the bottom, it becomes necessary to use a dry-sand or loam-sand mold. The methods and mixtures used in dry-sand and loam iron molding may be used in brass work as well. In "skin drying" the difference in sleeking and wetting down of the mold is in the substance used. In brass work flour, whiting, lime, water lime cement, powdered chalk, and lycopod are used. Plumbago is used for heavy brasses, especially those of red or whitish color, but not for yellow brass. The substances must be ground fine to close the pores of the sand as much as possible, to prevent the metal cutting in the sand and giving a rough casting.

For heavy castings, flour is shaken on the surface of the mold and then plumbago is thrown by hand or shaken out of a bag on the flour, and the surface sleeked with finishing tools. When, however, the molds have to stand for any length of time before the metal is poured, flour is not used, since vegetable growths may develop on the face of the mold that will cause roughness in the castings, and also cause the parts of joints to stick together. For a pasting material at the joints, powdered rosin or a mixture of rosin and charcoal dust is used. Lycopod works well as a facing and prevents the sand from adhering to the pattern. Much trouble is experienced in damp or frosty weather with metal patterns, which is caused by moisture in the air condensing on the metallic surface. This sweating, as it is called by the molder, causes the sand to adhere to the surfaces, and when the pattern is withdrawn tears the mold. To overcome this difficulty, kerosene oil is brushed over the surface, although even when this is done the results may not be entirely satisfactory.

The mold: The molds for small brass work are made on benches, over troughs or on molding machines. The principal differences between molds for iron and molds for brass are that the brass-work molds are made from finer and cleaner sands, that in brass molding a greater allowance must be made for contraction, and that different facings, parting sands, and finishings are used. Very nearly the same blackening mixtures are used in brass molding as in iron molding, and the methods of drying and venting, also, are practically the same in both classes of work.

Facing sand: New molding sand that has been carefully screened and tempered evenly is generally used in brass molding. The drier it is when placed in the mold the better, since an excess of moisture will cause steam and this causes scabs and blowing. The molds are rammed to about the same degree of firmness as in iron molds.

Venting: While in general the method of venting is about the same as in iron molding the cope in brass molding should be vented more freely, so as to allow an easy escape of the inclosed air and gases during the pouring, thus allowing the metal to run quickly and solidly into the corners. Small ventholes are often made entirely through the cope for this purpose.

Drying molds: Small molds are sometimes dried by burning gasoline on their surfaces, and in some cases and with some sands it is necessary to spray the surface of the mold with molasses water to obtain the necessary degree of hardness on the surface.

Contraction: In dry-sand or loam molding provision must be made for contraction while the casting is cooling, as the casting is likely to break, especially if the mixture of metal contains a large percentage of copper. In order to prevent this the cores should be made in such a manner that they will yield when the casting contracts, and to achieve this end they may be filled with cinders or with some yielding material. The mixture for dry-sand or loam work should be close-grained, but of such a character as not to bake too hard, as this will cause the metal to boil, with the result that the metal will not stay in contact with the sides of the mold, and that in consequence a bad casting is obtained.

Gating and feeding: Brass, if dropped any considerable distance, will cut the sand in a mold and cause lumps or scabs, and for that reason it is necessary to gate a mold for a heavy casting as near the bottom as possible. If the mold is very deep, it may have top pouring gates as well, in connection with the bottom gates. In light castings the chance for lumps and scabs is not as great as in heavier work, but the gates should be so cut that the casting will run full and sharp at the corners. In order to aid the metal in filling the mold properly the mold is often placed in an inclined position with the pouring gate at the top. After the mold has been poured it should be fed occasionally, as long as the metal remains fluid, which can be determined by the metal in the feeding head rising when new metal is poured in at the gates.

Cleaning: The method of cleaning brass castings is the same as is used in cleaning iron castings, the work being done by the use either of files and wire brushes or by charging the castings in tumbling barrels. Pickling dips are used as in iron molding for cleaning and brightening castings. In brass molding, however, various dips are used to produce different colors.

Melting.—While the crucible method is the most common in use for melting brass, it is also melted in direct contact with the flame in furnaces that use crude petroleum for fuel. The furnace that gives entire satisfaction is a pear-shaped boiler-plate shell, mounted on trunnions supported by standards on a solid foundation, the bottom being made removable for the purpose of lining with fire brick and making repairs. After the bottom is bolted in place the lining is done through the hinged charging doors at the top of the furnace. The furnace is tilted and held in the desired position by means of gears and a worm wheel operated by a handwheel. The oil and air enter the furnace near the top through two tuyères placed at an angle and pointed downward. The oil and air pipes are connected with the movable parts on the furnace by means of stuffing boxes on the trunnion. The furnace is heated to its working temperature before the charge is put in. To aid in preventing excessive oxidation of the charge, it is necessary to cover it with some material to protect it, and a small amount of anthracite coal is sometimes used for this purpose. When the charge is melted it is emptied into ladles through a brick-lined spout which is also used as the outlet for the products of combustion, and the operation of the furnace is judged by observing the flame that issues from the spout. The advantages of this furnace are that a larger amount of metal can be melted in one bath than where crucibles are used, and a greater amount of metal can be melted in a given time per square foot of floor space occupied than by the regular furnace.

Bronze, fine art, and statue founding is a trade apart from brass molding and as there is no work of this nature in Richmond the processes are not here described.

The molder whose specialty is iron founding can readily learn to make molds for brass castings, as the methods and practices in the two classes of work are very similar.

Product or specialties.—The product of the brass molder in the city of Richmond consists of castings of brass, bronze, aluminum, and white metal for machine and engine repairs and construction; and for the construction and repair of automobiles, street and steam railroad cars, and special machinery of every description.

Importance of the trade.—The number of journeymen brass molders at present employed in Richmond is about 15, including those who have served their apprenticeship at brass molding and are at the present time following this line of work.

Conditions of employment.—The continual bending of the molder over his floor and flask and the lifting of the parts of flask tend to cause backache and may occasion physical strain, although the liability to strain is somewhat less than it is in the heavier work of iron molding. As compared with iron molding there is a greater variety in the class of work done, and in so far as this is true, the brass molder's work may be said to be more stimulative than the work of the iron molder. In some cases, however, where continual repetition is the order, the work of the brass molder is monotonous and such as can make but little appeal to the worker's interest.

Economic conditions.—The apprentice to the trade receives as a beginning wage from $3 to $8 per week for the first year; the usual rate for the second year is from $4 to $10 per week; the third year from $5 to $12 per week, and for the fourth year from $6 to $14 per week. The rate of wages for apprentices, however, varies according to ability shown and the class of work on which he is engaged. The wages of the journeyman brass molder vary from $16.50 per week in some shops to $22.50 per week in others. The union scale of wages for daywork is 35.7 cents per hour and for piecework 46.7 cents per hour.

The hours of labor in all of the brass shops are about the same—9 hours per day, 50 hours per week, and 5 hours on Saturday.

There seems to be considerable fluctuation in the amount of work done, but the work is generally divided equally among the men in the union shops in the dull season. The seasonal activity is irregular, but the busy season extends generally from April to December, inclusive; the slack season from January to March, inclusive.

The iron-molders' organization has jurisdiction over this branch of the trade and the journeymen are members of this union.

Hygiene of the occupation.—The condition of employment which most seriously affects the health of the brass molder is the danger of infection of throat and lungs by floating particles of dust from the mineral facing, used in the facing of the mold, and where the grinding room is situated in the foundry the dust of the metal from the grindstones is also inhaled by the molder. While the molder is exposed to some extent to danger of poisoning from the fumes of the molten brass, the furnace tender is really the person who suffers most from these fumes and gases. Where precaution is not exercised there is always a chance of injury from burns from molten metals in the handling of the ladles and in the pouring of the mold. Again, if the mold is not properly vented and clamped, the strain of the gases and molten metal may cause the mold to overflow or burst. In such cases the danger that the molder will be burned is very great.

Age of maximum productivity.—The apprentice enters the trade generally between the ages of 16 and 18. In some cases the boy starts to work in the foundry younger, but his 4-year period of apprenticeship does not begin until he has reached the age of 16 years. After his apprenticeship is completed it generally requires about two years to reach his age of maximum productivity. In some cases the apprentice is thoroughly efficient in the last year of his apprenticeship, but these are exceptional cases where the boy is especially adapted to the work. Generally the maximum productivity is between the ages of 22 and 45.

Demand for labor.—The supply of labor in this line of work seems to be adequate to meet the demand, and while it is true that new industries cause a demand for a certain amount of increase in the output of the brass foundries, they have met this increase and there seems to be no good reason to say that the demand for this class of labor is increasing or decreasing. The source of supply is an apprenticeship system, and in some instances iron molders take up the trade of brass molding.

Educational and technical requirements.—While the general education required of the molder in the practice of his daily work is inconsiderable, the trade knowledge required is considerable. The process of molding requires the manipulation of a large variety of tools which the molder must handle skillfully to get the best results. A knowledge of modern foundry practice in general is essential; also a knowledge of metallurgy and of the chemistry of the trade, especially as regards the alloys; of mathematics in a degree which will enable the molder to handle the problems that arise in the shops and to advance in the trade; and of mechanical drawing and blueprint reading. The molder requires to an exceptional degree physical strength and powers of endurance.

What the industry gives.—The worker enters the trade as an apprentice and serves four years. In this time he is supposed to acquire a knowledge of the methods of molding, of core making, and of charging the furnace. He acquires a fair degree of manipulative skill in the use of the foundry tools, both machine and hand. There is, however, no special provision made for the instruction of the apprentice, and the knowledge acquired is received from direct contact with the work in hand. Even under the more favorable conditions there is no well-defined line of promotion for the average molder.

Deficiencies of workmen.—Generally the molder is deficient in common-school education, especially in the simple elements of arithmetic, and in ability to read mechanical drawings or blue prints of any description.

What the school ought to give.—Before the apprentice enters the trade he should have received a grammar-school education and prevocational training. After he enters the trade the subjects which may most profitably be taught him are drawing, chemistry, and metallurgy as applied to the trade.

CORE MAKING.

Processes.—Core making in general is the forming of bodies of sand to different shapes by use of core boxes, sweeps, or strikes, properly wired or rodded to help retain their shape, vented to carry off the gases that accumulate in the mold, the placing of hooks or other fastenings so that the core may be held in its proper position in the mold, using the proper method of ramming the core to secure the proper density. After the core is formed it is placed on a carriage and run into an oven and baked thoroughly, after which it is ready for the mold. While core making is a trade in itself, the product of the core room becomes a part of the mold, and the work, being so closely related and generally under one head, is spoken of as a part of the foundry.

Product or specialties.—The products of the core room are cores of baked sand for molds for castings of iron, brass, bronze, aluminum, or other metals.

Importance of the trade.—There are about 42 core makers and apprentices engaged in this trade in Richmond, and practically 50 per cent of them are employed by one establishment.

Conditions of employment.—The physical strain in core making is very considerable, as the continual lifting and bending causes pains across the small of the back. If the work is varied to any extent it would naturally stimulate the intelligence of the worker, but in some cases when there is a continual repetition of simple work it has a tendency to restrict the mental development of the worker. Lack of proper sanitary conditions, proper light, and washing arrangements are important as affecting the welfare of the worker, and the continual inhaling of the dust that arises from the sand irritates the throat and lungs, making them especially liable to infection.

Economic conditions.—The apprentice to this trade is required to serve a period of four years and the wages he receives are as follows: For the first year, from $3 to $4 per week, the second year from $5 to $6 per week, the third year from $7 to $9 per week, and the fourth year from $9 to $10.50 per week.

The hours of labor are about 7½ hours per day. The core maker's work is almost entirely by the piece and when an average day's work is finished he leaves the establishment. The minimum wage per week for journeymen is $16.50 and the maximum is $24 for piecework. The union scale of wages for day workers is 41 cents per hour. The season varies from summer to winter and there is no set time for busy or slack season. The fluctuation in employment is at times considerable and at others very little, but on the whole the fluctuation in employment is inconsiderable. About 75 per cent of the journeymen in this trade are members of the iron-molders' union.

Age of maximum productivity.—Apprentices are accepted between the ages of 16 and 18. The boy at 17 is the most acceptable. Generally the boy's first work, after entering into this trade, consists of helping around the shop, and by observation and practical use he becomes familiar with the names of all tools and their uses in the foundry. After serving a period of four years, the apprentice should be thoroughly efficient in his work. From observation the period of maximum productivity seems to be from 20 to 50 years of age.

Demand for labor.—The supply of labor in this occupation seems to be adequate to meet the demand, and from observation there is no reason to believe that the demand is increasing. The apprentice to the trade is recruited from the lower grammar grades of the public schools.

Educational and technical requirements.—The trade requires of the journeyman manipulative skill in the handling of tools, the rolling and venting of the cores, and the selection of the proper sand. There are very few educational requirements, as the core maker only has to handle the boxes as they come from the pattern maker.

What the industry gives.—The industry gives to the apprentice all the knowledge to be acquired in the shop by coming in contact with the actual work; the rolling, ramming, and venting of the cores and the proper handling to prevent injury to them.

Deficiencies of workmen.—The worker seems to be deficient in general education; in fact the majority interviewed have had very little education.

What the school ought to give.—The school should give the prospective apprentice an elementary-school education, prevocational training to help him choose his future vocation, and, if he selects core making, give him instructions in mechanical drawing and blue-print reading, modern foundry practice, and a knowledge of the properties of the sand for various kinds of cores; the arithmetic should be the most important part of these courses and should apply directly to the trade.

THE MACHINIST.

The machinist is one who works metal to a definite form, size, and finish by the use of machine and hand tools, and who assembles, repairs, and erects machines. The metal upon which a machinist works, in its original form, may be a casting, forging, or a piece of stock of indefinite shape from which he may work out the required object. The variety of the work often tests the ingenuity of the machinist to devise ways and means to perform the various operations so that the work when finished will be of accurate dimensions.

Machine work may be classified as light or heavy machine work. Often the work overlaps, and the distinction is not always clear, yet the methods of operation in both classes of work are the same. In the different kinds of machine and floor work machinists are spoken of as certain kinds of machine hands. The amount of skill required for either light or heavy work differs. It sometimes happens that a machinist changes from light to heavy work. Light and medium heavy work usually require more accuracy than heavy work, and one trained in light work finds some difficulty in getting accustomed to heavy work. It takes a great deal more time for the machinist accustomed to heavy work to become familiar with light work than the reverse.

The trade is further divided into machine construction, tool making, and diesinking. Under the first would be grouped all those operations which have to do with making and repairing machinery. Tool making requires a higher degree of skill than the average machinist usually possesses. This work ranges from making shop tools—such as jigs, boring bars, templates, etc.—to the making of fine hand tools and instruments of precision. Diesinking also requires a very high degree of skill, about on a par with that of the fine-tool maker, the work, however, being of an entirely different nature and with different methods of procedure.

In all machine-shop work there is no work that requires as much skill as the proper use of a hand file. However, machines are now doing to a very large extent the work which was formerly done by hand. Notwithstanding this fact, there will always be a demand for the man who can file straight and square.

In some communities there seems to be confusion as to the meaning of the word "machinist." Machine operators are frequently called machinists when they have absolutely nothing to do with the repairing or adjusting of the machines. They are machine operators and attend to the running of a machine. The tendency toward specialization is strong, and from the standpoint of the Richmond employer it is desirable. Extreme specialization is already a fact in many of the metal-working industries and in these particular industries the all-round machinist is well-nigh eliminated. In modern times inventions and improvements in the methods of manufacture have so multiplied that specialists are more capable of doing the work than the all-round machinist, the demand being for the specially trained man.

Many young machinists are learning a complete trade by going from one shop to another claiming to be able to run certain machines—usually the one they want to learn. They "take the chance" that they may be able to learn to run the machine before being discovered. If found out, they simply get a job in another shop. Foremen, as a rule, know this, for many of them learned their trade in the same way, and they are inclined to be charitable toward those who are ambitious enough to take such chances in learning a trade.

Processes.

Machine operators: There is a large number of operations performed on different machines that require little or no skill. The running of some of these machines is not considered a part of the machine trade, and in some cases one man may run several of them as occasion requires. Among these are saw machines, used for cutting off stock to required lengths, and consist of both circular saws and straight blades. In some cases sheet brass is cut on a regular band saw.

Tool grinders: In some of the larger shops all lathe, planer, and other machine-cutting tools as well as drills are ground by a special man, known as a grinder hand. His work consists of grinding all lathe, planer, slotter, boring-mill tools, drills, and all tools used in the shop to definite forms as set forth in a chart. He is not a machinist and requires little skill. This method of grinding tools has a bad effect upon the young machinists and apprentices, as there is no possible chance for them to learn how to grind tools, which is a very essential part of the trade.

Bolt threaders: Many machine shops, especially railroad shops, require a large number of more or less accurately threaded bolts. Bolt machines are used for threading these bolts by means of a revolving die which may be opened at the desired place, permitting the quick withdrawal of the bolt. It is inferior work, and in all cases boys or men without trade experience run the machines. There are no prospects ahead for the operator.

Drill-press hands, single-spindle drills: The drill-press hand is called such from the fact that he does the drilling on the drill press. This may be done either on the simple drill press or radial drill or the gang drill. The drill press has a single spindle so constructed that the different sizes of drills may be easily changed from one to another.

Radial drill: The radial drill has the single spindle so arranged that it may be moved in and out along a guide which in turn may be swung around and raised or lowered to accommodate itself to the work in hand.

Gang drill: The gang drill has a number of spindles either in a row or adjustable otherwise according to the purpose for which the machine is built. The operator requires very little skill to run either of these machines as any important work is done in jigs accurately made for the purpose.

Screw machines: The screw machine is practically the same as the turret lathe, but is used for different purposes. It is built along the general lines of a lathe, but has no carriage, and in place of the tailstock it has a turret arranged to hold usually six tools so that each one may be brought into play in the order in which it is needed, each operation being performed in progressive order. Boys frequently run the lighter machines after they have been set up and adjusted for the job in hand.

Automatic screw machines: The automatic screw machine performs its operations after the same general plan as the turret lathe; in fact the older styles had a turret the tools of which were advanced in the proper order by means of levers and guide straps fastened to a guide drum. The latest machine of this class, instead of having one bar of stock fed into the machine and the tools being advanced in order, has five bars fed at once, five operations being performed at the same time. Only the man who sets up and adjusts the machine requires any skill. He is not necessarily a machinist but one who has worked himself up from an operator by close attention to the details of operating the machine.

Keyway machine: The keyway machine is for the purpose of cutting keyways in pulleys or other things of similar form. The machine is not complicated and requires very little skill to run. It works by means of a cutter resembling a very coarse file having the proper width of cut and means of holding it up to the work.

Slotter: The operation of a slotter is similar to that of the shaper only that the ram works vertically instead of horizontally. The tool cuts on the down stroke, the ram being counterbalanced to return easily. It is used to work irregular shapes either internal or external, especially on heavy work. This class of work requires a machinist, although specialists sometimes run the machines.

Lathes: Probably the most essential machine in the general machine shop is the engine lathe. This is used for the purpose of turning all cylindrical work, both straight and tapered; boring and thread cutting, both internal and external; and by means of special arrangements turning spherical work or parts of spheres. The work is held between centers for cylindrical work and the tool is held in a tool post which in turn is part of the carriage. The carriage is advanced by means of a feed either by screw or through gears driven by means of a feed rod. It requires considerable skill to run this machine and requires a machinist to run it properly. Most of the machines used in machine-shop practice were evolved from the lathe.

There are many different kinds of lathes—the turret lathe, which has already been referred to, the axle lathes for turning the ends of car-wheel axles, wheel lathes for turning locomotive driving wheels and truck wheels, pulley lathes for pulleys, and others built for special purposes. In all cases machinists run the machines, as they require a certain amount of skill to operate.

Horizontal and vertical boring mills: Both the horizontal and vertical boring mills are used principally for boring. However, in the case of the latter, a great deal of turning and facing is done. The work is fastened to a table which revolves, the tool being fastened in a holder which may be adjusted to the work as need requires. The work revolves with the table, the tool being fed either vertically or horizontally as the occasion demands. On the larger machine a turret is arranged to hold the various tools that they may be brought into play as required. There are also tools held on adjustable side arms so that more than one tool can be worked at the same time. One who can run a lathe can quickly get used to this machine.

Shapers: For finishing plane surfaces shapers and planers are used. The shaper is a small machine on which light work is fastened to the bed or held in a planer chuck while the tool is held in a tool post at the end of a ram which is made to move forward and back, the cut taking place on the forward stroke. There are both geared and crank shapers, referring to the method of running the ram. With a crank shaper one belt is required to drive the machine. A geared shaper requires two belts running in opposite directions and may be operated either by a friction between the two pulleys or the belts may be shifted alternately onto a tight pulley thereby alternating the direction of the ram.

Planers: A planer works on this latter principle, the shaft to which the tight pulley is fastened being geared to the platen or table so that the table runs forward and back. The work is fastened to the platen or held in a chuck. The tool is held in a head which may be raised or lowered to suit the work. This head is fed across on a cross guide by means of a screw actuated by a ratchet feed. Heads are also placed on the housings so that they may be adjusted to plane on the edges or sides of the work. Considerable skill is required to fasten the work, so that when completed it will not be sprung out of shape, but will remain true. Consequently it is part of the machinist's trade to know how to run this machine.

Milling machine: There is one machine that is not as generally used as its worth merits, due to the lack of knowledge of how to operate it. Many foremen do not understand how to use the milling machine and do not recommend its use for this reason. This machine is not limited to plane milling, but may mill irregular shapes by the use of formed cutters. The work is done by fastening it to the bed, holding it in a chuck or on centers. The variety of work that can be done is almost limitless. The work is fed against a cutter having teeth cut so that it works on the principle of a file with very coarse teeth. Spur gears, bevel gears, and spiral gears may be cut, taps and reamers fluted, and many other things which could be done, but with difficulty, on other machines, except specially built machines. To run the milling machine to its best advantage a knowledge of trigonometry is required. Charts are furnished covering the most common requirements, but to cover everything the machine can do would require an unreasonable number of charts.

Bench or vise work and floor work: Bench or vise work and floor work consist of the fitting and finishing of parts and assembling machines and parts of machines. Considerable skill is required to file true and scrape the parts to a perfect fit, as is often necessary in assembling machine tools and other well-built machines. Assembling and erecting come under the head of floor work.

Brass finishing: Brass finishing is a branch of the machinist's trade at which the workman is kept when he becomes familiar with the work. The manipulation of the metal varies a little from that of the other stock worked in the machine shop, but the principles are generally the same. Brass is worked at a much higher speed than iron as it is so much softer that it is not liable to dull the edge of the tool so quickly. This work is very injurious to the health of the worker on account of inhaling the brass dust. One can not work many years at brass finishing without the loss of health.

Tool making: The principles involved in tool making are the same as in other machine work. Greater care must be exercised because of the greater accuracy demanded, sometimes work being required to the ten-thousandth part of an inch. When such accuracy is expected the work is ground to size on a universal grinder which grinds either cylindrical or plane surfaces.

Diesinking: Drop forgings are made by means of dies or blocks of steel into which a form has been made to conform to the desired shape. The work of making the dies is called diesinking. It is necessary to work out the metal, by various means, to the form of the object, making allowance for shrinkage and the flow of metal. It requires a considerable amount of skill to work out these forms and finish them so that the product will be properly made.

Product or specialties.—The product of the machinist in Richmond is varied and includes the building and repairing of locomotives, sugar machinery, cotton machinery, cigarette machinery, shot and shell for the Government, novelties of every description, automobile work, special machines of various kinds, and general machine repairs.

Importance of the trade.—In this occupation there are about 1,150 journeymen and apprentices. The importance of this occupation in Richmond is far-reaching, owing to the location here of railroad shops, locomotive works, drop forge, and novelty works.

Conditions of employment.—There is no great physical strain; in some cases, however, the work is heavy and would require some lifting, but generally the mechanic has ample help. The work is varied in character, especially in the job and repair shops. Practically all of the work stimulates the intelligence, especially in the making and constructing of instruments of precision.

Specialization in low-grade work and continual repetition, such as the threading of bolts or nuts, or the handling of some simple machine, would cause the worker to lose interest and have a tendency to narrow or restrict mental development. There is always danger of accident, especially from uncovered pulleys and belts, cranes, chain and air hoist, open gears, and of infection to throat and lungs from cast-iron dust. On bench work there is a chance of injury to the eyes from flying chips.

Economic conditions.—The apprentice to this trade enters between the ages of 15 and 17. The period of apprenticeship is four years, and the wages received in the railroad shops are higher than those paid by the repair or job shops. For the first year the apprentice receives from $3 to $7.29 per week, the second year from $4 to $8.57 per week, the third year from $5 to $9.45 per week, and the fourth and last year from $6 to $11.09 per week.

The hours of labor vary somewhat, the repair or job shops working from 8 to 9 hours per day, six days, and 48 to 54 hours per week, and the railroad shops working a 9 to 10 hour day, six days, and from 54 to 60 hours per week. The rate of wages for journeymen ranges from 25 cents to 41 cents per hour, the minimum being 25 cents per hour.

There is no seasonal period of activity and practically no fluctuation in employment. The trade is about three-fifths organized and in the railroad shops it is completely organized, and when it becomes necessary to cut expenses the hours of labor are cut instead of making a reduction in the working force.

Age of maximum productivity.—The period of maximum productivity for the machinist is from 25 to 55 years of age.

Educational and technical requirements.—The machinist to become thoroughly efficient in the trade should have a good general education which would include a knowledge of English, at least elementary algebra, geometry, and trigonometry, an understanding of mechanical drawing, and some knowledge of metallurgy.

Trade knowledge: Trade knowledge consists of "trade tricks" and "shop kinks." Many "shop kinks," after long usage, have become accepted shop practice where absolute accuracy is neither required nor desired.

Technical knowledge: Strength of material in its various phases, such as tensile strength, elongation, compression, elasticity, and torsion; the working of alloy steels—commonly known as high-speed steels—and the uses to which they may be put; the uses of high-carbon and low-carbon steels; and the speeds at which the various materials used in the machine shop may be worked.

Manipulative skill: An easy and efficient application of both trade and technical knowledge so that accurate results may be quickly secured with the least expenditure of energy. This has to do with the motions of the hands in conjunction with the movements of the body so that "every stroke will count." The sense of touch is essential to the manipulative skill of the machinist. Judgment of form and proportion is very desirable to the job machinist, as he is often called upon to make repairs which will not permit time for calculations.

Without initiative the machinist would be able to accomplish but little except in specialized lines. The machinist is expected to be able to know the best method to do any piece of work that is given him. Initiative plays a very important part in the skill of the machinist.

What the industry gives.—In nearly all shops the apprentice is taken into the shop to be taught the trade under a written or verbal agreement to the effect that he is to receive instruction in the different processes necessary for the development of a machinist. The first few months he is required to give out tools in order to familiarize himself with the different tools used. He works as a helper about three months, during which time he is given an opportunity to learn how the work is done. He is then given work on the drill press for the next three months. During this time he becomes familiar with the various methods of holding and drilling the work. For the year and half following his time is about equally divided with the lathe, shaper, and slotter. If any preference is shown it is for the lathe. The remainder of his four years is given to bench and vise and floor work. He dissembles machines, learns chipping and filing, and the assembling and adjusting of machines. So he passes in order through the operations of the various machines from the simplest to the most complicated, becoming familiar with the working speeds of various materials on the different machines. Instruction in the cutting speeds of the various materials used would save a vast amount of time. This, however, is not taught in the machine shop, as there seems to be a general lack of knowledge concerning the subject.

What the school ought to give.—The apprentice to the machinist trade should receive an elementary industrial education, and this should include at least elementary algebra, geometry, and trigonometry, and instruction in mechanical drawing, and some knowledge of metallurgy. The school should give courses in strengths of materials, so the apprentice may be able to work the materials to best advantage. In its various phases strength of materials would include tensile strength, elongation, compression, elasticity, and torsion. The school should also give instruction in the working of alloy steels, commonly known as high-speed steels, the use of high and low carbon steels, and the speeds at which the various materials used in the machine shop may be worked.

BLACKSMITHING.

Blacksmithing is a mechanical trade which is almost separate and distinct from the other mechanical trades with which it is allied. There is little or no relation between the blacksmith shop and the foundry, as the kinds and properties of the materials and the methods of handling them are entirely different. The only relation it bears to the machine shop is in the forging and dressing of tools; although this comes under the head of blacksmithing, it is at times classed as a separate and distinct occupation.

Processes.

The forge: The forge is generally a structure of iron, although it is sometimes constructed of brick or stone, upon which a smith's fire is built. In the bottom of the hearth, upon which the coal is placed, is a tuyère or opening through which the draft is applied. The mouth of the tuyère is covered generally with a perforated sheet which will allow the air to pass through freely, but prevents cinders and any foreign matter from dropping into the blast pipe. Should any pass through the small openings, which will occasionally happen, they are taken out below from an opening which is for that purpose. A hood for the forge is constructed of sheet metal and fastened to the chimney of the forge. The purpose of the hood is to catch and conduct the smoke to the chimney, which in a modern shop contains a suction draft to assist in the conveyance of the smoke from the forge. Fastened to the forge for the convenience of the workman is a water and coal trough, also a rack for tongs.

Firing the forge: To fire a forge, all clinkers and other matter which would obstruct the building of the fire are first removed. Some good inflammable material, such as wood shavings or oil waste, is then selected and placed on the hearth of the forge over the tuyère. Coal for the forge should be of the best quality soft coal thoroughly moistened; this when heated causes an adhesive tendency or causes it to coke. The selection of coal containing hard spots, which cause an uneven fire, should be avoided. Coal should be carefully placed around and over the ignitible material, leaving only an opening on the top for the draft and one in front for the placing of the metal to be heated. The material is then ignited and the proper draft applied until the coal is caught and fire is ready for work. The fire is shaken occasionally in order to maintain a live fire and even heat; if this is not done, the interior burns out, leaving a hollow space which renders the fire worthless for heating. On leaving the fire it is banked by placing fine damp coal over the entire fire—this keeps the fire alive and retains the heat.

Heating the iron: The iron should be properly placed in the fire in order that the heat be evenly distributed. This is very important, especially in welding, as stated later.

Upsetting: This is the method of shortening or increasing the dimension of a piece of hot iron or steel by hitting upon end.

Cutting off: The process of removing superfluous stock (hot or cold) by the use of cutting-off tools.

Scarfing and welding: This is one of the most difficult problems which the workman has to master. He may become skilled in all of the different operations involved in a forge shop and yet never become proficient in the art of welding. This is a process which is involved in the majority of forge-shop problems from the simplest to the most difficult work. Therefore it is necessary that the apprentice should acquire this knowledge at an early stage of his course.

Scarfing: The process of flattening or chamfering edges of iron preparatory to welding. The two surfaces being drawn out obliquely, a larger contact is given to them, which fortifies the junction of the two pieces. The two pieces should be upset before the scarf is made. Care should be exercised in performing this operation, as the class of weld depends almost entirely upon the nature of the scarf. Scarfing is not necessarily a preparatory step to all welding, for instance, in the butt weld, when the two pieces to be welded are simply abutted together, sometimes in the fire, after proper upsetting.

Welding: The process of incorporating or joining together two pieces of wrought metal while at a white heat. The metal at this temperature is in a plastic or semi-fused condition; therefore when placed together the semifused metals, after being properly hammered, unite, causing a solid body or joint. In heating iron or steel for welding a scale is formed which prevents the uniting of the two pieces. However, in the case of iron the scale, or oxide, melts at a lower temperature than the iron, and as a result the weld will be good if the proper heat has been secured. With soft steel or Norway iron the condition is different; the scale melts at a higher temperature than the welding heat. To overcome this difficulty, it is necessary to use something to soften or melt the scale. For this purpose, what is known as a flux is used.

Fluxing is the application of some good welding preparation to the joint before being welded. With iron, a good clean beach sand is sometimes used, but with soft steel sand only is used, as it melts and combines with the scale, causing it to liquefy, in which form it is easily forced from between the pieces to be welded. For welding tool steel to iron or soft steel a flux made of borax and sand is used. It is necessary that the metals should be taken from the fire at the proper time. If taken from the fire too early, the pieces can not be successfully welded, and if left in the fire too long the metal will be burned, rendering it useless for service. Great care should be exercised in heating, as both pieces should be heated evenly and to the same temperature.

Practice in bending and shaping of iron and steel with the necessary tools should receive due consideration, as this is the foundation for all advanced handwork.

The ingot is an oblong block of steel before it is forged or rolled. The ingot is cast in the steel foundry in an ingot mold, which is a mold made of cast iron of great thickness and accurately fitted. As soon as the steel is set in the mold the hot mass is taken by a crane from the ingot mold and placed in a soaking pit to be annealed. The exterior of the ingot while the metal is setting becomes chilled. The soaking pit is a mold made of fire brick beneath the floor, with all air excluded. When the ingot is placed in the same the interior heat of the ingot reheats the exterior surface and causes it to soften or anneal. When this process is finished the ingot is taken by a crane to the steam hammer, where it is drawn out roughly to shape. It may be necessary to reheat a number of times. This depends upon the amount of work to be done on the ingot and the speed of doing the work.

The steam hammer is a forge hammer consisting of a steam cylinder placed vertically over an anvil, the trip or hammer-head rising and falling by the power of steam. The trip is controlled by a lever which is generally operated by a hammer boy. The work is conducted to this hammer by means of hooks and held in place by special tongs. A large portion of steam-hammer work is drawn out to templates.

A template is a temporary pattern, guide, or model, by which work is either marked out or by which its accuracy is checked. Working to a template requires accuracy on the part of the operator, as the forging is generally finished by him, except where it is to be spotted or finished in the machine shop.

Tools.

Sledge hammer: The simplest and one of the most used tools is the sledge hammer. This tool is used for nearly all striking that is done on the anvil.

The anvil: The anvil is a heavy body of cast or wrought iron with a steel face welded on, casehardened; this prevents indentations being made in the anvil by use of hammers and other tools. One end of the anvil is horn shaped for rounding and doing small work; the opposite end contains two holes, one square, one round, which are to receive the ends of the various anvil blocks.

The hand hammer: The hand hammer is used in bringing a piece to proper shape, the work being finished by the use of various other tools, such as the fuller.

The fuller: The fuller is a half-round tool used to draw out or force out the heated metal, form grooves, etc. There are two kinds of fullers, top and bottom. The top fuller has the appearance of a hammer and is held on the work by a handle; the bottom fuller is the same shape as the top one, but contains a stem which fits into the anvil.

The flatter: The flatter is a broad-faced hammer used to dress and smooth work after it has been drawn into shape by the use of hand hammers and fullers.

Chisels: Two kinds of chisels are generally used, one for cutting cold and one for cutting hot iron. These tools are usually made in the shape of hammers, one side being forged and flat with a cutting edge ground on it; the other end is used for striking purposes. The hot chisel is ground thinner than the cold, because the chisel which is used for cutting cold iron has to be tempered medium, for it would break if ground very thin.

The hardy: The hardy is a block of iron ground to a sharp or chisel edge which fits on the anvil and is used for cutting-off purposes. There are various shaped anvil blocks and hand hammers which would be classed as special tools.

Tongs: Tongs for holding the work are made in a wide variety of shapes and sizes, depending upon the work that they are intended to hold.

Product or specialties.—The product of the blacksmith in Richmond consists of forgings used in the construction and repair of locomotives, forgings for ornamental and structural iron and steel, horse and mule shoes, and general repair work.

Importance of the trade.—There are about 400 journeymen and apprentices engaged in this occupation in Richmond.

Conditions of employment.—The work of the blacksmith is very heavy and consequently results in a physical strain. Where the work is of a diversified nature it tends to stimulate the intelligence, but in work that requires very little thought, or is a continual repetition of the same process, the work would tend to narrow or restrict the mental development. There is liability to accident from improper striking by helpers and of injury to the eyes from flying particles of steel.

Economic conditions.—The apprentice to this trade receives from $5.94 to $7.29 per week the first year, from $7.02 to $8.57 per week the second year, from $8.10 to $9.45 per week the third year, and from $9.18 to $11.09 per week the fourth year. The hours of labor are from 9 to 10 hours per day for six days and 54 to 60 hours per week. There is no busy or slack season in this line of work and the fluctuation of employment is inconsiderable. The journeyman's wages range from $15 to $21.99 per week and the union scale is from $17.87 to $22.14 per week. The trade is organized, covering about four-fifths of those actually engaged in the trade.

Age of maximum productivity.—The apprentice enters this trade between the ages of 16 and 20 and serves a four years' apprenticeship, and his period of maximum productivity is from 22 to 45 years of age.

Demand for labor.—The supply of labor is adequate to meet the demand, but there seems to be a gradual increase in the demand for skilled workmen in this occupation. The source of supply is from the lower grammar grades of the public schools.

Educational and technical requirements.—A mechanic who wishes to become proficient at the trade and to properly advance himself or to understand its theory, such as the properties of the iron he is using—viz, welding, tempering, strength of materials, etc.—ought to have some academic and mechanical training other than is given in the shop. This trade, as is the case of many others of to-day, is becoming specialized. Men become very skillful in performing a certain operation or manipulating a certain machine, but know very little concerning the different operations or conditions which surround them. The work requires strength, endurance, and manipulative skill to be able to complete it successfully.

What the industry gives.—The apprentice during his four-year period acquires a knowledge of the tools and their use. The first year is spent in helping around the fires and in handling small work on the anvil. His work for the following two years is graded according to the ability shown, and if he has been diligent and applied himself to the trade he is given every opportunity to learn. The remainder of the apprenticeship period is spent in handling the best class of work in the shop and in learning to temper tools properly. This is very important and the boy should be given ample time to acquire this knowledge.

Deficiencies of workmen.—The common deficiencies of the worker are a lack of general education and especially a lack of knowledge of mathematics and mechanical drawing.

What the school ought to give.—The school should give the prospective apprentice an elementary industrial education and instruction in mechanical drawing, metal work, and shop mathematics.

BOILER MAKING.

The trade of boiler making consists of the laying out, shaping, bending, flanging, assembling, and the riveting together of plates to form a cylindrical shell within which tubes or flues are placed, and the making of smoke boxes, uptakes, dampers, funnels, casings, and the necessary fittings.

Processes.—The boiler plate is laid off by the mechanic, called the layer out, to proper size and shape, and the holes are located for connections and rivets, after which it is placed on the punch machine either by the use of a crane or by hand. The holes are then punched for connections and rivets and the plate is moved to the shear machine where it is cut to the proper size and shape. The plate is then run through the rolls which gives to it a cylindrical shape. It is now ready for the fitter. If the shell is to be made with a butt joint, the plate must be chipped or planed to fit, and the butt strap placed over the joint and the holes reamed with hand or machine reamer to make certain the matching of holes in plate and strap. If made with a lap joint the edges of the plates are lapped and the holes reamed out to match for rivets. A few bolts are placed in the rivet holes to secure the plate while being riveted. The plate is then riveted either by hand or machine. The rivets are heated red-hot and the head end of the rivet is placed on the inside of the cylinder and the rest of rivet projecting through the plates is headed up either by hand hammers or by machine. The rivet is held in position by a holder on or bucker with a hammer or bucking iron while it is being headed on the outside. The proper spacing of rivet holes is necessary because of the constant strain upon the rivets.

The boiler is then set upon blocks and perforated heads, called tube sheets, placed in each end of the cylinder, which are for the purpose of holding the tubes in position. The tubes are passed through the sheets and the ends turned over or flanged on the outside of the plates. These tubes, or flues, convey the heat to the water which covers them, or contain the water which is heated by the hot gases or flames passing around them. The smoke box, fire box, and other parts made in the boiler department are placed in position and riveted on. The edges of plates are now chipped and joints calked to withstand required pressure of water or steam. The stay bolts are now placed in position and the boiler is ready for the machinist to set valves and gauges.

Product or specialties.—The product of the boiler maker is stationary and locomotive boilers and their parts.

Of the various types of boilers made, two are cited as illustrative.

First, the shell boiler—one which is self-contained and in which the water is circulated. This type of boiler has fire tubes or flues traversing the length of the boiler through which the flame and heated gases of combustion pass to impart the heat to the water which covers them, thereby causing steam to generate.

Second, the tubular or water-tube boiler—one in which the water is contained in the tubes around which the product of combustion circulates, on courses determined by suitable baffles.

Importance of the trade.—In boiler making there are about 375 journeymen and apprentices in Richmond, the majority of whom are actually engaged in construction work.

Economic conditions.—The wages of the apprentice to the trade for the first year are from $5.94 to $7.29 per week; for the second year from $7.02 to $8.57 per week; the third year from $8.10 to $9.45 per week, and for the fourth year from $9.18 to $11.09 per week. The rate of wages for apprentices in this trade is generally a little higher than in the other metal trades because of the lack of apprentices entering this line of work. The wage of the journeyman in this trade varies from $18 to $23.09 per week, and the union scale is $22.14 per week. The hours of labor in the various shops are about the same, 9 hours per day, 54 hours per week, and 9 hours on Saturday. There seems to be no seasonal period of activity and the fluctuation of employment is inconsiderable. The majority of the boiler makers are employed in the railroad shops of the city and these shops are thoroughly organized.

Age of maximum productivity.—The apprentice enters this trade from 16 years up to 20 years of age. He serves a period of four years' apprenticeship. After the apprentice has finished this four-year period he does not reach his maximum productive period until he reaches the age of 25 years, and until he is 55 years of age he is thoroughly efficient.

Demand for labor.—The demand for this class of labor is normal and there seems to be no reason to believe the supply will be inadequate to meet the demand for some time. The source of supply is from the lower grammar grades of the public schools and through an apprenticeship system.

Educational and technical requirements.—The worker needs first a grammar-school education to be able to grasp things and to think in the proper channel. He should have instruction as to the processes immediately involved in the construction of boilers, as to strength of materials, in the principles of the construction of the different types of boilers, and the principles of steam engineering, mechanical drawing, shop mathematics, and blue-print reading. The boiler maker requires skill in adjusting plates and bands and in operating special machines. Strength and endurance are necessary to enable the mechanic to do his work properly.

Deficiencies of workmen.—The common deficiencies of the boiler maker seem to be a lack of general education, very little knowledge of blue-print reading or mechanical drawing, and especially a lack of shop mathematics.

What the industry gives.—The apprentice to this trade is accepted after he has reached the age of 16 and is required to serve four years' time. On coming into the shop he is put to heating rivets. The rivets being one of the most important parts of the boiler, as the strength of the boiler depends largely upon proper riveting, it is essential that the spacing, driving, etc., should be properly done.

When rivets are heated they are passed by a helper to a holder on or bucker, who holds the rivet in position for the riveter or riveting machine. The apprentice, although only heating, gains from observation a knowledge of the different processes through which the rivet goes before and during the riveting. As soon as the boy becomes a proficient heater or when he has worked at it long enough to satisfy the foreman, he is advanced to reaming. The reamer is a fluted tool with cutting edges, used to enlarge and smooth the drill holes in the boiler plates. The reamer is generally one thirty-second of an inch larger than the drill used. It is operated by hand, hydraulic, or electric power.

Care should be exercised in the holding of the reamer, which should always be perpendicular to the work being reamed. During this process the apprentice acquires a certain degree of accuracy and becomes familiar with the handling of the hydraulic and electric reaming machines, but not with their mechanism, as he is not far enough advanced to take up work of this nature.

The next step is drilling, using air, hydraulic, and electric machines. Nearly all of the drilling and reaming machines are portable. This work requires a small degree of mechanical ability, as the holes to be drilled are all laid off and their location center punched by the layer out.

Care should be exercised in the placing of the drill, so as not to scar the boiler plate. The drill should be started and kept absolutely perpendicular during the process of drilling, excessive speed being guarded against, as the drill will be burned when run too fast.

After this preliminary training, which the apprentice has acquired by observation and practice, he is given the riveting machine and instructed in its use and care. This is a machine by which the operation of closing rivets is performed by power (air, hydraulic, steam, or electricity). The rivets are placed from the interior and held in position by a bucker with a heavy sledge or bucking iron. The riveting machine is then placed upon the rivet, which is still hot, and the head is formed, either flat, conical, or button head, as desired. The first six months of the apprenticeship course has now been about covered, and the methods of heating, drilling, reaming, and the operation of the riveting machine should have been acquired, also a knowledge of joints (butts, laps, etc.).

Twelve months of the apprenticeship is generally spent in acquiring a knowledge of patching. Patching is the closing of holes or leaks in old or new boilers, a work which requires accuracy and skill. Proper measurements of the patch should be obtained, after which the piece should be laid out from the same thickness of boiler plate as the one upon which it is to be placed, and should then be cut to the proper size by the use of the shearing machine. This is a machine consisting of shears driven by power, used to cut off the rough edges of plates or to trim them to exact dimensions. The knives are set at an angle with each other, so that the cut takes place from one end to the other, as with a pair of scissors.

The patch should be properly spaced and rivet holes drilled, it then being used as a template to drill the holes in the boiler, after which it is fastened in place and the holes reamed; the rivets are then headed over. The rough edges of the patch are then chipped off by the use of a flat chisel and hammer. Here the apprentice acquires a knowledge of chipping and the proper method of holding, using, and care of chisels. The patch now has to be calked outside only. This is done by striking a chisel or calking tool (a blunt-edged chisel) with a hammer, making a slight indentation along the same. The effect of this is to force the edge of one plate hard against the other or to drive a portion of the overlapping edge into the seam, and thus fill up any slight crevice between the plates which the rivets had failed to close.

The first important step pertaining to boiler making has now been covered, most of which has been handwork.

Machines: Instructions should be given at this time concerning the flue-rolling machine. The flues are tubes placed within the boiler for the conveyance of hot gases and smoke. They are made of thin sheet plates run over rolls and pressed to a cylindrical shape. An angle is formed on each edge, which edges interlap and when pressed together tightly and welded form a solid joint. Instruction in the details of the shear and punch machines should be given. The punch machine is used to perforate or punch holes in sheet metals by the use of power. It is not very complicated, but it is absolutely necessary to have a thorough knowledge of its mechanism and to be fully competent to perform the different operations for which it is used. The majority of the operators of these machines are specialty men.

The flange press: Flanging is the method of turning up the edges of a boiler plate to lap a joint and to secure same to another plate. Most flanging in the larger shops is done on a flange press, while in smaller shops it is done by hand. The flange press is a machine for bending the edges of the boiler plates. It consists of two formers or dies, one male, one female. The boiler plate is hot when brought to the press, being heated in a furnace. It is placed upon the male former or die and the machine set in operation. The female die is then applied and the rib or flange is formed.

Hand flanging is very laborious and accurate work, therefore a worker requires considerable experience to become proficient in the art. The hot boiler plate is placed upon a bending floor, which is made of iron perforated with holes to admit hooks or dogs for holding the plate in position. The flange is previously laid out by center punch marks and worked to a template. The flanging is done by hitting the projecting edges of the boiler plate with a large wooden mall or mallet. This is used in preference to a metal mallet because it does not scar or cause indentations to be made in the flange. The work previously stated has covered most of the apprenticeship. The remainder of the time should be devoted to laying out and other advanced work of the shop.

What the school ought to give.—Since the shop gives practically all the knowledge necessary for manipulative skill in the tools used in the construction of the boiler, the school should supplement this knowledge by instruction in mechanical drawing, shop mathematics, strength of materials, and some knowledge of steam engineering.

TINNING.

Processes.—A tinner works sheet tin, galvanized iron, and sometimes sheet brass and sheet copper. What is commonly known as tin is sheet iron covered with a thin layer of tin by passing the iron through a cleaning bath and then through a bath of molten tin, after which it is wiped off while still in a molten condition. The processes of the trade are as follows: In flat work the selection of proper gauge of material to use and the bending of lock joint by use of folder or brake, the laying of the tin and the closing of the joint by the use of mallet and seamers or roofing tongs. If solder joint is necessary, the soldering fluid is applied to joint or lap, generally by the use of a feather, and the flux sprinkled on. The sheets are lapped and solder stick is held directly over the joint and soldering iron is applied to same, melting the solder and causing it to run on the joint which causes fusing, which connects the pieces.

In tinware or house furnishing goods work, a pattern is first made and cut, making allowances for seam or lock joint, and turn up for the purpose of wiring or for hem at top or bottom. Sometimes it is necessary to make allowance for thickness of metal, when bent, but materials that gauge from 20 to 30, inclusive, require no allowances either for bending or rolling.

Wiring may be done either by hand or machine. The edge to be wired is first notched at an angle in one place and with a pair of pliers the edge at this point is turned up and the wire laid in and the edge bent over snugly around the wire, to hold wire in position until same is stretched around the article and edge turned over same to make the finish. The lock seam is made on the groover, the double seam either by hand or machine. Either the lock or double seam may be used when bottom and sides are joined together.

The processes are practically the same in sheet metal and cornice making as in tinware. The variations occur in the making of pattern because in sheet-metal work, the material being heavier, allowance has to be made for the thickness of the material in bending and rolling in machines. In sheet-metal work the metals used may be galvanized iron or steel, boiler plate, zinc, copper, and brass. Band iron is used for reinforcing and square or round rods for bracing. This work may be jointed either by lock or double seam and sometimes by lap joint and rivets.

Product or specialties.—The industry is divided into several divisions, the main ones being roofing, inside tinning, cornice and skylight making. In the earlier days the inside tinner made all sorts of household utensils of tin, but in recent years the use of tin for this purpose has decreased, aluminum and enameled ware having taken its place to a large extent.

Importance of the trade.—There are about 56 journeymen and apprentices engaged in this occupation in the car shops of Richmond, and the work consists of the repairs on cars and plant when necessary, and in some cases of replacing tin and sheet-metal utensils used on cars and around the plant.

Conditions of employment.—The work generally is very light and for that reason the employment causes no physical or nervous strain. In the car shops there is a great variety of work which has a tendency to stimulate the interest of the worker, and none of the work narrows or restricts the mental development. The trade is not unhealthful and there is very little danger of accident.

Economic conditions.—The apprentice to this trade serves a period of four years and receives in wages for the first year from $5 to $7.29 per week, the second year from $6.25 to $8.57 per week, the third year from $7.50 to $9.45 per week, and from $8.75 to $11.09 per week for the fourth year. The hours of labor are from 9 to 10 hours per day, 54 to 60 hours per week, and 9 to 10 hours on Saturday. The rate of wages for journeymen in this trade is from $19.17 per week to the union scale of $22.14 per week.

Employment in this occupation in the car shops of Richmond is fairly constant, and therefore very little fluctuation either from slack or busy season is shown. Most of the work is repair or replace work, and there is always work found for those who desire it. Tinners and sheet-metal workers in the metal trades have no organization of their own, but are members of the boiler makers' union.

Age of maximum productivity.—The apprentice enters this trade between the ages of 16 and 20. The apprenticeship is of four years' duration. The period of maximum productivity is from 21 to 45 years, after which his usefulness decreases.

Demand for labor.—The supply of labor is adequate to meet the demand at present. There should be a gradual increase in this line of work because of the increase in use of steel cars, but, owing to the abnormal business conditions that exist at present, the trade is about stationary. The supply seems to come from the lower grammar grades of the public schools and through a fairly good apprenticeship system.

Educational and technical requirements.—The worker to become proficient in this trade needs first an elementary-school education, instruction as to the use of tin and sheet metal, as to the composition, weights, and qualities of the sheets, instruction in pattern cutting and drafting, shaping and soldering of sheets, and in the use of special tools. The worker should have a knowledge of mechanical drawing and blue-print reading, and especially of shop mathematics applied to the trade. Initiative and dexterity are required of the worker in this trade because of the thought and skill necessary in a great amount of the work.

Deficiencies of workmen.—The great majority of the journeymen in this occupation have no knowledge of pattern cutting, drafting, or of mechanical drawing and very little of shop mathematics as applied to the trade. General education is also lacking in the majority of workers in this trade.

What the school ought to give.—The apprentice to this trade should receive an elementary-school education, supplemented by prevocational courses in mechanical drawing, pattern cutting and design, shop mathematics as applied to the trade, and a course in metal work in general.

RIVETING AND BUCKING.

Processes.—The riveter closes or forms a head on the protruding end of a rivet with a special riveting hammer or automatic riveting machine, usually driven by air, hydraulic, steam, or electric power. The rivet is a soft-metal bolt having a head on one end, used to fasten together two metal plates.

Bucking is the holding of the rivet in place while the opposite head is being formed by the riveter. The holding-on hammer or bucking iron is a heavy bar of iron with a countersunk end to admit the rivet head. The hole for the rivet is always made a little larger than the rivet, so that it may be easily admitted. If the hole is not well plugged, the rivet will not stand the calculated strain. Therefore, the action of the riveting machine upon the red-hot rivet in forming the opposite head while the rivet is being held in place by the bucking iron causes the stem of the rivet to expand or upset and completely fill the hole.

Steel-car work is classed as steel construction work, the same processes and machines being used in their construction and repair. Riveting and bucking is a very small portion of the great variety of work necessary to the construction of steel cars.

The riveting and bucking in the car shops of Richmond is done by the general boiler makers and repair men, except that a considerable amount of the riveting is done by the apprentices, who spend a portion of their apprenticeship on this work for the practice it gives them. The possibilities for advancement are greater than in many other lines because of the increasing use of steel cars.

Product or specialties.—The product of the riveter and bucker in Richmond is the riveting together of steel plates on cars and boilers and the riveting of parts in locomotive construction.

Importance of the trade.—There are about 20 workers in this occupation, most of whom are apprentices or learners in the boiler-making trade and in steel-car repair work.

Conditions of employment.—The work is heavy and requires strength and endurance, and the constant noise from the hammers causes partial deafness.

Economic conditions.—There is no apprenticeship system, but some of the apprentices to the boiler-making trade work at this occupation for the practice it gives them. The wages for the workers range from $15 to $18 per week. The occupation is unorganized. The hours of labor are 9 hours per day, 54 hours per week, and 9 hours on Saturday. There are no slack and busy seasons, and the fluctuation in employment is inconsiderable.

Age of maximum productivity.—The period of maximum productivity is from 25 to 50 years of age.

Demand for labor.—The supply of labor in this special line is adequate to meet the demand at present, but there is a gradual increase in the demand caused by an increase in the use of the steel car. The supply of recruits is made up of casual laborers.

Educational and technical requirements.—The worker in this occupation should receive an elementary industrial education, and while it is a fact that no special demand in an educational way is made on the riveter and bucker there is an opportunity for the beginner to advance by entering the trade of boiler making as an apprentice.

What the industry gives.—The industry gives very little either in trade or technical knowledge. The beginner may acquire a knowledge of the handling of the machine or hand hammer and of the proper way of heading up a rivet, but beyond this the occupation gives him nothing.

Deficiencies of workmen.—The majority of the workers in this occupation are deficient in general education, and without general education and some technical education the worker could not expect to advance in any of the allied trades.

What the school ought to give.—The school should give to the prospective apprentice in the boiler trade, who works at riveting and bucking for the practice he can acquire, mechanical drawing, shop mathematics, the theory of boiler construction, and the rudiments of steam engineering.

PIPE FITTING (CAR SHOP).

Pipe fitting in car shops varies very little in the methods employed from those in use in establishments in the building trades. The car work done in Richmond, being entirely repair work, necessitates a knowledge on the part of the workman of the various lines of pipe work, such as gas, steam, air, and water fittings, and should be thoroughly understood. This class of work in the car shops, being of a general nature, necessitates the continuous changing of the pipe fitter from one line of work to another.

Processes.—The processes of the trade are as follows: The cutting of the pipe by the use of the pipe cutter; the threading of the end of the pipe by the use of dies; the bending of the pipe (either cold or heated) by hand or machine—wrought-iron pipe is generally bent cold; copper and brass pipe is usually heated and then bent—the wiping of the threaded end with either white or red lead; and fitting or screwing on of couplings, nipples, ells, tees, or other connections by the use of wrenches.

Product or specialties.—The different classes of pipe work in the car-repair shops are as follows: Gas-pipe work, water piping, steam piping, and air piping, and the work necessitates the use of lead, wrought iron, brass, and copper pipes.

Importance of the trade.—In the metal trades the journeymen and apprentices engaged in this occupation number about 20, and practically all are employed in the railway car shops.

Conditions of employment.—This work, while strenuous, involves no peculiar physical, mental, or nervous strain. The majority of those engaged in pipe fitting in the car shops of Richmond served their apprenticeship in the shops in which they are at present employed, and the work being fairly steady there is very little change in the force of men. There is very little pipe work that is not interesting and that does not require intelligence to execute. Some of the work such as laying pipe lines, or some of the simpler work, requires very little thought or initiative, but on the whole the work of the pipe fitter can be said to stimulate the intelligence of the worker. The trade is fairly healthy except in repair work on sewer lines, where the worker is subject to poisonous gases and disease germs. In steam-fitting work the liability to burns is great if proper precaution is not taken.

Economic conditions.—The apprentices' wages range about the same in pipe fitting as in the other trades in the car shops. The first year the wage is from $5.94 to $7.29 per week, the second year from $7.02 to $8.57 per week, the third year from $8.10 to $9.45 per week, and the fourth year from $9.18 to $11.09 per week.

The hours of labor are from 8½ to 9 per day, from 48 to 54 hours per week, and from 5½ to 9 hours on Saturday.

The wages for journeymen range from $13.44 to $24 per week, and the union scale is from 35 to 50 cents per hour.

There seems to be no seasonal period of activity in this branch of trade and practically no fluctuation in employment. In the car shops when the work is slack or when necessary to reduce expenses the number of hours are reduced, and in this way the workmen retain employment. The journeymen in this trade are members of the plumbers' and steam fitters' local organization.

Age of maximum productivity.—The apprentice to this trade enters between the ages of 16 and 21, and is required to serve a period of four years, and while the apprentice is required to take a course of study during this period (either with the International Correspondence School, Railroad Y. M. C. A., or Virginia Mechanics' Institute), it apparently does not follow that the course of study taken applies to the work in which the apprentice is engaged. The age period of maximum productivity is between the ages of 21 and 45. While there are some men in this trade who are beyond the age of 45, they are few, and this seems to be a fair average.

Demand for labor.—The supply of labor is adequate to meet the demand. The source is an apprenticeship system recruited from the lower grammar grades of the public schools.

Educational and technical requirements.—All of the laying out, cutting, threading, and bending is done in the car shop, and generally by the apprentices under the supervision of a competent mechanic. The journeyman pipe fitter should have a thorough knowledge of the different pressures of steam. gas. water, etc., for which he is to pipe. The pipe fitters' tools consist of taps, dies, cutters, reamers, pliers, wrenches, etc., and are so numerous that there seems an endless variety. The major portion of gas piping is work connected with the plant, in and around the buildings. The reason for this is because gas is used very little in passenger cars at the present, with the exception of the dining car, where it is used almost exclusively for cooking purposes. The gas-lighting systems are being rapidly replaced by electricity. Wrought iron and lead pipe are used for water systems. Most of this class of work is done in engine repairing, dining-car, passenger-car, and refrigerator-car repairing, and also the water lines around the plant.

Air-pipe fitting is confined almost entirely to air-brake and other safety appliance work. There is more work of this character than any other line of pipe work in the car shop, as all passenger and freight cars are equipped with air brakes. All of the steam fitting is in engine-repair and car-heating systems, the most of it being car-heating work. All air and steam-pipe work require better joint fitting than water and gas. This is due to the larger amount of pressure of steam and air, and also to the contraction and expansion of the steam pipe.

What the industry gives.—The industry gives to the workman practice in the manipulation of the tools of the trade and in the actual construction of the work in hand, but no theory except what he can pick up in the trade. There is no reason, however, why a pipe fitter who applies himself to the study of air brakes should not become an inspector, but the only real chance for promotion is from an efficient mechanic to a foreman.

Deficiencies of workmen.—In pipe fitting the common deficiencies seem to be a lack of general education, especially in arithmetic as applied to the trade, blue-print reading, and lack of initiative in handling the work.

What the school ought to give.—The apprentice to the trade should be given a general education and prevocational training in mechanics, instruction in pressure of air, steam, gas, and water, and shop mathematics to enable him to compute pressures in the different lines of pipe work.

CAR REPAIRING.

Processes.—The car is run into the shop and jacked up, and the trucks removed and run into the truck-repair shop. The car is then let down onto trestles where it remains until it is ready to paint. Afterwards it is stripped of all trimmings, which are turned over to the polishing department, where all lamps and other fixtures are repaired and polished; the seats are turned over to the upholstering department where they are cleaned and repaired ready for the car when finished. The car is then either washed outside or the paint burned off, and washed inside, after which an inspection of the car is made by the "leading man" and all defects noted and a report made on the cost of repairing. The body men and platform men then make all necessary repairs.

Passenger-car body repairing: The body men do all repairing on the body, both inside and out. The work consists of replacing end sills, longitudinal sills, body bolsters, needle beams, crossties, bulkheads, partitions, and all necessary parts to put the car in proper repair.

Steel-car repairing: The work consists of straightening sheets and steel parts and riveting plates and such other work as would be necessary in repairing a car of steel construction.

Freight-car repairing: The work consists of repairing or replacing brace rods, bolsters, brake cylinders, and pipes, doors, draw timbers, flooring, grab irons, sills, etc., on the body, and riveting on truck frames, removing and applying journal boxes, replacing springs, and doing any required work on trucks.

Truck repairing: Truckmen repair all trucks and build new ones when necessary. The extensive use of steel truck frames has considerably reduced the number of truckmen, as any bent or broken frames are straightened and welded by blacksmiths. These frames are complete steel castings with no wood at all about them.

Platform repairing: Platform repair men do all work connected with platform and steps. They repair platforms and steps and build new ones when necessary.

Air-brake rigging: In all car shops there are several men who apply and test all air-brake rigging. This work requires about the same degree of skill as is necessary on other car work. The men have nothing to do with the repair of air-brake valves, as such work is done by machinists specializing on air brakes and the valves necessary to the operation of the brakes.

Coach trimming: All metal work in a car is put in place by men known as coach trimmers. The trimmings consist of hinges, door locks, window locks, hand-baggage racks, cord hooks, lighting fixtures, and whatever metal trimmings are required for the complete equipment of a car.

Inside car repairing: A certain class of repair work requires the most skilled workers. In some shops these men are called cabinetmakers, while in others they are considered as car repairers. In all cases the men are taken from the regular force, and their work consists of repairing and making chairs, tables, desks, and high-grade work for cars and fixtures for shop use.

Product or specialties.—This work covers the repairing of passenger, baggage, mail, and freight cars and cabooses.

Importance of the trade.—There are about 350 journeymen and apprentices working in this trade in Richmond.

Conditions of employment.—There is nothing in car repairing which makes any injurious demands upon the physical or nervous system. As the work is varied in character, it does not narrow or restrict the mental development, and the high-class work should stimulate the intelligence.

Economic conditions.—The wages of the journeymen workers in this trade range from a minimum of $11.61 to a maximum of $24.30 per week. The union wage is 35 cents per hour. The apprentice wage in this trade is from $5.94 to $7.29 per week the first year, from $7.02 to $8.57 per week the second year, from $8.10 to $9.45 per week the third year, and from $9.18 to $11.09 the fourth year.

The hours of labor for men employed in this trade are 9 hours per day, 54 hours per week, and 9 hours on Saturday. There is no busy or slack season in this trade and the fluctuation in employment is practically nothing. The men in the trade are completely organized.

Age of maximum productivity.—The workers in this trade enter between 16 and 18 years of age and serve an apprenticeship of four years. The period of maximum productivity is between the ages of 25 and 55.

Demand for labor.—The supply of workers in this trade is adequate to meet the present demand. The demand is decreasing for repair men on wooden cars and increasing for those on steel cars because of the more extensive use of the latter. The workers enter as apprentices and are recruited from the lower grammar grades.

Educational and technical requirements.—These workers need a grammar-school education, knowledge of drawing, mathematics, and modern practices in the trade. They need manipulative skill in handling the hand and machine tools, and require initiative, strength, and endurance.

What the industry gives.—An apprentice serves four years, divided about as follows: Six months on truck work, six months on rough work in the shop, three months doing platform and step work, three months laying off work, six months on locomotive woodwork—"engine work" it is called, one year on the outside of passenger cars, and one year on the inside of passenger-car bodies. Practically all that the apprentice acquires during this time is the manipulative skill required to actually do the work, getting but very little of the technical side of the work. The line of promotion in this trade is from apprentice to journeyman to foreman.

Deficiencies of workmen.—The workers in this trade are deficient in general education, mechanical drawing, and blue-print reading, and in mathematics of the trade.

What the school ought to give.—The schools should give the worker before he enters this trade a complete grammar-school education with prevocational training in woodwork. After he enters the trade the practical knowledge acquired while at work should be supplemented by courses in mathematics, mechanical drawing, and modern theory and practice applied to the trade. The schools also might well provide the opportunity for acquiring facility in the use of certain tools and machines.

MACHINE WOODWORKING (CAR SHOP).

Processes.—The work in this occupation consists of the practical experience in the use of circular saws for cutting off, ripping, and sawing angles; band saws for cutting angles and irregular shapes; scroll saws for sawing curves and scrolls; planes for planing and cutting to the required thickness; jointers for straightening, smoothing, and beveling edges; mortising machines for cutting mortises; tenon machines for cutting tenons; molding machines for making ornamental moldings; shapers for finishing edges of work of irregular shapes; sandpapering machines for finishing surfaces; lathes, boring machines, and various automatic machines for sharpening saws and edged tools.

Product or specialties.—The worker in this trade prepares material for the repairing of passenger, baggage, and freight cars and cabooses.

Importance of the trade.—In Richmond there are about 50 journeymen and apprentices employed in this trade.

Conditions of employment.—There is nothing in this occupation which involves either mental or physical strain to an excessive degree, but there is considerable danger from the operating of the machines, and the dust which is raised is injurious to the health. This work is varied enough in character to stimulate the intelligence and interest unless the worker is kept continuously upon one class of work.

Economic conditions.—The wages of journeymen in this trade range from a minimum of $12.96 to a maximum of $18.90 per week, this latter being also the union wage. These men work 9 hours per day, 54 hours per week, and 9 hours on Saturday. There is no busy or slack season in this trade and practically no fluctuation of employment. The workers in this trade are completely organized.

Age of maximum productivity.—The workers in this trade usually enter between the ages of 16 and 18 and serve an apprenticeship of four years. The age period of maximum productivity is from 25 to 55.

Demand for labor.—The supply of workers in this trade is adequate to meet the demand, and this demand is decreasing because of the introduction of steel cars. The workers are recruited from casual labor and from boys of the lower grammar grades.

Educational and technical requirements.—The worker in this trade should have a complete grammar-school education and a knowledge of blue-print reading, mechanical drawing, and mathematics applied to the trade. Also modern theory and practice in the trade and a knowledge of the construction and operation of a great variety of woodworking machines as follows:

Saws, classified under three heads—circular, band, and scroll:

The circular saw is fastened on a spindle or arbor driven direct by a belt pulley fastened to the same shaft. The arbor is usually supported by a frame which in turn supports the saw table. This saw is used for cutting off, ripping, and the cutting of various angles.

The band saw, an endless band of steel with teeth cut into one or both edges, generally about one-sixteenth to one-fourth of an inch in thickness. The width ranges from about one-fourth inch to 14 inches. The band is operated over two rubber-faced wheels placed directly one above the other. Between the wheels is a saw table having an opening through which the saw runs. It is used entirely for sawing curves and irregular shapes of various kinds.

The scroll or jig saw, an upright saw to which a reciprocating motion is given by a crank and connecting rod, the saw frame sliding in vertical guides. It is used for sawing scrolls and curves that can not be cut on a band saw. The great convenience of this machine is that the blade can be removed and replaced in a very short time. By boring a hole through the piece to be cut the saw may be placed through the hole and refastened; the cut can then be started at any desired point.

The wood planer, a machine for smoothing rough boards or for cutting boards to a required thickness. It consists of rapidly revolving cutters, which chip off the surface in minute shavings as the piece to be planed is passed under the cutter by a suitable feeding device, which is generally two rollers placed a little closer together than the thickness of the board.

The jointer, a machine consisting of a table and a cylindrical cutter over which the work is passed. It is used entirely for straightening, smoothing, and beveling the edges of boards.

The mortising machine, used for cutting mortises in wood parts for the reception of tenons. The wood is placed upon the table of the machine and the slot or mortise is cut by a tool consisting of a drill arranged in a chisel-shaped cutter operated by a foot lever. The drill removes most of the stock and the edges are squared and finished up by the cutter. It can be set to cut any depth or width mortise.

The tenon machine, for cutting tenons only. It consists of four heads, two for roughing and two for finishing. Very accurate work can be done on it.

The molding machine, used for cutting various kinds of ornamental moldings for interior and exterior finishing. The work is fed by rollers to the different shaped cutters which form the molding.

The shaper, for finishing the edges of irregular shapes. The cutters being interchangeable, a great variety of different shapes for cutting and molding may be selected as desired.

The wood-turning lathe, a machine for shaping (mostly rounding) articles of wood by causing them to revolve while the cut is being made by a chisel or some other cutting tool. A greater variety of work can be done on a lathe than on any other woodworking machine.

The boring machine, used for the purpose of drilling or boring holes through wood by the use of an auger or drill bit fastened in a revolving spindle with a holder which is operated by an automatic feed or hand lever.

The sandpapering machine, consisting of revolving cylinders covered with sandpaper which polishes the surfaces of boards passed between them.

The various automatic machines, for grinding and sharpening saws and other edged tools.

What the industry gives.—The workers in serving the four years' apprenticeship acquire the practical knowledge required to actually run the wood through the machine, but as there is no provision made in the shop for the systematic instruction of either journeymen or apprentices very little of the technical part of the trade is gotten in the shop.

Deficiencies of workmen.—The workers in this trade are deficient in general education, mechanical drawing, blue-print reading, mathematics, and modern theory and practice in the trade.

What the school ought to give.—Before entering the trade the worker should have a complete grammar-school education and two years of prevocational training in woodworking. After entering the trade school, courses should be taken in mechanical drawing, blue-print reading, mathematics applied to the trade, and modern theory and practice in the trade; also the school might well provide facilities for acquiring manipulative skill in the use of some tools and machines.

LABORERS.

The laborers are the unskilled workmen of the industry, those whose occupations require physical strength but no special skill or training.

The work of the laborers in the car shop is to load, unload, and haul material, assist in tearing down old and damaged cars, do trucking and any other unskilled work that is required to be done around the shop.

The possibilities for advancement are very limited. If the laborer is very observant and is willing to apply the knowledge gained from observation, he could advance to the foremanship of the labor gang or to a helper in one of the several departments of the shop.

The supply of laborers in the car shops of this city relative to the demand for them is growing less. The cause is attributed to the increase in the demand for laborers by the city government and the various other industries of the city. There is more fluctuation in the laboring force than in any other department of the shop. The majority of the laborers in the car shops are colored; the same applies to every other industry of the city.

FINDINGS ABOUT OCCUPATIONS IN THE METAL TRADES IN RICHMOND, VA.

[This chart is intended to summarize the statements and opinions of employers and employees in the trades in Richmond. The chart does not, therefore, necessarily represent the views of the Survey Committee, nor conditions and opinions of the trade elsewhere.]

Analysis outline.	Puddler.	Heater.	Roller.	Wood pattern maker.	Metal pattern maker.	Iron molder.
1. Process	In making wrought iron a reverberatory furnace is lined with iron ore and scale which is heated until it sets, when the furnace is charged with iron. The puddler's helper manipulates the iron while melting to prevent sticking, beating it up and cooking it until it melts. It is then taken in charge by the puddler during the process of boiling. After impurities are burned out and the iron "comes to nature," it is made into balls for the squeezer. Scrap heating is similar in process except that scrap is not boiled, but is heated only until plastic.	Heating muck bars of iron for rolling. The ball of plastic iron received from the puddling furnace is passed through the squeezer by the puddler's helper, to force out slag and to form blooms which are rolled into muck bars by being passed through the muck rolls by a roller. Muck bar iron is seldom used for industrial purposes until it has been refined. In this process the muck bar is cut into lengths, which are bound with iron wire together with pieces of scrap iron to secure proper weight. These bundles are placed in a furnace on a bed of sand and carefully heated to required temperature for rolling.	Rollers adjust and have charge of the rolls. Roughers and catchers do the actual work of rolling on muck rolls and bar rolls, the roughers standing at the front and the catchers at the back of the rolls. Rolls are set to the proper adjustments. Hot iron from the heaters is passed through the proper grooves in the rolls, and is thus gradually reduced in diameter to the required size and shape. In rolling horseshoe iron the finished bar comes out with nail grooves rolled in.	Where necessary full-size drawings from blue prints are prepared. Well-seasoned wood of best grade is selected—hard or soft, depending on the number of castings required. Parts, shaped by hand and machine tools, are assembled, with regard to draft or taper, leaving pieces loose to facilitate drawing from mold. Assembled parts are sandpapered and shellacked. In making core boxes, where these are required, similar processes are involved. Accurate construction of pattern and core box is necessary to insure proper thickness of metal in casting.	The metal casting is received from the cleaning room when it has been pickled to clean thoroughly. Blowholes are filled with solder or white metal. The casting is filed clean of broken gates and rough places and then scraped, after which it is given a coat of shellac and sometimes a coat of wax to make sure of a smooth, clean casting. Sometimes it is necessary to braze pieces to the metal pattern, and in that case the pattern maker must be skilled in brazing.	Placing pattern on follow board in flask; distributing facing sand over pattern; filling flask with unriddled sand, ramming, rolling over flask, and dressing face; placing cope on drag; distributing facing sand; placing gate and riser pins, and filling and ramming cope; making vents to carry off gases; placing cover board, rolling over cope, and finishing face; withdrawing gate and riser pins, and pattern; dressing up mold; cutting groove from gate pin to pattern; replacing cope on drag, clamping, pouring in molten metal, and after cooling turning casting out of flask to be sent to casting shed for cleaning.
2. Product or specialties	Pure iron or muck iron in plastic state.	Iron heated for rolling.	Bar, stay bolt, horse and mule shoe, railroad spike and fish-plate iron.	Patterns of wood from which castings are made.	Metal patterns from master patterns.	Castings of iron.
3. Importance of trade (number employed).	About 80, including puddlers, helpers, and scrap heaters.	About 17, including heaters and helpers.	About 12 rollers and 40 roll hands.	About 50 journeymen and apprentices.	About 8 journeymen.	About 300 journeymen and apprentices.
4. Conditions of employment—(a) That involve physical or nervous strain.	Intense heat from the puddling furnace, especially in the case of puddler who must rabble the charge.	Exposure to heat, though not so intense as in puddling, causes severe nerve strain.	Running rolls at high rate of speed in working heavy bars of heated iron.	None.	None.	Continual bending and lifting causes backache and physical strain.
(b) That stimulate intelligence and interest.	Observation of chemical changes which take place in the furnace.	None to any considerable extent.	Constant alertness is essential.	Variety of problems presented by the best class of work.	Diversity of process and the skill required in all metal-pattern work, especially in stove-pattern work.	Diversity of processes and variety in high-class molding.
(c) That narrow or restrict mental development.	The work is exhausting and unvarying in character.	Exhausting routine of hard labor while exposed to intense heat.	Automatic character of work.	Specialization in one line of work.	None.	The monotony in low-grade molding, where patterns are not changed frequently.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Danger of accident, especially of getting burned, is constant about the furnace and in the handling of hot iron.	Danger of accident, especially of getting burned, is constant about the furnace and in the handling of hot iron.	Danger of accident is constant. In passing the hot bars through the rolls the roller is in danger of getting hit by the hot iron, and of getting caught in the rolls.	In some shops lack of safety devices and of devices for carrying off dust; and poor light and ventilation.	Inhaling the fine dust that arises from the filing and scraping of the casting is injurious.	Infection of throat and lungs by floating dust from mineral facing; liability to burns from molten metal in cases of overflow or of improper venting of molds or of improper handling of ladles; exposure to dampness from sand and to heat from molten metal.
5. Wages: Apprentices—(a) Beginning wage.	No apprenticeship system.	No apprenticeship system.	No apprenticeship system.	$4 to $7.26 per week.	$4 per week.	$3 to $8 per week.
(b) Second-year wage.				$5 to $8.57 per week.	$5 per week.	$4 to $10 per week.
(c) Third-year wage.				$6 to $9.45 per week.	$6 per week.	$5 to $12 per week.
(d) Fourth-year wage.				$7 to $11.09 per week.	$7 to $9 per week.	$5 to $14 per week.
Journeymen—(e) Minimum wage.	Helpers and scrap heaters, $10.50 to $12 per week.	$12 per week.	$30 per week, paid by tonnage.	$18 per week.	$15 per week.	$16.50 per week.
(f) Maximum wage.	$15 to $18 per week.	$32 per week.	$39 per week, paid by tonnage.	$22.50 per week.	Not reported.	$30 per week.
(g) Union scale.	No union.	No union.	No union.	40 cents per hour.	Not reported.	Machine molding, daywork, 35.7 cents per hour; piecework, minimum, 46.7 cents per hour; stove molding, 50 cents per hour.
6. Hours of labor (regular, per day; per week; on Saturday).	No regular hours; the day's work is done when the heat is finished.	No regular hours; the day's work is done when the heat is finished.	No regular hours; the day's work is done when the heat is finished.	10 hours per day; 55 hours per week; 5 hours on Saturday.	10 hours per day; 60 hours per week; 10 hours on Saturday.	Machine molders: 9 hours per day; 50 hours per week; 5 hours on Saturday.
7. Seasonal activity: (a) Busy season.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	April to December, inclusive.
(b) Slack season.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.	January to March, inclusive.
(c) Fluctuation in employment.	Inconsiderable but irregular.	Inconsiderable but irregular.	Inconsiderable but irregular.	Very considerable but irregular.	Inconsiderable.	Considerable fluctuation in amount of work, but equal division of work among men in union shops.
8. Extent to which the trade is organized.	No organization.	No organization.	No organization.	About three-fourths.	No organization.	About three-fourths.
9. Entrance age.	16 to 25 years.	16 to 25 years.	16 to 25 years.	16 to 18 years.	14 to 16 years.	16 to 18 years.
10. Years required to learn trade.	2 years.	2 to 3 years.	2 years.	4 years.	4 years.	4 years.
11. Age of maximum productivity.	25 to 55 years of age.	25 to 55 years of age.	25 to 55 years of age.	25 to 55 years of age.	20 to 40 years of age.	22 to 45 years of age.
12. Is supply of labor adequate to meet demand? (Causes of deficiency, if any.)	Adequate.	Adequate.	Adequate.	Adequate.	Adequate.	Adequate.
13. Is demand for labor increasing or decreasing?	Stationary.	Stationary.	Stationary.	Stationary.	Stationary.	Stationary.
14. What is the source of supply?	To a considerable extent men from other sections of the country.	Unskilled workers.	Unskilled workers.	Apprentices.	Apprentices, recruited from the lower grammar grades.	Apprentices, recruited from the lower grammar grades.

Analysis outline.	Brass molder.	Core maker.	Machinist.	Blacksmith.	Boiler maker.	Tinsmith and sheet-metal worker.
1. Process	The processes in brass molding are essentially similar to those in iron molding. A finer quality of sand is used in brass molding. In Richmond brass molding is generally a smaller class of work than iron molding, and, therefore, snap flasks are more frequently used, and more match-board work is done in the brass foundry. Generally a higher grade of skill is required for brass molding.	The forming of bodies of sand into different shapes by use of boxes, sweeps, or strikes. These forms or cores must be properly wired or rodded to help retain their shape, and vented to carry off the gases that accumulate in the mold. Hooks or other fastenings are so placed that the core is held in its proper position in the mold, and sand is rammed into the core box to secure the proper density. After the core is formed, it is placed in an oven and baked thoroughly, to harden it for use in the mold.	Finishing castings and forgings to size, and erecting and repairing machinery. Bench or vise work, machine work, and floor work are involved in these processes, which include chipping, filing, drilling, tapping, reaming, turning, facing, boring, planing, cutting gears, and scraping bearings. The all-round machinist is skilled in the use of portable and hand tools and in the operation of lathes, drill presses, reamers, planers, shapers, vertical and horizontal boring mills, gear-cutting, and other special machines. Scraping bearings, assembling parts, and erecting are floor-work processes, except in the case of light machines, which are assembled at the bench.	Working to shape and size iron or steel, heated in forges or furnaces. The processes include cleaning forge or furnace, selecting fuel, igniting and applying draft, heating metal to proper temperature, upsetting heated metal by hitting or jumping the end, cutting off, scarfing to fortify joints (i. e., flattening or chamfering edges of heated metal after it has been drawn out), fluxing joints with fine beach sand or a mixture of sand and borax to cause perfect fusion, and welding by hammering joints at white heat. Heavy forgings are heated in furnaces, and hammered and shaped by use of steam hammers.	Plates are laid off to size and shape; rivet holes located and punched; punched plates sheared to size and shape and run through rolls which give a circular form. Where butt joints are made, plates are chipped or planed to fit, butt straps placed over joints, bolted in position, and holes in plates and strap reamed to match. Rivets, heated red-hot, are inserted from the inside, held in position by bucking irons, and headed up by hand or power hammers. The boiler is placed on blocks, and tube sheets, fire box, and other parts fitted and fastened in.	The production of utensils of tin or sheet metal, and the covering of surfaces such as roofs, doors, ceilings, or walls with sheet metal. As applied to the metal trade and the car shops of Richmond, the work of tinsmithing and sheet-metal working is specialized to meet the requirements of the industry as regards tin or light sheet-metal work on passenger, baggage, mail, private, and refrigerator cars, or as regards any repair work necessary around the plant. The work is considerably varied, owing to the diversity of product.
2. Product or specialties	Castings of brass, bronze, aluminum, and sometimes white metal.	Cores for molds for iron, brass, or other castings.	Varied: Includes locomotives, sugar and cotton machinery, cigarette machines, shot and shell, novelties, and general repair work.	Locomotive forgings, ornamental and structural ironwork, horse and mule shoes, and repair work.	Locomotive and stationary boilers and their parts.	Surfaces covered with tin or sheet metal, water covers and drains, ventilators, engineers' torches, and other specialties.
3. Importance of trade (number employed).	About 15 journeymen.	About 42 journeymen and apprentices.	About 1,150 journeymen and apprentices.	About 400 journeymen and apprentices.	About 375 journeymen and apprentices.	About 56 journeymen and apprentices reported in car shops and 220 in the building trades.
4. Conditions of employment—(a) That involve physical or nervous strain.	Continual bending and lifting causes backache and physical strain.	Bending and lifting of core boxes cause backache.	Heavy lifting in some classes of work.	Heavy work under prolonged exposure to excessive heat.	Lifting, moving, and adjusting heavy plates and parts, and constant noise from hammers.	None.
(b) That stimulate intelligence and interest.	Variety in class of work done, which is greater than in iron molding.	Variety in work requiring considerable rodding and venting.	Frequent change of work and the requirements of certain classes of work; for example, the construction of complicated machinery and the making of precision instruments, such as dies for drop-forging, stimulate interest.	Diversity in the best class of high-grade work, which calls for the exercise of ingenuity and skill.	The requirement of skill in certain classes of work, such as laying out, flange turning, and the making of ventilators and stacks.	Variety in high-grade work.
(c) That narrow or restrict mental development.	Monotony in some lines of low-grade work.	Repetitions in the making of simple cores.	Specialization in low-grade work.	Specialization in low-grade, unvaried work.	Long continuance at one kind of work, especially at work such as riveting or chipping.	None.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	To the extent that the molder handles molten brass, the fumes from the metal are injurious. As is the case in iron molding, there is danger of infection of throat and lungs by floating dust from mineral facing, liability to burns from molten metal, and exposure to dampness from sand and to heat from molten metal.	Infection of throat and lungs by floating dust from sand. Some establishments are poorly lighted and ventilated and make inadequate provision for washing.	Danger of accident from cranes, chain and air hoists, open gears, pulleys, belts, and set screws; danger of injury from cast-iron dust, where ventilation is insufficient.	Danger of accident from improper striking by helper, and of injury to eyes from flying particles of steel.	Deafness is caused by the noise of constant hammering; colds and rheumatism result from exposure to drafts after becoming overheated in the boiler.	None.
5. Wages: Apprentices—(a) Beginning wage.	$3 to $8 per week.	$3 to $4 per week.	$3 to $7.29 per week.	$5.94 to $7.29 per week.	$5.94 to $7.29 per week.	$5 to $7.29 per week.
(b) Second-year wage.	$4 to $10 per week.	$5 to $6 per week.	$4 to $8.57 per week.	$7.02 to $8.57 per week.	$7.02 to $8.57 per week.	$6.25 to $8.57 per week.
(c) Third-year wage.	$5 to $12 per week.	$7 to $9 per week.	$5 to $9.45 per week.	$8.10 to $9.45 per week.	$8.10 to $9.45 per week.	$7.50 to $9.45 per week.
(d) Fourth-year wage.	$6 to $14 per week.	$9 to $10.50 per week.	$6 to $11.09 per week.	$9.18 to $11.09 per week.	$9.18 to $11.09 per week.	$8.75 to $11.09 per week.
Journeymen—(e) Minimum wage.	$16.50 per week.	$16.50 per week.	25 cents per hour.	$15 per week.	$18 per week.	$19.17 per week.
(f) Maximum wage.	$22.50 per week.	$24 per week.	41 cents per hour.	$21.99 per week.	$23.09 per week.	$22.14 per week.
(g) Union scale.	Machine molding, daywork, 35.7 cents per hour; piecework, minimum, 46.7 cents per hour.	Machine work, daywork, 41 cents per hour; piecework, by piece.	Minimum, 25 cents per hour.	$17.87 to $22.14 per week.	$22.14 per week.	$22.14 per week.
6. Hours of labor (regular, per day; per week; on Saturday).	9 hours per day; 50 hours per week; 5 hours on Saturday.	Usually about 7½ hours per day; core makers work by piece and go home when day's task is finished.	8 to 10 hours per day; 48 to 60 hours per week; 8 to 10 hours on Saturday; in summer some shops work 8½ hours 5 days and 5½ hours on Saturday.	9 to 10 hours per day; 54 to 60 hours per week; 9 to 10 hours on Saturday.	9 hours per day; 54 hours per week; 9 hours on Saturday.	9 to 10 hours per day; 54 to 60 hours per week; 9 to 10 hours on Saturday.
7. Seasonal activity: (a) Busy season.	April to December, inclusive.	No marked seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.
(b) Slack season.	January to March, inclusive.	No marked seasonal slack period.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.
(c) Fluctuation in employment.	Considerable fluctuation in amount of work, but equal division of work among men in union shops.	Inconsiderable.	Practically none.	Inconsiderable.	Inconsiderable.	Practically none.
8. Extent to which the trade is organized.	All in iron-molders' union.	About three-fourths are in the molders' organization.	About three-fifths.	About four-fifths.	The railroad shops, in which a large majority work, are thoroughly organized.	Practically all are in the boiler-makers' organization.
9. Entrance age.	16 to 18 years.	16 to 18 years.	15 to 17 years.	16 to 20 years.	From 16 years up.	16 to 20 years.
10. Years required to learn trade.	4 years.	4 years.	4 years.	4 years.	4 years.	4 years.
11. Age of maximum productivity.	22 to 45 years of age.	20 to 50 years of age.	25 to 55 years of age.	22 to 45 years of age.	25 to 55 years of age.	21 to 45 years of age.
12. Is supply of labor adequate to meet demand? (Causes of deficiency, if any.)	Adequate.	Adequate.	Adequate.	Adequate.	Adequate.	Adequate.
13. Is demand for labor increasing or decreasing?	Stationary.	Stationary.	Increasing for highly skilled workers and for machine specialists.	Increasing gradually.	Increasing gradually, because of introduction of steel cars.	Stationary.
14. What is the source of supply?	Apprentices, recruited from the lower grammar grades.	Apprentices, recruited from the lower grammar grades.	Apprentices and, to a limited extent, drifting machinists.	Apprentices, recruited from the lower grammar grades.	Apprentices, recruited from the lower grammar grades.	Apprentices, recruited from the lower grammar grades.

Analysis outline.	Riveter and bucker.	Pipe fitter.	Car repairer.	Railway car painter.	Machine woodworker (car shop).
1. Process	Riveting together steel plates or parts in building or repairing cars, boilers, and engines, and in other work. Riveting is forming the head on the protruding end of the soft-metal rivet, by means of a special riveting hammer, or automatic riveting machine driven by air, hydraulic, steam, or electric power. Bucking is holding the rivet in place while the head is being formed, and is done with a hammer or bucking iron, which is a heavy bar of iron with a countersunk end fitting over the head of the rivet.	Running lines of wrought iron, brass, copper, or lead pipe, for conveying gas, water, steam, or air, and making necessary connections. The processes include cutting the pipe into lengths with pipe cutters, threading the end with hand or machine dies, bending pipe by hand or machine, making joints with white lead, red lead, or gasket of various prepared materials, and fitting or screwing on couplings, nipples, ells, tees, or other connections with various kinds of wrenches. Workers specialize to a greater or less extent in the several classes of work.	Repairing wood and steel cars, trucks, and air brakes. The processes include replacing end and longitudinal sills, body bolsters, needle beams, crossties, bulkheads, partitions, and other parts in wood-car bodies; straightening sheets and steel parts, riveting plates and other similar work on steel-car bodies; repairing and building car trucks, repairing and building car platforms and steps; applying and testing air-brake rigging, except valve work; putting on hinges, door locks and window locks, hand-baggage racks, cord hooks, lighting fixtures, and other metal trimmings; repairing and making chairs, tables, and desks, and wood finishing in cars.	Rubbing down car exteriors with coarse and fine sandpaper; applying wood filler, and three coats of body color, each coat being rubbed down with pumice stone and water; putting on exterior decorations of lettering and striping; and varnishing entire car. Interior woodwork is sandpapered smooth, shellacked, and given three coats of varnish, each coat being rubbed down with pumice stone and water. In refinishing cars old paint is removed and car scraped, scrubbed, and sandpapered. Steel cars are given five or six coats of body color; freight cars two coats. The spraying process is not used in Richmond shops.	Getting out material used in repairing cars by operating such machines as the following: Circular saws for cutting off, ripping, and sawing angles; band saws for cutting angles and irregular shapes; scroll saws for sawing curves and scrolls; planers for cutting to required thicknesses; jointers for straightening, smoothing, and beveling edges; mortising machines for cutting mortises; tenon machines for cutting tenons; molding machines for making ornamental moldings; shapers for finishing edges of work of irregular shapes; sandpapering machines for dressing surfaces; lathes, boring machines, and various automatic machines for sharpening saws and edged tools.
2. Product or specialties	Riveting steel plates on cars and boilers, and riveting engine parts.	Lines of connected pipe.	Repairing passenger, baggage, mail, and freight cars, and cabooses.	Finishing and refinishing cars.	Material for repairing cars and engine cabs.
3. Importance of trade (number employed).	About 20 workers, most of whom are apprentices or learners in boiler making and steel-car repair work.	About 20 journeymen and apprentices in the metal trades, 90 in the building trades.	About 350 journeymen and apprentices.	About 70 journeymen and apprentices.	About 50 journeymen and apprentices.
4. Conditions of employment—(a) That involve physical or nervous strain.	Heavy lifting and constant noise from hammers.	None.	None.	None.	None.
(b) That stimulate intelligence and interest.	None.	Responsibility for high-grade work of varying character.	The work is essentially varied, each job presenting an original problem.	Diversity of processes.	Diversity of processes and variety in class of work.
(c) That narrow or restrict mental development.	Simplicity of work.	None.	None.	Specialization in rough work, such as that done on freight cars and trucks.	Restriction to one machine or to one class of work.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Deafness is caused by the noise of constant hammering.	In some repair work there is danger of accident, or of infection from the poisonous gases and disease germs of waste matter; in ammonia piping the ammonia fumes affect the eyes.	None.	Danger of occupational disease is small, since the shops are well ventilated, the paint leadless, and the methods such as to avoid creating dust.	Dust raised in some processes is injurious.
5. Wages: Apprentices—(a) Beginning wage.	No apprenticeship system.	$5.94 to $7.29 per week.	$5.94 to $7.29 per week.	$5.94 to $7.29 per week.	$6.21 per week.
(b) Second-year wage.		$7.02 to $8.57 per week.	$7.02 to $8.57 per week.	$7.02 to $8.57 per week.	$7.56 per week.
(c) Third-year wage.		$8.10 to $9.45 per week.	$8.10 to $9.45 per week.	$8.10 to $9.45 per week.	$8.86 per week.
(d) Fourth-year wage.		$9.18 to $11.09 per week.	$9.18 to $11.09 per week.	$9.18 to $11.09 per week.	$10.26 per week.
Journeymen—(e) Minimum wage.	$15 per week.	$13.44 per week.	$11.61 per week.	$12.42 per week.	$12.96 per week.
(f) Maximum wage.	$18 per week.	$24 per week.	$24.30 per week.	$19.71 per week.	$18.90 per week.
(g) Union scale.	No union.	35 to 50 cents per hour.	35 cents per hour.	37.7 cents per hour.	$12.96 to $18.90 per week.
6. Hours of labor (regular, per day; per week; on Saturday).	9 hours per day; 54 hours per week; 9 hours on Saturday.	8½ to 9 hours per day; 48 to 54 hours per week; 5½ to 9 hours on Saturday.	9 hours per day; 54 hours per week; 9 hours on Saturday.	9 hours per day; 54 hours per week; 9 hours on Saturday.	9 hours per day; 54 hours per week; 9 hours on Saturday.
7. Seasonal activity: (a) Busy season.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.	No seasonal period of activity.
(b) Slack season.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.	No seasonal slack period.
(c) Fluctuation in employment.	Inconsiderable.	Practically none.	Practically none.	Practically none.	Practically none.
8. Extent to which the trade is organized.	No organization.	Practically all are in the plumbers' and steam-fitters' organization.	Completely.	Practically all are in the carmen's organization.	Completely.
9. Entrance age.	No age specified.	16 to 21 years.	16 to 18 years.	16 to 18 years.	16 to 18 years.
10. Years required to learn trade.	Indeterminate.	4 years.	4 years.	4 years.	4 years.
11. Age of maximum productivity.	25 to 50 years of age.	21 to 45 years of age.	25 to 55 years of age.	25 to 55 years of age.	25 to 55 years of age.
12. Is supply of labor adequate to meet demand? (Causes of deficiency, if any.)	Adequate.	Adequate.	Adequate.	Adequate.	Adequate.
13. Is demand for labor increasing or decreasing?	Increasing gradually.	Stationary.	Decreasing for wood-car repair men, and increasing for steel-car repair men.	Stationary.	Decreasing because of introduction of steel cars.
14. What is the source of supply?	Casual labor.	Apprentices, recruited from the lower grammar grades.	Apprentices, recruited from the lower grammar grades.	Casual labor; apprentices, recruited from the lower grammar grades.	Casual labor; apprentices, recruited from the lower grammar grades.

FINDINGS ABOUT EDUCATION FOR OPERATIVES IN THE METAL TRADES.

Analysis outline.	Puddler.	Heater.	Roller.	Wood pattern maker.	Metal pattern maker.	Iron molder.
15. What does worker need to properly equip him for trade? (a) General education.	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.
(b) Trade and technical education.	Instruction as to construction, lining, and charging of furnaces, and as to the process of boiling; metallurgy and chemistry of the trade and the theory of iron making; mechanical drawing.	Instruction as to construction and operation of furnace, and of the processes immediately involved; some knowledge of metallurgy, of the chemistry of the trade, and of the theory of iron making; mechanical drawing.	Instruction as to the construction, adjustment, and operation of the rolls; some knowledge of allied processes and of the theory of iron making; mechanical drawing.	Instruction in blue-print reading, mechanical drawing, and shop mathematics; instruction as to foundry practice and methods of constructing patterns in conformity with that practice; instruction as to the qualities of woods and as to selection of woods for patterns in different classes of work; instruction as to the shrinkage of metals, the proper use of glue, screws, and fillets, and the methods of so constructing and finishing patterns as to resist moisture and hard usage.	Instruction in blue-print reading, mechanical drawing and shop mathematics; instruction as to foundry practice, the shrinkage of metals, and the use of metal-working hand and machine tools.	Instruction as to use of follow boards, handling flasks, setting cores, venting molds of different classes, selecting sand, ramming molds, and use of chaplets; metallurgy and chemistry of the trade, including especially a knowledge of alloys, some shop mathematics and mechanical drawing.
(c) Manipulative skill.	In working the boiling metal into a plastic ball, and in manipulating the ball.	A sufficient amount of skill to avoid accident.	In passing metal through the rolls and in catching the heated bars.	In handling a great variety of hand tools and machines.	In handling tools and in brazing metals.	Usually a high degree of manipulative skill is required.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Strength and endurance.	Strength, endurance, and color sense.	Strength, endurance, and quickness.	Accuracy, patience, special adaptability, dexterity, and keenness of sight.	Accuracy, endurance, dexterity, and keenness of sight.	Strength and endurance.
16. What the industry gives: (a) Conditions of apprenticeship.	No apprenticeship system.	No apprenticeship system.	No apprenticeship system.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.
(b) Provision made in shops for systematic instruction of apprentices.	No apprentices.	No apprentices.	No apprentices.	No provision.	No provision.	No provision.
(c) Trade and technical knowledge.	The knowledge necessary for the practice of the trade can be acquired in the shop.	Knowledge of the trade is acquired by the helper in assisting the heater.	The knowledge necessary for the practice of the trade can be acquired in the shop.	That trade knowledge which pertains to special lines of work; much depends, however, upon the intelligence and disposition of the foreman and of fellow workers and upon the class of work done in the shop.	A knowledge of the mechanical processes.	Very little trade or technical knowledge is given by the industry, except where the class of work done is of an exceptionally high grade and varied.
(d) Manipulative skill.	All that the trade requires.	All that the trade requires.	All that the trade requires.	Practice in the use of hand and machine tools.	All that is required by the class of work done.	All that is required by the class of work done.
(e) Extent to which trade can be learned in the shop.	Entirely.	Entirely.	Entirely.	The practical part as regards special lines of work can be learned in the shop.	The mechanical processes can be learned in the shop where conditions are favorable and the work varied.	The practical part as regards special lines of work can be learned in the shop.
(f) Provision made in the shops for systematic instruction of journeymen.	No provision.	No provision.	No provision.	No provision.	No provision.	No provision.
(g) Line of promotion.	Scrap heater or puddler's helper, puddler.	Second helper, first helper, heater.	Roll hand, catcher, rougher, roller.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, casting inspector, foreman.
17. Common deficiencies of workers.	Few workers possess the physical strength and endurance required, or sufficient general education to advance in the trade.	Few workers possess the physical strength and endurance required, or sufficient general education to advance in their trade.	Few workers possess the physical strength and endurance required in their work.	Deficiency in mechanical drawing and in shop mathematics.	Deficiency in mechanical drawing and in shop mathematics.	Deficiency in arithmetic, blue-print reading, and in general education.
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop.	Complete grammar-school general education; prevocational courses in metal working.	Complete grammar-school general education; prevocational courses in metal working.	Complete grammar-school education; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in woodworking.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.
II. After entering the shop—(a) Trade and technical knowledge.	Specialized courses covering the trade and technical requirements of iron-making trades.	Specialized courses covering the trade and technical requirements of iron-making trades.	Specialized courses covering the trade and technical requirements of iron-making trades.	Specialized courses covering the trade and technical requirements of pattern making.	Specialized courses covering the trade and technical requirements of pattern making.	Specialized courses covering the trade and technical requirements of molding.
(b) Manipulative skill.				Where shopwork is specialized or of a low grade, the school should provide opportunity for acquiring skill in high-grade work.	Opportunity for acquiring facility in different classes of work.	Some practice in different classes of work.
III. Nature of part-time courses needed.	Metallurgy; mechanical drawing; shop mathematics; the history and theory of iron making.	Metallurgy; mechanical drawing; shop mathematics; the history and theory of iron making.	Metallurgy; mechanical drawing; shop mathematics; the history and theory of iron making.	Mechanical drawing; shop mathematics; courses dealing with the qualities of woods, glues, and varnishes, with the shrinkage of metals and with the theory and practice of molding, so far as this bears upon pattern making.	Mechanical drawing, shop mathematics, metallurgy, and the theory and practice of molding, so far as this bears upon pattern making.	Metallurgy, with especial reference to metals and alloys used in casting, shop mathematics, mechanical drawing, and courses covering the history and theory of molding.
IV. Nature of evening school courses needed.	Same as III.	Same as III.	Same as III.	Same as III, for apprentices; advanced special trade courses, covering modern shop practice, for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern shop practice, for journeymen.

Analysis outline.	Brass molder.	Core maker.	Machinist.	Blacksmith.	Boiler maker.	Tinsmith and sheet-metal worker.
15. What does worker need to properly equip him for trade? (a) General education.	An elementary school education.	An elementary school education.	An elementary education, advanced mathematics, and mechanical drawing.	An elementary school education.	An elementary school education.	An elementary school education.
(b) Trade and technical education.	A knowledge of the processes and of foundry practice as in iron molding, metallurgy, and chemistry of the trade, especially as regards alloys; some shop mathematics and mechanical drawing.	Instruction as to the proper venting and rodding of cores, and as to selection of sand, and in general a trade and technical knowledge of metallurgy, trade chemistry, and knowledge of the whole process of molding; mechanical drawing.	Instruction as to strength and other qualities of materials, as to speeds at which various metals should be worked, as to uses of high and of low carbon steels, and as to uses and working of alloy steels; metallurgy, mechanical drawing, and shop mathematics.	Instruction as to construction and operation of forges, as to effect upon metal of heating to different temperatures and methods of tempering to secure special qualities in steel to suit it to special uses, as to methods of working metal at different heats, and as to proper construction and design of utensils forged; metallurgy and mechanical drawing.	Instruction as to the processes immediately involved in the construction of boilers, as to strength of materials, as to the principles of construction of different types of boilers, and as to principles of steam engineering; mechanical drawing, blue-print reading, and shop mathematics.	Instruction as to the multifarious uses to which tin and sheet metal are put, as to the composition, weights, and qualities of the sheets, as to pattern drafting and cutting, as to the processes of cutting, shaping, and soldering sheet metal, and as to use of special tools; shop mathematics and mechanical drawing; the trade knowledge required for work in the railroad shops, as compared with that required in the building trades, is of a special character.
(c) Manipulative skill.	Usually no high degree of manipulative skill is required.	Usually no high degree of manipulative skill is required.	In handling pieces being worked, and a great variety of tools; in operating machines of various types.	Some classes of work require a high degree of manipulative skill in handling and shaping the heated metal.	In adjusting plates and bands, and in operating special machines.	In cutting, shaping, soldering, and applying the sheets.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Strength and endurance.	Strength and endurance.	Adaptability, initiative, inventiveness, strength, dexterity, and accuracy of eye.	Strength, endurance, dexterity, and accurate color sense.	Strength and endurance.	Dexterity and accuracy.
16. What the industry gives: (a) Conditions of apprenticeship.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years; in some shops written agreements to teach apprentices, in other shops only verbal agreements.	Apprenticeship period of 4 years; the number of apprentices is restricted in accordance with union provisions.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.
(b) Provision made in shops for systematic instruction of apprentices.	No provision.	No provision.	In railroad shops and locomotive works apprentices are required to attend some night school or to attend correspondence school classes, for which the boys pay $2 a month and the company gives one-half hour a day.	No provision.	No provision.	Railroad shops require apprentices to take correspondence school, Y. M. C. A., or Virginia Mechanics' Institute courses—not necessarily courses pertaining to their trade.
(c) Trade and technical knowledge.	A knowledge of the processes to the extent that the work is varied and of a high class.	Very little trade or technical knowledge is given by the industry, except where the class of work is of an exceptionally high grade and varied.	Depends upon extent to which work is specialized, character of work done, and intelligence and disposition of foreman; in most shops only an inconsiderable amount of technical knowledge can be acquired.	Depends upon the class of work done and the extent to which the work is specialized; no knowledge of the trade beyond that required by the class of work done is given by the industry.	None beyond that which is immediately incidental to the work.	The necessary trade knowledge under favorable conditions and where the foreman is intelligent and disposed to give instructions.
(d) Manipulative skill.	All that is required by the class of work done.	All that is required by the class of work done.	Where the work is varied and not specialized or where the worker shifts from shop to shop.	The degree of manipulative skill required by the special line of work done in the shop.	To the extent that manipulative skill is needed, it can be acquired in the shop.	All that the trade requires.
(e) Extent to which trade can be learned in the shop.	The practical part as regards special lines of work.	The practical part as regards special lines of work can be learned in the shop.	The trade can not be learned in the shop, except as regards the practical requirements of special lines of work.	The practical but not the technical part; very few shops provide that instruction and training in annealing, hardening, and tempering metals which might profitably be given.	The practical part only.	The practical part entirely.
(f) Provision made in the shops for systematic instruction of journeymen.	No provision.	No provision.	No provision.	No provision.	No provision.	No provision.
(g) Line of promotion.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Tool-room boy, drill-press hand, shaper hand, lathe hand, slotter hand, assembling hand, erecting hand, gang foreman, general foreman, master mechanic.	Apprentice, journeyman, foreman.	Apprentice, journeyman, boiler inspector, foreman.	Apprentice, journeyman, foreman.
17. Common deficiencies of workers.	Deficiency in blue-print reading, arithmetic, and in general education.	Deficiency in blue-print reading and in general education.	Deficiency in shop mathematics, mechanical drawing, and in general education.	Deficiency in mathematics and mechanical drawing, of skill in annealing, hardening, and tempering metals, and of general education.	Deficiency in mechanical drawing and shop mathematics required for laying out work and in general education.	Deficiency of skill in pattern drafting and of mathematics required in laying out work.
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; advanced courses in mathematics, including trigonometry.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.
II. After entering the shop—(a) Trade and technical knowledge.	Specialized courses covering the trade and technical requirements of molding.	Specialized courses covering the trade and technical requirements of molding and core making.	Specialized courses covering the trade and technical requirements of the machinist trade.	Specialized courses covering the trade and technical requirements of blacksmithing.	Specialized courses covering the trade and technical requirements of boiler making.	Specialized courses covering the trade and technical requirements of tinsmithing and sheet-metal working.
(b) Manipulative skill.	Some practice in different classes of work.	Some practice in different classes of work.	Some training to offset specialization in the shops.	Some training to offset specialization in the shops.	Opportunity for acquiring facility in the operation of various tools and machines.	Opportunity for acquiring facility in the use of special tools.
III. Nature of part-time courses needed.	Metallurgy, with especial reference to metals and alloys used in casting, shop mathematics, mechanical drawing, and courses covering the history and theory of molding.	Courses dealing with the construction of cores and with nature of the materials used; mechanical drawing, shop mathematics, and courses covering the history and theory of molding.	Shop mathematics; mechanical drawing; metallurgy; courses dealing with strength of materials, design and uses of machines, jigs, and shop tools, methods of rigging for work, speeds and feeds for various metals, and construction of engines.	Metallurgy; mechanical drawing; shop mathematics; courses covering the theory and practice of annealing, hardening, and tempering of metals, and the history and theory of iron making.	Mechanical drawing; shop mathematics; boiler construction; the history and theory of steam engines.	Mechanical drawing; pattern designing; shop mathematics; methods of laying out work.
IV. Nature of evening school courses needed.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern shop practice, for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern shop practice, for journeymen.	Same as III for apprentices; advanced special trade courses covering modern shop practice, for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern methods, for journeymen.	Same as III for apprentices; advanced special trade courses, covering modern methods, for journeymen.

Analysis outline.	Riveter and bucker.	Pipe fitter.	Car repairer.	Railway car painter.	Machine woodworker (car shop).
15. What does worker need to properly equip him for trade? (a) General education.	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.	An elementary school education.
(b) Trade and technical education.	None beyond a knowledge of the processes immediately involved, except as a preparation for some allied occupation.	Instruction as to the use of special tools and dies for cutting pipe and threading the ends and as to methods of making connections and running lines of pipe; mechanical drawing; in some work ability to estimate for heating plants is essential; each class of work requires special trade and technical knowledge, as, for example, regarding the principles involved in the various systems of heating and of refrigerating.	In wood-car repair work the trade and technical knowledge of the carpenter in the building trades is required; in steel-car repair work the trade and technical knowledge of certain classes of metal workers is required; in addition, special knowledge is required of the construction and operation of brakes, trucks, and of all car appliances; shop mathematics, mechanical drawing, blue-print reading, and estimating.	In general the trade and technical knowledge of the painter, including a knowledge of the composition and use of varnish and paint removers and of wood fillers, of methods of removing old finishes and of preparing surfaces for new finishes, of the composition and mixing of paints, oils, and turpentines, of the preparation, and laying of quick and slow drying varnishes, and of the principles of color harmony; free-hand and mechanical drawing, and estimating.	Instruction as to the construction and operation of a great variety of woodworking machines, of the methods of laying out work, of blue-print reading, mechanical drawing and shop mathematics; since much of the work may be done in various ways a thorough knowledge of the specific uses of each tool and machine is required to avoid waste of labor and time.
(c) Manipulative skill.	Dexterity in handling hot rivets and a few tools.	In using special tools and in making connections.	In the use of a great variety of tools.	In handling brushes, especially in fine finish work, and in laying on varnishes.	In the operation of power-driven woodworking machines.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Strength and endurance.	Strength, initiative, and judgment.	Initiative, strength, endurance, and accuracy.	Artistic sense as regards color harmony and design; accuracy.	Strength, endurance, and accuracy.
16. What the industry gives: (a) Conditions of apprenticeship.	No apprenticeship system.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.	Apprenticeship period of 4 years.
(b) Provision made in shops for systematic instruction of apprentices.	No apprentices.	No provision in a majority of the shops; railroad shops require apprentices to take correspondence school, Y. M. C. A., or Virginia Mechanics' Institute courses—not necessarily courses pertaining to their trade.	Apprentices work 6 months on trucks, 6 months on rough work, 3 months on platform and steps, 3 months at laying off, 6 months on engine work, 12 months on outside and 12 months on inside passenger-car work.	No provision.	No provision.
(c) Trade and technical knowledge.	No trade or technical knowledge.	A knowledge of the mechanical processes, but very little of the technical knowledge required in many lines of work.	The necessary trade knowledge can be acquired in practice.	Only that amount of trade knowledge is given by the industry which is immediately incidental to the work.	Only the knowledge required to run the work through the machines.
(d) Manipulative skill.	All that the trade requires.	All that the trade requires.	All that the trade requires.	All that the trade requires.	All that the trade requires.
(e) Extent to which trade can be learned in the shop.	Entirely.	Only the practical part in any line of work; in special lines an insufficient knowledge of the practical requirements, as, for example, in the case of estimating for and installing various heating, refrigerating, and compressed-air systems.	The practical part entirely.	The knowledge gained in practice is insufficient to make the painter an artistic workman; in Richmond shops there is, moreover, a considerable amount of specialization, one man putting on body color, another lettering and striping, another staining and varnishing interiors.	A knowledge of the operation of machines, but none of the technical knowledge relating to woodworking.
(f) Provision made in the shops for systematic instruction of journeymen.	No provision.	No provision.	No provision.	No provision.	No provision.
(g) Line of promotion.	To gang boss.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.	Apprentice, journeyman, foreman.
17. Common deficiencies of workers.	Deficiency in general education required for advancement in trade.	Deficiency in technical knowledge required in installing various heating, refrigerating, and compressed-air systems.	Deficiency in mechanical drawing, blue-print reading, shop mathematics, and general education.	Deficiency of skill in mechanical and free-hand drawing, of knowledge required for estimating, of artistic sense, and of general education.	Deficiency in mechanical drawing, blue-print reading, shop mathematics, and general education.
18. Suggestions from the trade as to what school ought to give: I. Before entering the shop.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in metal working.	Complete grammar-school general education; mechanical drawing; prevocational courses in woodworking.	Complete grammar-school general education; mechanical drawing; prevocational courses in designing and painting.	Complete grammar-school general education; mechanical drawing; prevocational courses in woodworking.
II. After entering the shop—(a) Trade and technical knowledge.	Specialized courses covering the trade and technical requirements of boiler making or some allied occupation.	Specialized courses covering the trade and technical requirements of various classes of work.	Specialized courses covering the trade and technical requirements of car-repair work.	Specialized courses covering the trade and technical requirements of the occupation.	Specialized courses covering the trade and technical requirements of the woodworking trades.
(b) Manipulative skill.	Opportunity for acquiring facility in the operation of various tools and machines.	Opportunity for acquiring facility in the use of special tools.	Opportunity for acquiring facility in the use of special tools and machines.	In designing and lettering.	Opportunity for acquiring facility in the operation of special machines.
III. Nature of part-time courses needed.	Mechanical drawing; shop mathematics; boiler construction; the history and theory of steam engines.	Mechanical drawing; courses covering the theory of various heating and refrigerating systems; methods of estimating for heating plants.	Mechanical drawing; shop mathematics; air-brake instruction.	Mechanical and free-hand drawing; design; color harmony; paint mixing; courses covering the composition of materials, methods of estimating, and hygiene of the trade.	Mechanical drawing; shop mathematics.
IV. Nature of evening school courses needed.	Same as III.	Same as III for apprentices; advanced special trade courses, covering modern methods, for journeymen.	Same as III for apprentices; advanced special trade courses in carpentering and in metal work for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.	Same as III for apprentices; advanced special trade courses for journeymen.

6071°—Bull. 162—16. (To face page 226.)

APPENDIX E.—ANALYSIS OF OCCUPATIONS IN DEPARTMENT STORES IN RICHMOND.

GENERAL SUMMARY OF OCCUPATIONS.

STORE ORGANIZATION.

The modern department store is a complex business organization. The many departments, in some instances 40 or more in number, each one of which is a store in itself, require extensive executive or administrative, office, and distributing forces as well as a large force of sales persons to carry on the work of each department and the departments collectively.

A department store with its aggregation of small stores can not succeed except through a strong central organization which holds the departments together and standardizes, so to speak, the service of the whole store. This central organization is the executive or administrative force and its means of accomplishing its work is the store system. The executive force determines the policy of the store in all matters of buying, arrangement of departments, management, handling of customers and the like. This executive force includes the owners or directors of the store, the store superintendent and the manager, as a rule, and not infrequently includes also buyers, heads of departments and others who may be qualified to speak on matters of organization and management.

Department organization is also important, and although worked out with as much care as the organization of the store, it is less complex and less difficult to manage.

The organization of the specialty store is somewhat departmental in character and therefore much like that of the department store, but owing to the fact that departments are fewer in number and the character of the stock less varied than in the department store, the organization is much less complicated. The same general plan as used in the department store is carried out on a smaller scale.

The general dry-goods store which is in a state of transition from the old-fashioned general store to the more modern type of organization combines somewhat the department plan and the classified stock plan without a definite department organization. In these stores executives are few. Where departments are used, there is a head for each, the buyer usually acting in this capacity, and the other part of the store is in charge of a manager.

Both the general store and the specialty store use, however, the modern store system of accounting for sales, etc., though usually one less complicated than the type used in the department store. The relation of employer to employee is more intimate in these stores—employees as a rule being known personally by their employers—a fact which probably makes the large executive force and elaborate store system less necessary.

CLASSIFICATION OF OCCUPATIONS.

In this classification, the specialty store and the general dry-goods store have been included, for the chief difference between the occupations in all the stores is the amount rather than the kind of experience and service required. For the purpose of this study which is concerned mainly with the sales force and the kind of training for their work that may be given, the occupations of the store have been classified as follows:

The executive positions.—The men and women engaged in administrative work have been placed in this class. These are managers, superintendents, floor men, heads of departments, and advertising managers.

The selling occupations.—These include the men and women who sell goods, care for the stock and look after the order and arrangement of their several departments. These workers are buyers, heads of stock, stock keepers, markers, and sales persons of several classes or grades, including learners, specialty sales persons, and general sales persons.

The nonselling occupations, which are concerned with the actual handling of the goods, include the workers in the receiving and delivering departments. These departments vary in organization in the various stores studied but the differences are largely a matter of size and number rather than character, hence the divisions apply in the main to all stores. Check boys and girls are put in this class, as in Richmond these young people frequently do the wrapping of the packages for the sales person or for the delivery room.

The office occupations.—The office force includes all those workers who have to do with the accounting for the goods, such as cashier, bookkeeper, transfer clerk, mail-order clerk, and charge clerk, including the stenographer who writes the letters and the telephone girl who answers the store's telephone calls.

The alteration department.—The alteration department is really a manufacturing department and employs productive workers, fitters and sewers who are not necessarily or distinctly a department store group though they are rapidly becoming so.

ANALYSIS OF STORE OCCUPATIONS.

This study is concerned, as has been previously noted, with the department of salesmanship including such learners as checkers, bundle wrappers, assistant stock keepers, and markers, as these workers enter the selling occupations more frequently than any of the other workers. In order to give a view of store work as a whole, however, all occupations are analyzed briefly and selling occupations more minutely.

Executive Positions.

Executives without exception are men and women who have risen from the ranks of store workers. These people have had experience in the line of store work which they are directing and frequently have had experience in other departments of store work. Buyers, heads of departments, and managers are drawn mainly from the sales force of the department or the store in which they are employed or from the sales force of some other store engaged in the same line of business.

The manager is the merchandising executive. He directs the buying and selling of merchandise through buyers and heads of departments. The advertising manager and display men are also responsible to him for their work. He determines the kind of merchandise the store shall carry, the division of merchandise among departments, the amount of stock to be carried, and the advertising policy to be used for the store. The manager knows markets and merchandise; he understands business conditions; and he knows how to interpret the sales, losses, and demands of the business he directs. To be a successful executive, the manager must be a student of merchandising and business conditions. He must have sufficient knowledge of accounting to understand the statements of the firm. In addition to the larger business qualifications he must have ability to deal with the buyers and heads of departments.

The superintendent has charge of the care of the building. He employs new workers and places them in the departments and dismisses employees. He has charge of the administration of the store system of sales slips, charges, credits, refunds, and also of the delivery department. He decides questions about the store system that may arise in the daily routine. He has general supervision of the delivery department and decides upon changes that may be made in the delivery system. Many details of management connected with the daily routine of the departments, the management of crowds on sales days and during the holiday season, and the enforcement of store rules and discipline of workers are also included in his duties.

The superintendent must know how to deal with people. He must be able to judge of their capacity and suitability for the work when employing them, determine to some extent the type of work the applicant may be expected to do, enforce the store rules, and administer discipline with firmness and fairness. The superintendent who is successful combines these factors of training, experience, and education with that quality called personality, so highly valued but difficult to define, which enables him to administer business shrewdly, deal with employees fairly, and give the customer a maximum of comfort in shopping and satisfaction in purchases made.

Men holding these administrative positions who have had less than high-school training say that they have made up as far as possible for the education they lacked by reading, study of practical affairs, and attention to business. Without exception men in these positions interviewed for this study said that a good fundamental education of high-school grade or more, if of a practical sort, is necessary for the success of younger men entering business of the present day.

Floor men.—Floor men manage what may be called the store traffic. They direct customers, see that customers have attention, distribute sales persons through the department when for any reason one part of the department is crowded with sales persons and other parts left without workers, sign sales slips when necessary, and attend to the enforcement of general rules pertaining to that part of the store. The floor man must have had at least a grammar school or high-school education, preferably both. He must have a general knowledge of the stock in the departments on his floor,[1] have some knowledge about goods and taste in displaying them, for it is frequently his duty to criticise and suggest ways of displaying stock. He must also know the location of all departments and have a general idea of the kind of stock in each, so as to be able to answer requests intelligently and direct customers. The floor man must also know how to manage the employees in the departments on his floor. The floor man may or may not have had experience in buying goods and selling. One who has had this experience is considered much more desirable than the one who has had no experience in handling merchandise. In Richmond floor men are sales persons and clerks who have risen from the ranks, but more often they are men who have worked in rural stores or as traveling salesmen and agents.

Department heads.—Department heads are essentially sales persons as their work has to do with the handling and selling of merchandise, and although their work is largely executive in character it is also selling inasmuch as it is administrative selling. This occupation which is an important one both from the standpoint of the store and the employee, is discussed in detail under the sales force.

Advertising manager.—The advertising manager is an important person in the up-to-date store, for he is the one who informs the public what his store offers for sale. He classifies the stock for advertising as far as classification is necessary, makes the advertising "write up" or supervises it, supervises or does the illustrating for the advertisements, and attends to the details of securing and contracting for "space" in daily papers, magazines, or other media of advertisement. When the store is very large and the system of advertising large and complicated, the illustrating may be done under the direction of the advertising man and the contracting for space by the business manager. An advertising manager should have a good academic education of high-school grade and special instruction along the lines of advertising. He should know enough about the various kinds of stock to be able to handle accurately and acceptably to both the store and the customer the data relating to the goods to be advertised which the heads of departments and buyers prepare for that purpose. When illustrations are part of the advertising scheme, he must know how to make sketches, or how to direct the work, or how to judge the worth of sketches. The advertising man must know how to figure space for his advertisement, how to allot

[1] The term "floor" is used to designate the part of the store which the floor man has in charge and frequently is not more than two departments on a floor containing many departments.

it to the various departments, and how to "feature" special and seasonable stock. He acquires his knowledge of the work in many ways. He may have gained some of it through selling and handling of merchandise; he may have had special instruction in advertising including illustrating, or have made special study, as much has been written on the subject in recent years; and he may have had practical business experience of an administrative character which contributed to his training.

Selling Occupations.

It is the business of the sales force to sell goods or to contribute directly to the making of sales. Sales persons are divided into five general classes, viz, buyers and heads of stock who assist in selling in rush times, general sales persons, specialty sales persons, and table or aisle sales persons. While this classification applies to all departments, no two departments can be said to require the same kind of ability, hence in a comprehensive study of store occupations, the duties of five classes or grades of sales people should be defined in detail for each department. While such study is desirable, the time available for this study did not permit of work in such minute detail. The duties of these workers were studied in many departments and those factors which apply to all are reported.

Buyers.—The buyers determine the amount and kind of goods to be purchased for their respective departments including replacing of stock and selecting new lines to be put in the departments, purchase the goods for their departments, check up goods received, and attend to the details of price setting and marking of goods. Buyers in the smaller stores frequently act as sales persons during odd hours, look after special customers occasionally, if special attention is necessary, and assist in the selling on sale days. Successful buyers must have an education of not less than the grammar-school grade, preferably of high-school grade which enables them to use all common branches with facility, especially in their application to accepted business usages including a working knowledge of commercial forms such as bills, business letters, checks, etc. Training and experience in handling and selling merchandise are also essential.

Buyers must know how to study and interpret demand and sales, for the buying is done on the basis of what the public wants. From a study of sales slips, the observing buyer realizes that customers frequently buy what they can get and not what they want. A good buyer studies this aspect of selling and uses it in making a choice of stock both for replacing and for stock of new type or style.

In addition to this knowledge of sales, the demand of the customers, and the kinds, value, and selling qualities of stock in the department, the details of which are gathered largely from the sales persons in the department, the intelligent, progressive buyer knows many of the details of the manufacture of the stock handled, such as the kinds and source of raw materials used, processes of manufacture, especially those that determine different kinds and qualities, changes made in the product from year to year, and any other details that tend to give an all-round knowledge of the stock. This kind of knowledge is being looked upon with increasing favor, as customers have much more confidence in the person who knows with some degree of accuracy the essential points in the goods.

General education should be acquired in school before going to work, though among the older successful buyers the education has been interrupted with work; business knowledge, forms, and customs may be acquired to some extent in commercial courses, but by far the greater part is gained, under present conditions, in the store while actually engaged in the work; knowledge and interpretation of demands and sales is gained by experience almost exclusively since these factors vary largely in the stores and in different localities and permit of no very useful general rules that may be learned apart from actual experience; much of the knowledge of the stock, its manufacture, etc., is gained through much handling and incidental information picked up from time to time by the observant buyer, but this is frequently supplemented by printed information prepared by manufacturers, by technical or general books dealing with subjects pertaining to the stock and by lectures or courses of instruction given for the purpose. These courses are increasing in popularity and when well organized, and the instruction good, are a real source of help to the ambitious successful buyer.

Head of stock.—The head of stock takes care of the stock in the department and keeps close watch upon the reserve stock so as to be sure that the supply is always in right proportion to the demand. The head of stock is usually the most reliable and experienced sales person in the department. Working under the direction of the head of stock, the sales persons also care for stock, each one, including the head of stock, having charge, as a rule, of a section of the stock.

Practically all stock is looked over, dusted, freshened if possible, rearranged, price tags readjusted, superfluous cards, papers, tags, etc., removed every day. At the same time stock is replenished from the reserve stock, remnants sifted out and made ready for disposal, odd ends of stock prepared for sale or sent to other departments where special provisions are made for the disposal of such stock, empty boxes, papers, etc., carried away, and old defaced boxes, cards, etc., replaced. This is done in the early morning before customers begin to arrive and is considered a very important part of successful store management.[1]

The amount of stock both in the department and in reserve is noted daily and reported to the head of stock who reports to the buyer.

In addition to these routine duties there is also the mending of stock, such as sewing on buttons, repairing rips, matching up stock, as pairing of shoes and to some extent pairing of gloves and hosiery, sewing buttons on cards, fastening notions on cards, removing spots, etc. This work is frequently done by the stock keeper and sales persons during the daily stock keeping, but when it requires special skill, as in the mending of gloves, it is sent to a special department where it is done by a person skilled in that work.

The head of stock must have at least a grammar-school education, for the duties demand more than a mere cleaning up of stock, counting, and mending. In addition to the fundamentals of education which are used more or less literally, the head of stock must know how to apply this general knowledge to the work of the store, the department and the care of the stock, the latter being important in proportion to the kind and value of the stock in charge.

The head of stock must know all the kinds, the qualities, amounts, value, etc., of stock in the department. The head of stock usually takes immediate charge of the most valuable stock or the newest type of stock; the assistants attend to the remainder. Amounts needed are reported to the buyer.

In addition to knowledge of stock and ability to care for it, the head of stock, if interested and ambitious, knows many of the details of the kind, quality, manufacture, and other general qualities of the stock. This knowledge is gained by study, observation, and experience in handling the stock and not infrequently is supplemented by the study of literature from manufacturers, general books on the subject, and to a limited extent lectures or study in courses on the subject. These courses are just beginning to be given in Richmond, hence have been only a very limited source of information and assistance as yet.

Sales persons.—It is the business of the sales persons to sell goods, though they share to some extent in the care of stock. Selling varies in all departments according to the

[1] The head of stock and sales persons also see that the stock is put away and covered carefully for the night. In some cities the head of stock is called the assistant buyer.

type of goods handled. There are, however, certain fundamental principles of salesmanship which apply in all departments. These are treated in various ways by different authors, but in all cases fall under the following heads, viz, (1) Approach to customer, (2) showing the goods, and (3) closing the sale, the latter including the money transaction and securing of the address of the buyer if the goods are to be delivered. Selling involves a kind of psychology which is coming to be recognized as a very important factor throughout the entire sale. Some business men refer to it as common sense, thinking that anyone may have it if sufficient thought and care are used in dealing with customers. It is often spoken of as personality. It is in reality a combination of all qualities, sometimes innate and developed naturally, frequently innate and developed by conscious study, and sometimes entirely lacking. When it is lacking, successful salesmanship—not mere handling goods over the counters—is practically impossible of attainment. Perhaps the most important point in this psychological aspect of selling is the manner of approaching the customer. The sales person must study the customer, if selling is to be done on a really skillful and what is coming to be termed a scientific basis. The greeting, the attitude in listening to the customer's statement of her wants, the replies given, the kind of questions asked to elicit further information, the method of showing stock, the interest in the preferences of the customer, willingness to show stock of the exact kind wanted or the nearest kind available, require a well-developed power of observation, a strong human interest, and a kind of intelligence that can only be developed by what is termed the psychology of salesmanship. Real salesmanship is rarely ever acquired by the young person except through months and often years of experience, close study of merchandise, and careful observation of people.

The general sales person.—The older type of dry-goods store, and to some extent the department stores of Richmond, employ a few persons known as general sales persons. These workers are sales persons trained by many years of service and sell goods in all departments of the store. These employees have a clientele of good customers whom they take about in all the departments or sections of the store, making all sales and assisting in all purchases, for these sales persons are frequently considered advisers as well as sellers of goods.

This type of selling seems to be passing rapidly and customers are accepting the theory that the sales person who specializes in one line of goods has a better knowledge of the stock, is better informed about the style and suitability of the thing desired, and is thus able to give as good or better advice than the person who distributes her attention over many departments and lines of stock.

The general sales person should have a grammar-school education or the equivalent. As many employees interviewed came from the country schools having no grades or system of graduation, it is difficult to ascertain the rating of their education. They are, however, as well versed in the fundamentals as the grammar-school graduate, and usually are possessed of a native ability and interest in their work that makes up for formal education.

These workers must know the location of all departments in the store, have some knowledge of the location of different kinds of stock, be informed about prices, values, and have some judgment about suitability for the customer. When customers are of long standing, their preferences as to style and cost are fairly well in mind and the sales person is guided accordingly. This training is acquired in various ways. It begins usually in the general country store, where one sales person sells everything from coal oil to China silks. This experience is supplemented by working in one or more departments of the store which is more or less departmental in its organization. The privilege of working as a general sales person is, as a rule, given only to workers of long experience in the store in which they are employed, and in compliance with requests of customers who prefer a sales person whom they know personally.

The specialty sales person.—The specialty sales person sells goods in one department only and sometimes only one line of goods, as fine gloves, white silks, children's shoes, etc. These workers must know their stock, care for it, display it attractively, and perform all the duties of the sales person. They are expected, to some extent, to have a more complete knowledge of their stock than general sales persons, but more often the specialization is due to store organization rather than the desire for a more exhaustive knowledge of stock or ability to handle it. Some employers consider long service in one department highly desirable, because it gives opportunity for specialization and a complete knowledge of the stock and the work of the department. This applies, however, only to those departments in which it is possible for sales persons, in the estimation of employers, to reach their maximum earning power.

The specialty saleswoman should have at least a grammar-school education or the equivalent, and two or more years of schooling in addition are desirable. That quality which is frequently termed native ability may make up for lack of fundamental education, but this quality is not found in the school laggards who have dropped out of the elementary school before the work was completed, though it often is found in the country boy or girl who lacked the opportunity to complete the elementary-school course.

The specialty sales person must have all the personal qualifications and the selling ability of the general sales person. The title "specialty sales person" is not used except for those who have shown marked success, have served a long time, or desire to remain in one line of selling.

Table or aisle girls.—These workers are learners or apprentices, having their first experience in selling goods, making out sales slips, and wrapping packages. Beginners who have had no experience in selling are, as a rule, placed at these counters. They are not expected to know stock, as their wares are changed every day, the worker usually not knowing what she is to sell until she appears in her place in the morning. Her stock is always of one price and frequently of one sort, though with slight variations as two or three "special" collars, a certain line of purses, etc. She may sell collars one day, aprons the next day, and handkerchiefs, which can be folded up and thrust into an envelope for delivery, the next day. Yard goods, except remnants, are not often sold in this way, so that measuring, cutting, folding, and wrapping are not a part of her work. The stock is limited in quantity and styles, so that with a little handling and arrangement she may learn sufficiently for the day's business the stock which she is to handle.

In this position the worker learns a little about a number of different kinds of stock; she gains facility in making out sales slips; she learns how to speak to customers, and how to interest them by helping them to find the different styles or varieties of goods on her counter. Although aisle or table selling is considered the simplest sort of salesmanship, if indeed it can be called salesmanship in its true sense, some managers consider it a very excellent test of selling ability, and these positions, of which there are a number in any large store, are used to test out new workers to determine their possibilities for regular department positions.

The aisle or table girl must have as much education as the sales girl, for employment depends in a measure on education and general ability. Experienced sales persons are advanced in their work not because of more education, but because of more experience and familiarity with the details of selling and knowledge of stock. The bright, energetic, ambitious girl will make the best of this position and readily advance to department work. This position is rarely given to older persons.

Sales persons having no special line are designated by the general name, sales person, or the name of the department in which they work. Since many of them look forward to positions of more responsibility, oftentimes in departments other than the one in which they are employed, the general term applies. These workers must know stock, its value, price, kinds, amounts, etc.; they must take care of stock under the direction of the head of stock; they must make sales which to the ordinary observer do not differ from those made by the head of stock, the buyer, or the more experienced sales persons.

A good memory is also a strong asset for sales persons. Verbal memory, as in memorizing prices, numbers, or other forms of marking used in designating stock, is required in practically every department of the store. Visual memory, as in remembering patterns, or kinds of stock, the faces of customers, some of whom the sales person may recognize with a smile or greeting, is also a desirable qualification. There are many ways in which memory plays an important part in salesmanship, each department having some kind of stock, some phase of work which calls for it.

Good eyesight is also important, as it is called into use in a great majority of the departments, laces for instance requiring close use of the eyes in matching fine patterns. Matching of colors, as in threads, fabrics, etc., also requires good eyesight in addition to the ability to match colors. Matching the weave in cloth, reading the numbers, names, or other forms of marking on stock boxes require ability to see quickly as well as distinctly.

Unfortunately there is as yet no scheme for ranking the general staff of sales persons by experience or achievement, which may account in a measure for the lack of interest, the irresponsibility, and the absence of initiative which, employers assert, characterize the rank and file of women workers.

Sales persons in the stores in Richmond, with one exception,[1] receive no training for their work other than incidental direction by the head of the department and assistance from fellow workers. That they can be trained and made more intelligent, able to give more efficient service to the store with the same or less tax upon strength, time, and ingenuity has been amply demonstrated in other cities.

Nonselling Occupations.

Check or bundle boys and girls.—These employees work in the store, and not in the shipping department. They have been classified as nonselling workers, since their work has to do with preparing the package for delivery. These workers receive the package from the sales person, examine the goods, ascertain price, remeasure yard goods, verify the quantity, examine sales slip, and stamp it, send the sales slip and money to the cashier, wrap up the package, and deliver it with the duplicate sales slip and change to the customer, or where it is to be delivered, tie or paste the address slip on the package ready to be sent to the delivery room. This work has to do with the handling of merchandise rather than the packing and routing of packages, hence leads to positions in the selling rather than the shipping department. Very few boys are employed for this work.

These young people must be responsible, accurate in their work, and fairly nimble with their hands. They are required to have facility in making out sales slips, using arithmetical processes. They must use all necessary care in taking addresses, be able to spell all names of merchandise, names of streets, etc., when they make out sales slips as they do in some of the Richmond stores, and they must be able to write legibly. These employees, though carrying considerable responsibility, are among the youngest workers in the store. They are, to some extent, the force from which sales persons are drawn and should therefore have the sales person's qualifications and education. Occasionally a check girl will become a cashier. This is the exception, however, rather than the rule.

[1] One store has classes for junior workers in common branches and store system.

Office Occupations.

File clerks.—The larger stores employ a person whose duty it is to file letters, bills, etc. This person works in the office and not only places the papers in the files where they belong, but is responsible to some extent for the classification of letters, bills, etc. This worker must have a liking for routine. She must have a good memory, be able to read readily, be a good writer, and quick at simple figuring.

This position is rarely, if ever, given to a young person without commercial training. Where the work of filing is small and not of very great importance, the filing clerk may look forward to a stenographic or bookkeeping position. In some instances this work is done by the stenographer. The duties of the stenographer in the store are the same as in any business office. There is a large proportion of business letters known as the form letter in which a standard method of writing the letter is used for all correspondence. In addition to this there are the other forms of office correspondence, such as answering inquiries, and writing replies to mail orders.

The store stenographer should be well versed in business forms, be quick and accurate in her work, and have a good knowledge of business English. She should have at least a high-school education or the equivalent and a good commercial training. This position can not be filled without special training in stenography and typewriting, including training in business forms.

Mail-order clerk.—This employee receives, reads, and fills orders for goods to be sent by mail. In some instances the mail-order clerk is an office employee who attends to the business of writing the letters and making out the bills. When this is the case, an assistant known as the "shopper" selects the goods to fill the order and attends to having it wrapped ready for shipment. When the clerk is both clerk and shopper she must have the qualifications necessary for the office work as well as the qualifications of a skillful buyer, for she frequently has to match colors, select trimmings, determine suitability of material, etc. The mail-order clerk must be able to dictate a good business letter, carry the routine work of her office, select materials, direct the wrapping and mailing of small bundles, and conduct the system of directions to the shipping department as to the sending of merchandise which requires special packing. In addition to these duties, she must keep accounts or report in regular form mail accounts to the bookkeeper. This position requires considerable judgment, initiative, knowledge of merchandise, willingness to take responsibility, and knowledge of office work. In some stores, especially those having a large rural clientele, it is considered a position of considerable importance. The person holding this position needs more than an elementary-school education—that is, more than a mere working knowledge of the elementary-school subjects.

Transfer clerk.—The transfer clerk attends to having purchases or charges transferred from one department to another and has charge of the refunds or credits for returned goods. This work is really office work, since the clerk makes out refund or credit slips, enters account of same on the special books provided for that purpose, and reports the same to the office to be cared for through the regular channels of accounting. The woman in this position needs tact, patience, and good judgment, for she must listen to explanations, complaints, and get details about goods returned and frequently make explanations that are satisfactory to the customers. Unlike bookkeeping, it requires little or no knowledge of actual bookkeeping. It does require, however, a good knowledge of simple arithmetic and accuracy in making credits or transfers, and uniformity of work.

Tube or carrier girl.—This worker is really a cashier. She receives the checks or sales slips as they come through the carrier to the cash desk, checks up the prices, amounts, and the total, O. K's the sales slips with a stamp, makes the change, and returns the slip and change to the sales person or the bundle girl when she is responsible for both the delivery of change and the package. She also enters the amount of the sale on her recapitulation sheet, and at the close of the day balances sales and cash, and renders account for the day.

Bookkeeper.—The position of bookkeeper in the store covers all the duties usually performed by the employee engaged in such work in any type of business. It is her duty to look after all accounts, keep account of all purchases, sales, credits, charge accounts, etc. For convenience, the work is frequently divided into several classes with one clerk responsible for each class or division. For this work the usual forms of bookkeeping are used and employees are trained for the work in commercial courses. A commercial course in addition to the regular high-school course, or as part of the high-school course, is considered necessary for this type of work. These office positions are rarely ever filled with young persons of no special training or experience. A strong liking for figures, for routine work, and for accuracy, and dependableness are very necessary personal qualifications for this work.

Auditor.—The auditor checks up and verifies accounts, makes up returns of day's sales, figures costs, makes up statistical statements, inventories, etc. This position requires a knowledge of bookkeeping and a high degree of accuracy and responsibility. The demands made upon the auditor differ in the various types of stores according to the volume of business and the complexity of the business organization. A good commercial education and general education, a high degree of intelligence about business methods and customs, are necessary equipment for this work. Unlike selling goods, it requires little contact with people other than those employed in the same office.

Shippers.—Shippers are men and boys. They are divided into two groups, one foe inside work such as wrapping and packing of bundles, checking up of addresses, routing of packages ready for delivery, and one for the outside work of delivering the packages to the homes of the customers.

The head shipper.—The head shipper is in a sense a manager as he is responsible for the method used in packing bundles, checking up and accounting for packages, and the routing of packages for delivery. The customer who buys a spool of thread and a card of hooks and eyes to be delivered has very little idea of the work required to get the package started on its way, or the amount of time, energy, wear, and tear on horses and wagons or automobiles required to take the package to its destination. The head shipper, or shipping clerk as he is sometimes called, directs all packing, lays out routes for delivery men, checks off the loads, or directs the checking, and manages the outside as well as the inside force. To do his work successfully, the head shipper must be able to manage men as well as the handling of things; he must be quick, accurate, and methodical in his work, for the rapidity with which deliveries are made up depends on systematic work. A good education is necessary for this position. Men of less than high-school education are holding such positions, but more than a grammar-school course is desirable. A knowledge of simple accounting and the ability to systematize work are very necessary for efficient service in this capacity.

Helpers.—The helpers in the shipping department are young men and boys who act as packers and clerks. Their work consists in packing, addressing, and routing of packages as directed by the head shipper. The goods are divided into two lots for packing, first the breakable going to the packing room to be packed in excelsior and corrugated paper, and second, those containing unbreakable merchandise as all sorts of dry goods, notions, etc., which require only strong paper to keep them in good condition. Packages thus made ready for delivery, are arranged in order ready for the wagons. The boys and men who do this work must be bright and alert, strong and active, for several deliveries a day call for constant and frequently rapid work, and some of the merchandise is heavy and requires strength in handling.

Selection of Workers.

Buyers and floor men are almost without exception chosen from the ranks of the regular employees after having shown ability and initiative necessary for the work, or come into the store from rural districts with the necessary experience and knowledge for these positions.

Experienced sales persons are chosen for their personal qualifications and the length and kind of their experience. Sales persons are very frequently young people just out of school, who have had no experience in store work or preparation for it. A written application is required in some instances, in others not, but the impression made during the interview is largely the determining feature in employment.

Check boys and girls, bundle wrappers, stock keepers, and other young workers in the store are selected very largely on the basis of the personal impression of the person in charge of the employment. According to reports, employers have been giving no serious attention to the study of the entrance requirements beyond age and ability to answer questions readily during the interview. In view of the fact that the chief criticisms against these young people are directed toward the ability to read, write, and figure readily and accurately, and to such personal qualities as willingness to take responsibility and to work, it would seem that the first interview and the application form might be planned to bring out some of these points and thus call attention to factors in the work which when met in the routine work would be taken more seriously and intelligently by the young people, and thus tend to reduce the proportion of failure to make good.

Training for Store Employments.

Training for store employments has been demonstrated to be an important branch of vocational education, and preparation for the work before entering employment as well as extension courses for experienced sales persons are found in many cities. Employers are recognizing the value of such courses as a part of business administration and the schools are beginning to realize that salesmanship offers a teachable content of considerable importance—two factors which go far to determine the kind and extent of training to be given.

Types of instruction needed.—Two types of instruction are necessary to meet the needs of these two classes of workers. This is recognized by the Richmond merchants who presented to the school board of the city a proposal for the training of store employees. This proposition asked for the services of a teacher for the young employees or junior workers to be taught in the stores, and special provision for older and experienced sales persons in the night classes of the public schools.

The young workers need training in the elements of salesmanship, care of stock, and store system, and to some extent spelling, reading, writing, etc., as applied to the work of the store. This instruction may go as far into the details of salesmanship as the age, experience, and ability of the pupils warrant. If offered in the store, these lessons may be given with actual merchandise in hand and thus meet real conditions. Experienced workers, on the other hand, need and desire instruction in the art of salesmanship as applied to selling in general, and to their particular lines of stock. A number of experienced salesmen and saleswomen expressed a desire for instruction in the kinds, qualities, etc., of the materials they handle, such as the kinds, grades, and qualities of woolen fabrics, with practical information as to methods of telling what is good silk, good wool, etc., also detecting the cotton in so-called wool fabrics and how to recognize the weighting in silk. These suggest two very definite and interesting types of practical instruction. First, an advanced course in the science of salesmanship, and, second, practical laboratory courses for the study of different types of merchandise, including instruction in the source of raw materials and methods of manufacture. The same methods may be applied to shoes, to gloves, to ready-to-wear clothing, and other specialized stock.

Grouping of pupils.—A very essential feature of instruction in salesmanship for workers who have passed beyond the beginning stage is grouping the pupils according to the kind of merchandise handled, as well as on the basis of experience. Careful arrangement of students handling similar lines of stock and of nearly the same experience with lessons planned and presented with the needs of the group well in mind will command the interest of the class and bring results. The mixed class having beginners who need to know the courtesies of salesmanship, the minor details of selling, and experienced workers desiring advanced work, tempts the teacher to teach to one group to the exclusion of the other. This is the common mistake of the evening course and does more to hurt the development of salesmanship courses than any other one thing.

Promotion as a factor in instruction.—Beyond the first making good in the store the possibility of promotion is the strongest incentive to training.

Promotion may be secured in several ways: (1) By increased wage or an increased rate of commission (the latter method is very common); (2) by increased responsibility; and (3) by increased responsibility and increased wage, either in the department in which the worker has been employed or by the transfer to another department to new and frequently larger responsibilities, with no greater wage in the beginning, but with greater opportunities for responsibility and larger salary when the details of the newer work have been learned.

Promotion within a department is in some instances more desirable than change to another department. This is true of such stock as shoes, gloves, toilet goods, and books, which present constantly new stock to be learned and new methods of selling, which keep the work live and interesting. In such departments salaries are, as a rule, commensurate with the knowledge and responsibility required; hence change is not necessarily desirable.

In some instances the knowledge of the stock and selling in one department definitely prepares the employee for positions in other departments carrying similar lines of stock, and change from one to another department can be made quite readily, provided personal qualifications and selling ability meet the requirements. There are, on the other hand, departments for which experience in any other department does not prepare, as, for instance, selling of notions can not be said to carry over to the selling of ribbons beyond the making of sales slips and meeting the customers. Where these transfers are desirable instruction should be given to meet the need of workers making such change.

In salesmanship and other subjects the need for instruction is evident from reports of merchants who desire better service for their customers and from the requests of employees asking for specific instruction. The teachable content of salesmanship is rich enough for a course of considerable length with much that applies to beginning or preparatory courses and a broad and rich content for experienced workers. With workers grouped according to their lines of merchandise, and courses fitted to meet those lines, instruction can do much to lift the work out of the job category to that of a dignified position.

STATISTICAL SUMMARY OF INFORMATION SECURED FROM WOMEN EMPLOYED IN RETAIL STORES.

Schedules relating to employment in retail stores were taken for 46 men and 312 women, through personal interviews of 15 to 30 minutes each. These employees were from 11 stores. The number of men included is too small for satisfactory analysis.

The statistics show that 76 per cent of all the workers are natives of Virginia, half of these being natives of Richmond; 17.9 per cent are Americans, but born outside of

Virginia; and 5.8 per cent are foreign born. The following table shows the numbers and percentages:

TABLE 75.—NUMBER AND PER CENT OF EMPLOYEES OF SPECIFIED NATIVITY, BY SEX, IN RETAIL STORES.

Place of birth.	Employees born in specified community.					
	Number.			Per cent.		
	Males.	Females.	Total.	Males.	Females.	Total.
Richmond	12	125	137	26.1	40.1	38.3
Virginia, outside of Richmond	23	112	135	50.0	35.9	37.7
United States, outside of Virginia	9	55	64	19.5	17.6	17.9
Foreign country	1	20	21	2.2	6.4	5.8
Not reported	1	....	1	2.2	....	.3
Total	46	312	358	100.0	100.0	100.0

This table shows that 38.3 per cent of the workers were born in Richmond and 37.7 per cent in surrounding counties, which apparently indicates that the city schools and near-by country schools are determining the kind and quality of education that 76 per cent of these people may have. As the standards of educational and personal qualifications of workers entering store employments are raised—as they are undoubtedly being raised year after year—these native-born men and women who must meet the new requirements and standards will depend upon local schools for their necessary training and education.

SEX OF EMPLOYEES.

Employees in the retail stores covered in this study are largely women and girls. Schedules were obtained for 46 men and 312 women, or 1 man employee to 7 women employees. The largest number of men are found in the department stores where they occupy nearly all of the executive positions as the buyers, floor men, managers, and superintendents. Both the receiving and delivery departments employ men almost exclusively. The specialty stores, especially those which deal exclusively in women's and children's wearing apparel, employ women chiefly. The following table shows the sex distribution of the 358 workers interviewed in the two types of stores:

TABLE 76.—NUMBER AND SEX OF EMPLOYEES IN RETAIL STORES OF EACH SPECIFIED KIND.

Character of store.	Number of establishments.	Number of employees.		
		Males.	Females.	Total.
Department stores	3	28	141	169
Specialty stores:				
General dry goods	5	8	23	31
Women's, misses', and children's clothing	[1] 3	10	148	158
Total, specialty stores	8	18	171	189
Total, all stores	11	46	312	358

[1] One of these stores employing 8 men and 49 women carries also general dry goods.

AGE OF ENTRANCE TO STORE EMPLOYMENT.

Although children in this State may leave school at the age of 12, and, if necessary, go to work—and they are entirely free to go to work after the fourteenth birthday—only 15, or 4.3 per cent of the 347 workers reporting, stated that they had gone to work under the age of 14 years. While those who entered at 14 and 15 years number 91, or 26.2 per cent, the largest number falls in the 16 to 20 years of age group, with a total of 170, or 49 per cent, of the total number interviewed. Table 77 shows the classifications of the age of entrance for all workers reporting in all stores.

TABLE 77.—NUMBER AND PER CENT OF EMPLOYEES OF SPECIFIED AGE ON ENTERING EMPLOYMENT IN RETAIL STORES.

Number.

Age.	Total employees reporting age of entering retail store employment.								
	Males.			Females.			Total.		
	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.
Under 14 years	1	3	4	6	5	11	7	8	15
14 and 15 years	8	5	13	32	46	78	40	51	91
16 to 20 years	16	5	21	60	89	149	76	94	170
21 years and over	3	4	7	36	28	64	39	32	71
Total	28	17	45	134	168	302	162	185	347

Per cent.

Age.	Males, department stores.	Males, specialty stores.	Males, all stores.	Females, department stores.	Females, specialty stores.	Females, all stores.	Total, department stores.	Total, specialty stores.	Total, all stores.
Under 14 years	3.6	17.7	8.9	4.5	2.9	3.7	4.3	4.3	4.3
14 and 15 years	28.6	29.4	28.9	23.9	27.4	25.8	24.7	27.6	26.2
16 to 20 years	57.1	29.4	46.7	44.8	53.0	49.3	46.9	50.8	49.0
21 years and over	10.7	23.5	15.5	26.8	16.7	21.2	24.1	17.3	20.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Employment of children under 14 years of age is prohibited by law, although upon proper showing the court is authorized to permit children aged 12 to 14 years to work.[1] Boys and girls under 16 years of age may be employed, and, as Table 77 shows, a goodly number fall in this class. Merchants assert, however, that there is a growing tendency to employ fewer young people under 16 because they are unprepared for much of the work they are called upon to do. This means, first, that there is a growing sentiment against the young worker in the store; second, that merchants have come to realize that certain educational qualifications, more than the desire for work on the part of the child or the need of a person to fill the place, are necessary to fit a young person for store work; and, third, that except in unusual cases children who remain in school until the grade work or the high-school course is completed, while they may not use directly the kind of knowledge thus gained, do bring to their work greater capacity for learning and meeting the problems of salesmanship. This is especially true of progressive merchants who are interested in and to some extent are using the modern scientific methods which are being applied to business.

[1] Acts of 1914, ch. 339, secs. 1 and 6.

AGE OF EMPLOYEES.

A study of the ages of 338 workers actually employed reporting from 11 stores shows that only 13, or 3.9 per cent, are under 16 years of age, and that 116, or 34.3 per cent, representing the largest number, are aged 16 to 20. A small decrease comes after the age of 20 years. Of the last age group the schedules show that the number of employes over 40 years of age was 22 or only 6.5 per cent of the total. These facts are set forth in the following table:

TABLE 78.—NUMBER AND PER CENT OF EMPLOYEES OF SPECIFIED AGE IN RETAIL STORES, BY SEX.

Number.

Age.	Total employees reporting age.								
	Males.			Females.			Total.		
	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.
Under 16 years	2	1	3	6	4	10	8	5	13
16 to 20 years	9	....	9	41	66	107	50	66	116
21 to 25 years	7	7	14	44	39	83	51	46	97
26 years and over	10	10	20	40	52	92	50	62	112
Total	28	18	46	[1] 131	[1] 161	[2] 292	[1] 159	[1] 179	[2] 338

Per cent.

Age.	Males: Department stores.	Males: Specialty stores.	Males: All stores.	Females: Department stores.	Females: Specialty stores.	Females: All stores.	Total: Department stores.	Total: Specialty stores.	Total: All stores.
Under 16 years	7.2	5.5	6.5	4.6	2.5	3.4	5.0	2.8	3.9
16 to 20 years	32.1	....	19.6	31.3	41.0	36.7	31.5	36.9	34.3
21 to 25 years	25.0	38.9	30.4	33.6	24.2	28.4	32.0	25.7	28.7
26 years and over	35.7	55.6	43.5	30.5	32.3	31.5	31.5	34.6	33.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Not including 10 not reporting as to age.
[2] Not including 20 not reporting as to age.

YEARS IN STORE EMPLOYMENT.

The length of service of the greater proportion of men and women who go into store employments, as shown in Table 79, is short as compared with the number of possible working years of both men and women. Of the 45 men reporting 25, or 55.6 per cent, had been in the work less than five and a half years; and of the 301 women reporting 208, or 69.1 per cent, had been in the work less than five and a half years. This seems to indicate that the proportion of women remaining in the work for a short period of years is larger than of men. Of the total number reporting on this subject only 113, or 32.7 per cent, said they had been in retail-store employment for five and a half years or more, while 233, or 67.3 per cent, reported having worked less than five and a half years. The following table shows the number and per cent of employees, by sex, who have been employed in retail stores each specified number of years.

TABLE 79.—NUMBER AND PER CENT OF EMPLOYEES, BY SEX, WHO HAVE BEEN IN RETAIL STORE EMPLOYMENT EACH SPECIFIED NUMBER OF YEARS.

Number.

Years in retail stores.	Total employees reporting years of employment in retail stores.								
	Males.			Females.			Total.		
	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.
Under 6 months	4	......	4	13	21	34	17	21	38
6 months and under 1½ years	7	......	7	22	24	46	29	24	53
1½ years and under 2½ years	4	2	6	23	17	40	27	19	46
2½ years and under 3½ years	2	......	2	12	19	31	14	19	33
3½ years and under 4½ years	2	2	4	21	18	39	23	20	43
4½ years and under 5½ years	1	1	2	8	10	18	9	11	20
5½ years and under 6½ years	1	1	2	13	8	21	14	9	23
6½ years and under 7½ years	......	......	......	5	5	10	5	5	10
7½ years and under 8½ years	2	......	2	6	9	15	8	9	17
8½ years and under 9½ years	1	2	3	3	2	5	4	4	8
9½ years and under 14½ years	2	5	7	6	19	25	8	24	32
14½ years and under 19½ years	1	1	2	5	3	8	6	4	10
19½ years and over	1	3	4	1	8	9	2	11	13
Total	28	17	45	138	163	301	166	180	346

Per cent.

Years in retail stores.	Males, Department stores.	Males, Specialty stores.	Males, All stores.	Females, Department stores.	Females, Specialty stores.	Females, All stores.	Total, Department stores.	Total, Specialty stores.	Total, All stores.
Under 1½ years	39.3	......	24.4	25.4	27.6	26.6	27.7	25.0	26.3
1½ years and under 4½ years	28.6	23.5	26.7	40.5	33.1	36.5	38.6	32.2	35.3
4½ years and under 9½ years	17.8	23.5	20.0	25.4	20.9	22.9	24.1	21.1	22.5
9½ years and over	14.3	53.0	28.9	8.7	18.4	14.0	9.6	21.7	15.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

CONJUGAL CONDITION.

Table 80 shows for 328 employees reporting, the proportion of married, widowed, and unmarried engaged in store work. Of the men 74.2 per cent and of the women 79.5 per cent were unmarried. Of the men 25.8 per cent and of the women 11.4 per cent were married, and 9.1 per cent of the women were widowed. Similar figures for store employees in other cities are not available to show to what extent similar proportions exist.

TABLE 80.—NUMBER AND PER CENT OF EMPLOYEES IN RETAIL STORES OF EACH SPECIFIED CONJUGAL CONDITION, BY SEX.

Conjugal condition.	Total employees reporting conjugal condition.					
	Males.		Females.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Department stores:						
Single	17	70.8	99	75.0	116	74.4
Married	7	29.2	14	10.6	21	13.5
Widowed	......	......	[1] 19	14.4	[1] 19	12.1
Total	24	100.0	132	100.0	156	100.0
Specialty stores:						
Single	6	85.7	137	83.0	143	83.1
Married	1	14.3	20	12.1	21	12.2
Widowed	......	......	[2] 8	4.9	[2] 8	4.7
Total	7	100.0	165	100.0	172	100.0
All stores:						
Single	23	74.2	236	79.5	259	79.0
Married	8	25.8	34	11.4	42	12.8
Widowed	......	......	27	9.1	27	8.2
Total	31	100.0	[3] 297	100.0	[3] 328	100.0

[1] Two divorced. [2] One divorced. [3] Three divorced.

EMPLOYEES IN SPECIFIED OCCUPATIONS.

The department stores, and to some extent, the specialty stores as well, have four classes or groups of employees, namely, the executive force, the selling force, nonselling force, and office employees. Managers in every case are men, and many of the buyers are men. Heads of departments are frequently buyers and carry the duties of department management as well as selecting and ordering goods. Buyers in many instances sell goods and have been listed with the sales force. In some stores the head of stock is the buyer. This, however, is not the rule. Men and women both occupy these positions, frequently in entirely different lines, and in some instances both men and women buy the same kind of stock. For example, muslin underwear and lingerie, fancy neckwear, trimmings, laces, and other lines of stock which are characteristically feminine, are bought by women; men's furnishings, furniture, carpets, men's clothing and other lines for men, and large and heavy wares are bought by men; domestics, silks, gloves, novelties, books, draperies, etc., are bought both by men and women, the choice of one or the other depending on individual ability.

Of the 46 men interviewed, 12, or 26.1 per cent, hold positions as heads of departments and buyers; of the 312 women reporting, 40, or 12.8 per cent, hold positions as heads of departments and buyers. Men and women sales persons are employed in the various departments on much the same basis as buyers, that is according to the kind of stock to be handled. Bundle wrappers are girls exclusively, probably because they are willing to sit still in the small "box" provided for their work. Check carriers are boys and girls. The office manager is usually a man, though women were found working in this capacity. Cashiers, stenographers, and other office employees are usually women. The receiving of goods—opening of boxes, and distributing the goods in the various departments, or placing them in the room for reserve stock—is done exclusively by men and boys. Packing, routing of bundles, and delivery of packages are also done exclusively by men.

Table 81 shows the classification of the workers in the stores.

TABLE 81.—NUMBER OF PERSONS EMPLOYED IN SPECIFIED OCCUPATION GROUPS IN RETAIL STORES, BY SEX.

Occupation group.	Males.			Females.			Total.		
	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.	Department stores.	Specialty stores.	All stores.
Executive force	2	6	8	11	8	19	13	14	27
Selling force, buyers, stock keepers, etc	3	6	9	8	23	31	11	29	40
Selling force, sales persons	12	6	18	87	111	198	99	117	216
Nonselling force	7	......	7	13	2	15	20	2	22
Office force	2	......	2	16	11	27	18	11	29
Alteration department	......	......	......	3	16	19	3	16	19
Miscellaneous, printers, etc	2	......	2	3	......	3	5	......	5
Total	28	18	46	141	171	312	169	189	358

AGE AND SEX OF OCCUPATION GROUPS.

Managers did not report individually for this study, but many of them were interviewed with regard to requirements, etc., of the employees. Floor men must have had experience in store work, hence are among the older employees.

Table 82 shows the age and sex distribution of all the workers interviewed by occupation groups.

Two buyers, it may be noted, are reported under 20 years of age. This is unusual, as considerable knowledge of stock and experience in selling are considered necessary training for successful buying. Sales persons, especially for table selling or for notions, may begin while quite young; out of the 204 reported only 4 are under 16 years of age. The younger workers begin as stock keepers and bundle girls and gradually work into selling positions, either as aisle or table girls, or as assistants in the small-wares departments.

TABLE 82.—NUMBER OF EMPLOYEES OF SPECIFIED AGE IN RETAIL STORES, BY SEX AND OCCUPATION GROUP.

Occupation group.	Employees of specified occupation group.								
	Males.				Females.				Total.
	Under 16 years.	16 to 20 years.	21 to 30 years.	31 years and over.	Under 16 years.	16 to 20 years.	21 to 30 years.	31 years and over.	
Floor men			2	1					3
Heads of departments			1			6	10	3	20
Advertising force			3	1					4
Buyers		[1] 1	3	4		[1] 1	7	4	20
Stock keepers	1					10	8	1	20
Sales persons		5	9	4	4	65	80	37	204
Receiving department		1							1
Shipping department	[2] 1	1	3	1	[2] 5	8	2		21
Office force		1		1	1	14	10	1	28
Alteration department							6	11	17
Miscellaneous	1		1			1	1	1	5
Total	[3] 3	9	22	12	10	105	124	58	[3] 343

[1] Probably assistant buyer.
[2] Check girls and boys who wrap and carry bundles and work in the store and not in shipping department proper.
[3] Not including 15 not reporting as to age and occupation.

Executives must be experienced workers to hold positions of responsibility and they must have a first-hand knowledge of the problems of the store. This experience is gained through years of service, hence very few of these workers are under 25 years of age. The younger ones are found in departments handling inexpensive staple articles.

The younger workers are scattered somewhat throughout all the types of employment, but the majority begin in a few positions open to them and rarely ever filled by older persons, which indicates, though indefinitely, that young employees must go through a preparatory or trying-out period before they can gain places of full standing in the type of work for which they are qualifying. This period is more or less indifferently used, usually because of little or no effort on the part of the store to give systematic training for the work which the girl or boy may normally be expected to accomplish with credit later on.

DEPARTMENTS IN WHICH WORKERS ARE ENGAGED.

Women's specialties are sold by women; men's and boys' clothing and shoes are sold by men; dress goods, linens, rugs, carpets and draperies, upholstery, and some miscellaneous things are sold by both men and women, these being articles which can be handled only by older and experienced workers.

DIFFERENT OCCUPATIONS OF THE EMPLOYEES.

The different occupations held in the stores indicate in the main, promotion (though perhaps not necessarily higher wage), for change of employment in practically all cases was to positions requiring greater responsibility. Several "misfits" were reported as changed. One unsuccessful sales girl was changed to bundle and check girl, where she succeeded and then went into the office as tube girl. A counter girl became an aisle or table girl, a change considered a demotion. But she "made it go" and continued in that work by preference. Others failed to sell one kind of stock but succeeded in other lines.

Change from one position to another in one store meant promotion, most frequently, but in many cases the change was from one store to another, either for change of work or increased wage. The number of changes is greatest in department stores because the opportunities for change are more numerous than in the other stores.

Of the total number of men and women reporting, 99 had been employed in two occupations, 48 in three occupations, 31 in four occupations, 14 in five occupations, and 7 in six occupations. Of the men reporting, in department stores, 6 had been employed in two occupations, 3 in three occupations, 4 in four occupations, and 1 in five occupations. Of the women reporting, in department stores, 38 had been employed in two occupations, 19 in three occupations, 17 in four occupations, 4 in five occupations, 7 in six occupations.

The following table gives the statistics relating to the change of occupations and years of service for each group.

TABLE 83.—NUMBER OF EMPLOYEES WHO HAVE FOLLOWED ONE AND MORE THAN ONE OCCUPATION IN RETAIL STORES, BY SEX AND YEARS OF EXPERIENCE.

Sex, kind of store, and years of experience in retail stores.	Employees reporting specified number of years of experience in retail stores.								
	Total.	One occupation only.	Two or more occupations.						
			Two.	Three.	Four.	Five.	Six.	Number not reported.	Total.
MALES.									
Department stores:									
1 year and under	11	8	2	......	1	......	......	......	3
2 to 4 years	8	2	3	1	2	......	......	......	6
5 to 9 years	5	1	1	2	......	......	......	1	4
10 years and over	4	1	......	......	1	1	......	1	3
Total	28	12	6	3	4	1	......	2	16
Specialty stores:									
1 year and under	......	......	......	......	......	......	......	......	......
2 to 4 years	4	2	2	......	......	......	......	......	2
5 to 9 years	4	......	1	1	......	......	......	2	4
10 years and over	9	......	4	1	2	......	......	2	9
Total	17	2	7	2	2	......	......	4	15
All stores:									
1 year and under	11	8	2	......	1	......	......	......	3
2 to 4 years	12	4	5	1	2	......	......	......	8
5 to 9 years	9	1	2	3	......	......	......	3	8
10 years and over	13	1	4	1	3	1	......	3	12
Total	45	14	13	5	6	1	......	6	31
FEMALES.									
Department stores:									
1 year and under	35	24	10	......	1	......	......	......	11
2 to 4 years	56	18	13	11	9	3	1	1	38
5 to 9 years	35	4	11	7	5	1	4	3	31
10 years and over	12	1	4	1	2	......	2	2	11
Total	138	47	38	19	17	4	7	6	91

TABLE 83.—NUMBER OF EMPLOYEES WHO HAVE FOLLOWED ONE AND MORE THAN ONE OCCUPATION IN RETAIL STORES, BY SEX AND YEARS OF EXPERIENCE—Concluded.

Sex, kind of store, and years of experience in retail stores.	Employees reporting specified number of years of experience in retail stores.								
	Total.	One occupation only.	Two or more occupations.						
			Two.	Three.	Four.	Five.	Six.	Number not reported.	Total.
FEMALES—concluded.									
Specialty stores:									
1 year and under	45	30	10	3	1			1	15
2 to 4 years	54	17	18	9	2	3		5	37
5 to 9 years	34	7	10	10	2	4		1	27
10 years and over	30	9	10	2	3	2		4	21
Total	163	63	48	24	8	9		11	100
All stores:									
1 year and under	80	54	20	3	2			1	26
2 to 4 years	110	35	31	20	11	6	1	6	75
5 to 9 years	69	11	21	17	7	5	4	4	58
10 years and over	42	10	14	3	5	2	2	6	32
Total	301	110	86	43	25	13	7	17	191
MALES AND FEMALES.									
All stores:									
1 year and under	91	62	22	3	3			1	29
2 to 4 years	122	39	36	21	13	6	1	6	83
5 to 9 years	78	12	23	20	7	5	4	7	66
10 years and over	55	11	18	4	8	3	2	9	44
Total	346	124	99	48	31	14	7	23	222

Of 38 men reporting, 10 had held no positions outside of store work, and 11 of those reporting occupations other than store employments had held positions in other types of stores than the ones included in this study, or in lines of work which involved salesmanship, and can therefore be considered as being in the same line. Of 284 women reporting, 202 had held no positions outside of store work and 40 had filled occupations requiring selling ability. Of the 28 men reporting other occupations, 11 had come from mechanical and industrial pursuits and of the 82 women only 10 had come from the trades and industries, 2 from nursing, and 7 had been teachers or social workers.

These facts indicate pretty clearly that store employments hold the very large proportion of those who undertake the work, and shifting about of these workers in Richmond is very limited, hence the schools in organizing salesmanship classes, especially for those already employed, are dealing with a group of workers well established in their life work.

HOURS OF LABOR.

Hours of labor in the stores of Richmond vary, a number of the stores having adopted the standard working day, 9 hours or less, which totals for the week lower than the law requires.[1] Other stores are open at night, hence have a long working day and week.

Stores having the shorter working day also close at 5 p. m. and for half holiday on Saturday throughout the summer months, hence the summer schedule of hours and

[1] See Virginia Code of 1904, section 3657b, as amended by act approved Mar. 20, 1914.

the winter schedule of hours as shown in Table 84, which follows. This plan of a shorter working day for the entire year, no night work, and a shorter day and week in summer has been adopted by all uptown merchants and greatly adds to the desirability of store employments.

TABLE 84.—NUMBER AND PER CENT OF EMPLOYEES WORKING SPECIFIED NUMBER OF HOURS PER DAY IN RETAIL STORES, BY SEX.

A. Winter Schedule.

Sex, and kind of stores.	Total employees reporting specified number of hours of work per day.											
	Number.							Per cent.				
	Under 8 hours.	8 and under 8½ hours.	8½ and under 9 hours.	9 and under 9½ hours.	9½ and under 10 hours.	10 and under 10½ hours.	10½ and under 11 hours.	Under 8 hours.	8 and under 8½ hours.	8½ and under 9 hours.	9 and under 9½ hours.	9½ hours and over.
Males:												
Department stores	......	1	......	19	5	1	......	......	......	......	......	......
Specialty stores	......	1	......	5	......	2	5	......	......	......	......	......
All stores	......	2	......	24	5	3	5	......	5.1	......	61.6	33.3
Females:												
Department stores	......	......	3	133	......	......	......	......	......	......	......	......
Specialty stores	......	2	22	124	......	1	......	......	......	......	......	......
All stores	......	2	25	257	......	1	......	......	.7	8.8	90.2	.3
Males and females:												
Department stores	......	1	3	152	5	1	......	......	.6	1.9	93.8	3.7
Specialty stores	......	3	22	129	......	3	5	......	1.9	13.6	79.6	4.9
All stores	......	4	25	281	5	4	5	......	1.3	7.7	86.7	4.3

B.—Summer Schedule.

Sex, and kind of stores.	Under 8 hours.	8 and under 8½ hours.	8½ and under 9 hours.	9 and under 9½ hours.	9½ and under 10 hours.	10 and under 10½ hours.	10½ and under 11 hours.	Under 8 hours.	8 and under 8½ hours.	8½ and under 9 hours.	9 and under 9½ hours.	9½ hours and over.
Males:												
Department stores	......	20	3	1	......	......	......	......	......	......	......	......
Specialty stores	......	6	......	......	......	1	......	......	......	......	......	......
All stores	......	26	3	1	......	1	......	......	83.9	9.7	3.2	3.2
Females:												
Department stores	3	127	......	......	......	......	......	......	......	......	......	......
Specialty stores	21	106	2	15	......	......	......	......	......	......	......	......
All stores	24	233	2	15	......	......	......	8.8	85.0	.7	5.5	......
Males and females:												
Department stores	3	147	3	1	......	......	......	1.9	95.5	1.9	.7	......
Specialty stores	21	112	2	15	......	1	......	13.9	74.2	1.3	9.9	.7
All stores	24	259	5	16	......	1	......	7.9	84.9	1.6	5.3	.3

All workers do not report at the stores at the same hours. Floor men report earlier than sales people so as to be in readiness to direct the work of opening the store, uncovering and arranging of stock. They must also be on hand to see that stock is covered at night and people dismissed. Shipping clerks and delivery men frequently work after other employees have left for the night. The working day for practically the entire group falls between 8½ and 9½ hours per day in winter and between 8 and 8½ hours in summer. The hours of labor per week were 51 and less than 57 for 94.4 per cent of the workers in winter, and 48 and less than 51 for 84.9 per cent of the workers in summer.

WAGES.

The study of wages of store employees, owing to the commission system which prevails, is a very difficult problem. Practically all the stores of Richmond use the commission plan of paying a flat rate and 2 per cent, 3 per cent, or more on the total amount of goods sold; thus the worker determines, to some extent, her own worth to the business.

Table 85 shows the returns on wages from 300 reporting, and is as fair a statement as can be made except from pay-roll figures.

TABLE 85.—NUMBER AND PER CENT OF EMPLOYEES IN RETAIL STORES EARNING CLASSIFIED AMOUNTS OF WAGES PER WEEK, BY SEX AND KIND OF STORE.

Number.

Sex and kind of store.	Employees earning, per week—								Total.
	Under $5.	$5 and under $10.	$10 and under $15.	$15 and under $20.	$20 and under $25.	$25 and under $30.	$30 and under $35.	$35 and over.	
Males:									
Department stores	2	[1]8	[2]8	[1]2	1	......	1	......	[3]22
Specialty stores	......	3	4	1	1	......	......	2	11
All stores	2	11	12	3	2	......	1	2	33
Females:									
Department stores	[4]13	[5]83	12	6	......	......	......	......	[3]114
Specialty stores	14	[6]104	[7]22	[8]8	3	2	......	......	[3]153
All stores	27	187	34	14	3	2	......	......	267
Males and females:									
Department stores	15	91	20	8	1	......	1	......	136
Specialty stores	15	106	26	9	4	2	......	2	164
All stores	30	197	46	17	5	2	1	2	300

Per cent.

Sex and kind of store.	Under $5.	$5 and under $10.	$10 and under $15.	$15 and under $20.	$20 and under $25.	$25 and under $30.	$30 and under $35.	$35 and over.	Total.
Males:									
Department stores	9.1	36.4	36.4	9.1	4.5	......	4.5	......	100.0
Specialty stores	......	27.2	36.4	9.1	9.1	......	......	18.2	100.0
All stores	6.1	33.3	36.4	9.1	6.1	......	3.0	6.1	100.0
Females:									
Department stores	11.4	72.8	10.5	5.3	......	......	......	......	100.0
Specialty stores	9.1	67.9	14.4	5.2	2.0	1.3	......	......	100.0
All stores	10.1	70.0	12.7	5.2	1.1	.8	......	......	100.0
Males and females:									
Department stores	11.0	66.9	14.7	5.9	.7	......	.7	......	100.0
Specialty stores	9.1	64.6	15.9	5.5	2.4	1.2	......	1.2	100.0
All stores	10.0	65.7	15.3	5.7	1.7	.7	.3	.7	100.0

[1] Besides wages 1 reported "some commission."
[2] Besides wages 1 received a commission of 2 per cent.
[3] See notes to details.
[4] Besides wages 1 received a commission of 1 per cent.
[5] Besides wages 8 received a commission of 2 per cent; 1 a commission of 4 per cent; 1 a commission of 1 per cent; 1 reported "more at Christmas;" and 1 reported "some commission."
[6] Besides wages 3 received a yearly commission; 1 reported $7 in millinery, short season; and 1 reported $8 and over.
[7] Besides wages 6 received a commission of 6 per cent, and 1 reported "some commission."
[8] Besides wages 1 received a commission of 5 per cent.

The following table shows, by occupations, the highest, lowest, and average wage of 295 employees reporting and indicates the positions which command the highest salaries. A number of the higher salaried employees did not report wages.

TABLE 86.—HIGHEST, LOWEST, AND AVERAGE WEEKLY WAGES OF EMPLOYEES REPORTING.

Occupation.	Males.				Females.			
	Number.	Wages per week.			Number.	Wages per week.		
		Highest.	Lowest.	Average.		Highest.	Lowest.	Average.
DEPARTMENT STORES.								
Heads of departments					9	$10.00	$7.00	$8.44
Buyers	2	$32.00	$20.00	$26.00	3	18.00	15.00	16.83
Heads of stock					3	15.00	9.00	11.00
Markers					1	5.00	5.00	5.00
Sales persons, experienced	11	18.00	5.00	10.55	62	15.00	3.50	6.62
Learners, selling force					3	7.00	4.50	5.83
Receiving department	1	8.00	8.00	8.00				
Shipping department	3	14.00	5.00	10.33				
Bundle wrappers	1	10.00	10.00	10.00	9	6.00	3.00	4.72
Check girls and boys	1	3.00	3.00	3.00	4	3.00	3.00	3.00
Cashiers					1	5.00	5.00	5.00
Stenographers					1	12.00	12.00	12.00
Transfer clerks					1	8.00	8.00	8.00
Mail-order clerks					3	10.00	7.00	8.00
Charge clerks					1	3.00	3.00	3.00
Telephone operators					1	6.00	6.00	6.00
General office work	1	12.00	12.00	12.00	6	10.00	4.00	6.67
Sewers, alteration department					3	16.00	10.00	12.00
SPECIALTY STORES.								
Floor men	1	8.50	8.50	8.50				
Heads of departments					8	18.00	5.00	9.50
Window trimmers	4	20.00	10.00	13.63				
Buyers	2	45.00	40.00	42.50	8	25.00	8.00	17.75
Heads of stock					6	10.00	5.50	7.75
Assistant stock keepers	1	4.00	4.00	4.00	9	6.00	4.00	5.11
Sales persons, general					10	15.00	5.00	10.85
Sales persons, experienced	3	17.00	8.00	12.50	79	15.00	4.00	7.27
Learners, selling force					6	5.00	3.50	4.00
Bundle wrappers					1	5.00	5.00	5.00
Check girls					1	3.50	3.50	3.50
Cashiers					7	10.00	4.50	6.00
Charge clerks					1	7.50	7.50	7.50
Box-tube girl					1	5.00	5.00	5.00
General office work					1	7.50	7.50	7.50
Fitters, alteration department					6	20.00	8.50	13.25
Sewers, alteration department					9	8.00	6.00	7.33

CONDITIONS OF EMPLOYMENT.

Next to wages the most talked-about problem of employment is that of the conditions under which any given work is performed, and the effect upon the workers. The problems of proper ventilation, lighting of rooms, and dressing and lunch room accommodations have been given much study, and in spite of increasingly complex conditions, especially in larger cities, much has been done.

There are other conditions of employment relating to the health of the workers which these points do not cover, such as strain caused by standing and by reaching or lifting heavy stock, eyestrain, and nervous strain which comes from over exertion or excitement, and their effect upon the physical life of the employees. Store work demands much standing, though employers provide seats for the workers, and employees, especially saleswomen, floor men, and shippers, reported noticeable strain from being on the feet continuously. The ill effects may be due in part to careless posture, such as standing with the weight on one foot, or ill-fitting, high-heeled, or too small shoes, and clothing which is too tight.

Table 87 gives the report of the employees reporting on the questions, "Does your work involve peculiar physical or nervous strain?" and "Are there conditions of your work which tend to impair health?"

TABLE 87.—EMPLOYEES IN RETAIL STORES REPORTING AS TO EFFECT OF THEIR EMPLOYMENTS ON HEALTH.

Sex of employees.	Employees answering yes or no as to whether their work involved—											
	Physical strain.				Nervous strain.				Impairment of health.			
	Yes.	No.	Per cent yes.	Total reporting.	Yes.	No.	Per cent yes.	Total reporting.	Yes.	No.	Per cent yes.	Total reporting.
All stores:												
Males	10	33	23.3	43	12	32	27.3	44	9	32	21.9	41
Females	106	190	35.8	296	114	187	37.9	301	22	273	7.5	295
Total	116	223	34.2	339	126	219	36.5	345	31	305	9.2	336

The reports on physical strain, etc., by occupation groups, show that physical strain is felt by sales people, floor men, and women in practically all groups. Nervous strain comes in most cases in times of great rush, as at the holiday season, or special sales days, and is felt by all workers who have to do with getting ready for the sale, as buyers, sales persons, shippers, tube girls, but probably most of all by the sales persons who deal directly with the customers and floor men who manage the crowds and attend to certain details of signing purchase slips and directing customers. Workers engaged in basement departments reported ill effects from artificial light and lack of fresh outside air. Table 88 gives statistics on questions regarding health and working conditions.

TABLE 88.—EMPLOYEES IN RETAIL STORES REPORTING AS TO THE EFFECT OF THEIR EMPLOYMENTS ON HEALTH, BY SEX AND OCCUPATION.

Occupation.	Total employees reporting whether their work involved—											
	Physical strain.				Nervous strain.				Impairment of health.			
	Males.		Females.		Males.		Females.		Males.		Females.	
	Total reporting.	Number reporting yes.	Total reporting.	Number reporting yes.	Total reporting.	Number reporting yes.	Total reporting.	Number reporting yes.	Total reporting.	Number reporting yes.	Total reporting.	Number reporting yes.
Floor men	1	1			2	2			1	1		
Heads of departments	1	1	17	7	1	1	18	9	1	1	18	1
Advertising force	4				4	1			4			
Buyers	8		10		8	5	12	7	8	1	12	
Stock keepers	1		18	7	1		19	5	1		19	
Sales persons	18	3	189	75	17	2	188	70	15	4	183	15
Receiving department					1				1			
Shipping department	6	2	14	2	6	1	15	2	6	1	15	1
Office force	2	1	26	6	2		27	10	2		27	1
Alteration department			19	9			19	11			18	4
Miscellaneous	2	2	3		2		3		2	1	3	
Total	43	10	296	106	44	12	301	114	41	9	295	22

The information in these tables is interesting and valuable, inasmuch as it shows that the employees are thinking about their own work. Deeper study into what causes physical strain, nervous strain, and the like is necessary before adequate preventive measures can be taken. If basements are to be used as sales departments, they should be supplied with fresh circulating air, not merely cool air, which is frequently dead air. Basement conditions in Richmond stores, as basements go, are not bad, but these, like store basements in other cities, can and should be made comfortable and free from risk to the health.

AGE AT LEAVING SCHOOL.

Until a year ago children in Richmond were not compelled to go to school, and the law restricting the employment of children to 14 years of age excepted orphans and others dependent upon their own labor for support or with invalid parents dependent upon them.[1] In spite of this fact only 8.1 per cent of the 347 reporting stated that they had left school before they were 14 years of age. More than 50 per cent of the total number, however, had left before the age of 16 years. The following table gives the figures on this subject:

TABLE 89.—NUMBER AND PER CENT OF EMPLOYEES IN RETAIL STORES WHO LEFT SCHOOL AT EACH SPECIFIED AGE, BY SEX.

Number.

Age at leaving school.	Total employees reporting age at leaving school.						
	Department stores.		Specialty stores.		All stores.		
	Males.	Females.	Males.	Females.	Males.	Females.	Total.
10 years			1		1		1
11 years	1				1		1
12 years		2	1	3	1	5	6
13 years		7	1	12	1	19	20
Total under 14 years	1	9	3	15	4	24	28
14 years	4	28	1	35	5	63	68
15 years	8	32	6	38	14	70	84
Total, 14 and 15 years	12	60	7	73	19	133	152
16 years	6	24	1	40	7	64	71
17 years	6	17	4	19	10	36	46
18 years	1	18	2	16	3	34	37
19 years	1	5	1	2	2	7	9
20 years		3		1		4	4
Total, 16 years and over	14	67	8	78	22	145	167

Per cent.

Under 14 years	3.7	6.6	16.7	9.0	8.9	7.9	8.1
14 and 15 years	44.4	44.1	38.9	44.0	42.2	44.1	43.8
16 years and over	51.9	49.3	44.4	47.0	48.9	48.0	48.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Comparison of the data relating to the age at which store employees left school and the amount of schooling they had had shows some interesting resemblances. For example, 51.9 per cent of the workers had left school before they were 16. Table 90,

[1] See page 13; see also Acts of 1908, ch. 301, sec. 1, and Acts of 1914, ch. 339, sec. 1.

which follows, shows that 47.6 per cent of them had not completed the elementary school course, and 70 per cent of the total number had not attended school beyond the elementary grades.

TABLE 90.—NUMBER AND PER CENT OF EMPLOYEES IN RETAIL STORES WHO LEFT SCHOOL IN SPECIFIED GRADES, BY SEX.

Number.

Grade.	Employees reaching specified grade before leaving school.						
	Department stores.		Specialty stores.		All stores.		
	Males.	Females.	Males.	Females.	Males.	Females.	Total.
Elementary school:							
First grade							
Second grade				1		1	1
Third grade							
Fourth grade				2		2	2
Fifth grade	2	9	3	3	5	12	17
Sixth grade	4	15	3	18	7	33	40
Seventh grade	3	17	1	32	4	49	53
Eighth grade	2	20	5	17	7	37	44
Graduates	3	28	2	41	5	69	74
Total	14	89	14	114	28	203	231
High school:							
First year	1	13		17	1	30	31
Second year	3	8	1	12	4	20	24
Third year	2	7		6	2	13	15
Fourth year		3		3		6	6
Graduates	5	5		6	5	11	16
Total	11	36	1	44	12	80	92
College or normal school		6		1		7	7

Per cent.

Grade.	Department stores: Males.	Department stores: Females.	Specialty stores: Males.	Specialty stores: Females.	All stores: Males.	All stores: Females.	All stores: Total.
Elementary school:							
First to fourth grades				1.9		1.0	0.9
Fifth and sixth grades	24.0	18.3	40.0	13.2	30.0	15.5	17.3
Seventh and eighth grades	20.0	28.2	40.0	30.8	27.5	29.7	29.4
Graduates	12.0	21.4	13.3	25.8	12.5	23.8	22.4
High school	44.0	27.5	6.7	27.7	30.0	27.6	27.9
College or normal school		4.6		.6		2.4	2.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The individual schedules for these workers show that those who had had high-school education, or at least more than the elementary-school course, reported that high-school education was of value in store work, while the majority of those who had not had the high-school course failed to see the value of it. Many who considered high-school training of value thought it worth while for other fields of employment, but not for their own.

One young woman, a high-school graduate, employed in a book department, when asked if her high-school course was of value in her work, said "I suppose it is in a general way, since I find that knowing about books helps me to suggest to customers when they desire it. I also use my knowledge of foreign languages for the few foreign books that we sell."

STUDY SINCE LEAVING SCHOOL.

Many young men and women who go to work at an early age do so because of need, either real or imaginary, and later attend courses given in other schools, the public night schools giving regular grade and high-school subjects, and the commercial schools drawing the largest numbers. Many of those attending grade and high-school courses were doing so at great sacrifice of time and strength in order to complete the courses. Some workers had accomplished it. The following table shows the number of employees of each sex attending specified schools and courses after leaving the public day schools:

TABLE 91.—NUMBER OF EMPLOYEES IN RETAIL STORES ATTENDING SPECIFIED SCHOOLS AND COURSES SINCE LEAVING PUBLIC DAY SCHOOL, BY SEX.

School and character of courses.	Employees who attended some school after leaving public day school.						
	Department stores.		Specialty stores.		All stores.		
	Males.	Females.	Males.	Females.	Males.	Females.	Total.
School attended:							
Public night school	10	18	2	34	12	52	64
Business college	3	11	1	6	4	17	21
Mechanics' Institute	1	...	3	...	4	...	4
Correspondence courses	2	...	...	...	2	...	2
Private instruction	...	2	...	2	...	4	4
Other schools	2	3	...	4	2	7	9
Total attending	18	34	6	46	24	80	104
Character of courses:							
General grade work	7	8	2	19	9	27	36
Commercial courses	8	19	2	18	10	37	47
Dressmaking	...	1	...	1	...	2	2
Millinery	...	...	...	1	...	1	1
Music	...	2	...	2	...	4	4
Salesmanship	...	1	...	...	...	1	1
Telephone operating	...	1	...	1	...	2	2
Journalism	...	...	...	1	...	1	1
Mechanical drawing	...	...	1	...	1	...	1
Advertising	1	...	...	...	1	...	1
Show-card writing	2	...	1	...	3	...	3
Not specified	...	2	...	3	...	5	5
Total attending	18	34	6	46	24	80	104
Not attending	10	103	8	118	18	221	239
Total reporting	28	137	14	164	42	301	343

WHAT WORKERS WANT TO LEARN IN NIGHT SCHOOLS.

In inquiring into the subjects store workers wished to have presented in night or part-time classes, arithmetic came first with the majority. English also was suggested. Arithmetic with few exceptions meant a kind that could be suited to daily work. English to the majority meant rhetoric and grammar and to some extent literature. Oddly enough, salesmanship and arithmetic were mentioned by the same number.

These experienced men and women said, however, that courses for such workers as themselves would have to go far beyond the study of store system and demonstration sales, though the latter may be of great value to them. Such courses as practical and scientific study of the fabrics, a kind of art adapted to their individual lines, problems of buying, of turning over stock, etc., are greatly needed, and if acceptably outlined and presented in a concrete practical way to small groups of sales persons engaged in similar lines, so that discussion and study may be directed toward a common end, the older workers will fill the classes. There is no doubt, however, that these courses must be directed toward a specific group. General courses attempting to apply to all kinds of selling, will not answer. The following table shows the number suggesting each specified subject:

TABLE 92.—NUMBER OF EMPLOYEES IN RETAIL STORES SUGGESTING SPECIFIED SUBJECTS FOR EVENING CLASSES, BY SEX.

Subject.	Total employees suggesting subjects.						
	Department stores.		Specialty stores.		All stores.		
	Males.	Females.	Males.	Females.	Males.	Females.	Total.
General education	7	10	1	13	8	23	31
Arithmetic	10	86	9	114	19	200	219
English [1]	9	65	6	91	15	156	171
Principles of salesmanship [2]	16	84	14	105	30	189	219
Window or show-case trimming		2	4		4	2	6
Card writing			5		5		5
Commercial branches		3	1	5	1	8	9
Sewing and dressmaking		2		10		12	12
Millinery				4		4	4
History				1		1	1
Geography	1				1		1
Chemistry			1		1		1
Hygiene				3		3	3
Music	1				1		1
Manners and morals [3]	2	8		9	2	17	19
Total [4]	28	129	18	162	46	291	337

[1] Includes reading, writing, speaking, and grammar.
[2] Implied by such answers as how to approach cutomers and to display goods, knowledge of stock and stock keeping.
[3] This head covers those who suggested teaching honesty, courtesy, patience, alertness, good judgment, proper dress, etc., apart from salesmanship instruction.
[4] Includes those who suggested 2 or more subjects.

A great many of the workers were interested in salesmanship instruction, especially the older and more experienced workers whose service in store employment led them to believe that much could be taught that would greatly help the individual worker to do more effective work, as well as to raise the status of the work as a type of employment.

The workers seem to have a vague notion that the personal qualities mentioned in the third footnote to the foregoing table can be taught in lessons which apply directly to them. Patience to most of them was not only the greatest virtue of a sales person, but one of the large elements of her success. These factors are enumerated under this table as an interesting phase in the replies given to the question, "What could an evening school teach to help you in your occupation?"

Household arts, millinery, and dressmaking interested very few women, for most of them regarded these subjects as too exacting for women already tired and worn by the long day's work. Instruction relating directly to their own work or general subject matter useful in their daily work would in their estimation be of more value to them.

APPENDIX F.—ANALYSIS OF OCCUPATIONS IN THE TOBACCO INDUSTRY IN RICHMOND.

SUMMARY OF THE INDUSTRIAL SURVEY OF THE TOBACCO INDUSTRY.

SCOPE OF THE INQUIRY.

Data relating to hours and to conditions of employment in the cigar, cigarette, and tobacco factories of Richmond were gathered in the course of the survey from 18 establishments, employing in the aggregate more than 5,200 laborers and semiskilled operatives. As the total number of such workers returned by the census in 1910 was 5,355, the present investigation has covered, more or less completely, practically the entire field in an industry which, measured by the number of its employees, as well as by the value of its product, and the amount of capital invested in buildings and equipment, is one of Richmond's principal industries.

No attempt has been made, however, to secure data in the same degree of detail for all classes of workers. After some preliminary investigation, on the contrary, it was decided to make the inquiry intensive as regards the employment of white women and girls. The chief consideration which seemed to justify this was the fact that if all classes were included, the investigation could not, within the time available for the work, be made exhaustive and complete with regard to any one class of employees. Moreover, in its characteristic productive employments, except for the primary processes of sorting, steaming, stemming, and flavoring the raw material, the tobacco industry is almost entirely dependent upon white women and girls, providing by far the greatest field of industrial employment for this class of workers in Richmond.

It was realized that the work done by the colored men in the industry in handling, sorting, and flavoring the raw tobacco requires in a high degree a special technique and skill, and that the work of these employees is an important factor in determining the quality of the manufactured product. As regards the work of the colored women, which consists largely in hand or machine stemming, picking, resteaming, and drying the tobacco, it is true that, although of a simple character, much of it requires a considerable degree of manual dexterity. The work of the colored employees has, therefore, been thoroughly covered in the descriptive analyses of occupations. In view of the simple character of their work and the lack of variety in the processes performed by the colored workers, however, it did not seem probable that an intensive study of their employments would add materially to the knowledge gathered by the agents of the survey from conferences and general observation; or that the results of an intensive inquiry, if made, would bear specially upon the problem of industrial education. In compiling the data from the individual schedules, therefore, a few schedules which were taken from colored workers, male and female, have been excluded for the purpose of making the group of workers to which the compiled data apply homogeneous.

As regards the white male employees, who constitute approximately only 5 per cent of the total number of workers, it was felt that their number did not warrant a special investigation in a survey, which must necessarily, under the fixed limits of time and available resources, be selective in its field work. These workers are to a considerable extent practical mechanics and in some cases journeymen machinists, employed in tending, operating, and repairing machines.

As has been noted, however, general tables have been introduced which cover the total working force, white and colored, male and female, in the principal tobacco establishments, and in the text of the report all the principal occupations have been fully analyzed.

PRODUCT OR SPECIALTIES.

The specialties of the Richmond factories are cigars, plug and cut-plug tobacco, and cigarettes. Some 50 different brands of cigars and cheroots, an equally large number of brands of chewing tobacco and of cut-plug smoking tobacco, and 40 or more brands of machine-made cigarettes, are manufactured, these products indicating the three general types of manufacturing plants—cigar factories, tobacco factories, and cigarette factories. Richmond is also an important shipping point for unmanufactured tobacco. The products of these factories are widely distributed in the domestic and foreign markets, and a considerable portion of the product is distributed under Government contracts.

SIZE OF ESTABLISHMENTS.

The number of employees severally reported by the 18 establishments visited ranges from 10 to 1,500. In the following summary table these establishments are classified according to number of employees.

TABLE 93.—NUMBER OF WHITE AND OF COLORED EMPLOYEES IN 18 CIGAR AND TOBACCO FACTORIES IN 1914, BY SIZE OF ESTABLISHMENTS.

Number of employees.	Number of establishments.	Employees.		
		White.	Colored.	Total.
Under 100	4	140	62	202
100 to 199	8	495	583	1,078
200 to 499	3	516	505	1,021
500 to 999	2	675	790	1,465
1,000 to 1,500	1	1,300	200	1,500
Total	18	3,126	2,140	5,266

The general character of these establishments and the number of employees reported by each are shown in the following table:

TABLE 94.—NUMBER OF EMPLOYEES IN 18 TOBACCO ESTABLISHMENTS, BY CHARACTER OF WORK DONE, 1914.

Establishment No.	Character of work.	Number of employees.[1]		
		White.	Colored.	Total.
1	Manufacturing	75	45	120
2	Manufacturing; stemming	155		155
3	.....do	56	70	126
4	.....do	675	90	765
5	.....do	104	59	163
6	Manufacturing	74	17	91
7	Manufacturing; stemming	30		30
8	.....do	1,300	200	1,500
9	.....do	105	44	149
10	.....do	316	105	421
11	Stemming; shipping	36	35	71
12	Manufacturing	200	200	400
13	Shipping		200	200
14	Stemming; shipping		10	10
15	Stemming		700	700
16	.....do		150	150
17	.....do		100	100
18	.....do		115	115
	Total	3,126	2,140	5,266

[1] Exclusive of office force, shipping clerks, and foremen.

In these establishments modern machines are rapidly supplanting the handworkers in certain lines, and modern factory methods are replacing the old factory methods in every branch in the industry. With the exception of making cigars by hand and packing high-grade cigars, the industry may be described as a series of semiskilled and unskilled operations more or less dependent upon one another. There are comparatively few professional cigar makers who stem the leaf, break and make it into a bunch, roll the wrapper about the bunch, and finish the head of the cigar. A remnant of the old customs in the trade still obtains in some factories in which the workers who are engaged in the simpler hand tasks sing as they work, but nowhere is found the reader, who is indispensable to the Spanish cigar makers in the Cuban factories. The singing is favored by some foremen, especially for negro workers, who seem to work more steadily and happily when their tasks are set to a rhythmic movement.

While the number of operations and processes, such as steaming, stemming, flavoring, and packing, are common to the manufacture of various products in the different factories the machines used for the principal operations in the manufacture of cigars, cigarettes, and plug tobacco differ widely from factory to factory, and the different types of machine characterize the product of the factory.

SKILLED, SEMISKILLED, AND UNSKILLED WORK.

Except for the work of the machinists employed in tending and repairing the complicated machines used in the factories, the making and the packing of big cigars by hand constitute almost the only skilled employments in the tobacco industry. Machine bunching and rolling and hand packing of little cigars and packing cigarettes are semiskilled operations. Box making, though not a characteristic operation of the industry proper, also ranks as semiskilled work. These operations are all performed by white women and girls. Stemming by machine, which may be called a semiskilled operation, is done entirely by colored women. The unskilled operations are stemming by hand; flavoring and making plug and smoking tobacco; and weighing, stamping, banding, and packing cut-plug and smoking tobacco. In addition to these unskilled operations within the factory many colored men are employed as laborers for heavy work.

SUPPLY OF LABOR.

Workers in the tobacco industry are largely natives of Richmond, and almost entirely natives of Virginia. Packers, bunchers, rollers, stampers, and banders are white women and girls, many of them country-bred Americans. It is not uncommon to find mothers and daughters working side by side. Girls enter the industry from the grammar grades of the Richmond schools, or come into the city from the country districts to take employment in the factories. Men in the industry, with the exception of foremen, managers, hand cigar makers, and machinists, are negro laborers. With few exceptions the workers have learned their trade in the Richmond factories. As has been noted, however, there are comparatively few cigar makers in the industry, and the demand for such workers is relatively small.

According to the Census returns in 1910, more than five-sixths of the males and more than one-half of the females employed in the industry were negroes, the racial composition of the working force being as shown in the following table:

TABLE 95.—RACE, NATIVITY, AND SEX OF WORKERS IN THE TOBACCO INDUSTRY OF RICHMOND, 1910.

Class of workers.	Workers in the tobacco industry.					
	Number.			Percentage of distribution.		
	Male.	Female.	Total.	Male.	Female.	Total.
White	286	1,496	1,782	13.8	45.6	33.3
Negro	1,791	1,782	3,573	86.2	54.4	66.7
Total	2,077	3,278	5,355	100.0	100.0	100.0
NATIVE WHITE.						
Native parentage	261	1,367	1,628	12.6	41.7	30.4
Foreign or mixed parentage	18	99	117	.9	3.0	2.2
Total native white	279	1,466	1,745	13.4	44.7	32.6
Foreign-born white	7	30	37	.3	.9	.7

Although the labor law of the State permits in cases of necessity the employment of children under the age of 14, comparatively few such children are employed in the tobacco factories. Only 2 of the 150 white women and girls from whom individual schedules were obtained were under 14. According to the census of 1910 the number of children under 16 years of age employed in the cigar and tobacco factories was 443, of whom 83 were under 14. Of the total number under 16 years, 171 were boys and 272 were girls. In the table following the distribution of the workers, male and female, in 1910 is shown by age periods:

TABLE 96.—SEMISKILLED OPERATIVES AND LABORERS IN THE TOBACCO INDUSTRY CLASSIFIED BY SEX AND AGE PERIOD, 1910.

Age, in years.	Workers of specified age period.						
	Semiskilled operatives.		Laborers.		Total.		
	Male.	Female.	Male.	Female.	Male.	Female.	Total.
10 to 13	28	27	18	10	46	37	83
14 to 15	64	179	61	56	125	235	360
16 to 20	153	728	205	206	358	934	1,292
21 to 44	485	1,315	722	483	1,207	1,798	3,005
45 and over	158	182	183	92	341	274	615
Total	888	2,431	1,189	847	2,077	3,278	5,355

FLUCTUATION IN EMPLOYMENT.

The slack season in the tobacco industry extends approximately from the middle of July to the middle or end of October. During this season the factories generally run short time, retaining their employees so far as possible on their rolls. The stemming factories, however, which employ colored workers only, shut down entirely when the stemming season, which extends from November to April, is over. In the larger manufacturing plants, however, stemming continues throughout the year, the raw tobacco being stored and stemmed as required. Reports on the individual schedules indicate that a comparatively small proportion of the white women and girls have at any time taken up industrial employment outside of the tobacco industry. In the slack season a considerable number of country girls return to their homes while other workers remain at home in the city, and a few seek employment in the stores, factories, and boarding houses. The great majority, however, continue in the factories working short time.

AGE OF MAXIMUM PRODUCTIVITY.

The processes of manufacture in the tobacco industry are comparatively simple, and generally a fair degree of facility is acquired by beginners in the course of a few weeks. Machine workers are expected to become proficient in operating a machine in three weeks, during which period they are paid a small time wage in addition to the regular piece rate. Girls who can not learn in this period are commonly either shifted to some other work or dismissed as incapable. During the first two years, however, the speed at which the girl works fluctuates from day to day and from week to week irregularly, a fairly uniform and regular speed being maintained after this period. The average girl learns to hand roll or hand bunch or shade and pack big cigars with a fair degree of facility in about six months, these lines of work being more difficult than other lines of handwork. In handwork generally, such as lining boxes and packing smoking tobacco, facility increases during the first six months. There is a tradition among some classes of workers that a marked increase in facility in handwork comes in the seventh year; that in this year the capacity of a worker who has been earning, for example, on the average $10 per week may increase rapidly to $15 per week. As regards the upper age limit of maximum productivity, very few women remain in the industry after the age of 48 or 50, and in several instances the statement was made by workers that older women, whose hands had become somewhat stiffened with age, and calloused, could not continue at their work.

CONDITIONS UNDER WHICH WORK IS PERFORMED.

Some of the processes in the manufacture of tobacco involve conditions of work which are more or less enervating. This is true of those processes, such as steaming and flavoring, which must be carried on in an atmosphere having a high degree of humidity and temperature. In other processes the dust from the tobacco is irritating, and the odor in the case of some workers nauseating when proper ventilation is not provided. Generally, however, at least in the opinion of the white women and girls represented by the individual schedules, the work in the factories is not unhealthful and is not of a nature that involves serious physical or nervous strain.

PROMOTIONS FROM ONE OCCUPATION TO ANOTHER.

While some of the processes in the manufacture of tobacco, cigars, and cigarettes require more skill than others, it is generally true that the acquirement of skill in one line of work does not normally lead to promotion to any other line. Teachers and inspectors are naturally selected from experienced workers, but the economic advancement of the worker depends rather upon increasing skill in one line of work than upon regular advancement to other lines which pay higher wages. This is necessarily the case in an industry where the processes are not progressive, as regards the skill required in performing them, but are, on the contrary, independent and coordinate. In recent years the policy has been adopted in some shops of teaching beginners several processes. Except in the factories where this policy is in force, workers tend to continue in that one line of work in which they have acquired by experience some degree of facility.

UNTRAINED BEGINNERS.

One-half of the white women and girls from whom schedules were taken stated that they had been in the industry not over two and one-half years. More than one-third had been in the industry not over 18 months, the average number of years in the industry for the 150 workers being approximately 3.7. If this proportion obtains generally throughout the working force, it would indicate that the number of beginners entering the industry in a period of less than four years is equal approximately to the total number of employees in the industry at any given time, or that each year the number of beginners is equal approximately to one-fourth of the total working force. This would mean that from 350 to 400 girls enter the tobacco factories each year as beginners. Making every allowance for error in these proportions, it is evident that the industry must each year train a very considerable proportion of its working force. This fact, also, as well as the considerations noted in the preceding paragraph, would seem to make expedient the institution of some adequate system of training beginners.

LACK OF ELEMENTARY TRAINING.

There is no distinct evidence in the data gathered that the industry is hampered by the general lack of school training among its employees. Preference is given to bright, alert, intelligent girls, and almost all the responsible and more remunerative occupations which demand judgment and initiative are held by the more intelligent workers, notwithstanding practically all the white female employees have a grammar-school education, and a few have a high-school education.[1]

The efficiency of the workers does not, on the whole, appear to be dependent upon any sort of training other than that obtained in the factory, and the workers do not themselves feel that more schooling would have been of value to them in their occupation. Generally those workers who expressed a desire for more school training, to be obtained in the evening classes, regarded such training either as means of escape from the factory or as means of making themselves more proficient, not in their present occupation, but in some entirely different line of work, or more commonly in the simple household arts.

FACTORY TRAINING OF WORKER.

As regards the acquirement of skill and efficiency in the actual processes of manufacturing and packing in the tobacco industry, there is practically no direct training that can be given the worker outside of the factories. In the cigar industry and to some extent other branches of the industry, training is provided for in the factories. Forewomen, technically known as teachers, train the girls of their respective departments in the processes of which they have charge. Under these worker-teachers such unskilled work as banding, stamping, packing little cigars, and bunch making require from four to eight weeks' training and the more highly skilled work, such as rolling and packing, from two to six months. This training is, on the whole, very good but highly specialized and contributes only incidentally and frequently very slightly to the general intelligence of the worker. The more complicated processes of cigar making, as well as the simpler processes of plug and smoking tobacco making, can be and are learned thoroughly in the factories, and they can not be advantageously taught elsewhere.

It is, however, clearly of advantage to a girl to be skilled in more than one line of work since every process understood by the worker is an additional guarantee of steady employment during the slack seasons, and of securing employment when thrown out of work. The advantages to the employer which arise from the "all-round training" of employees are equally obvious, since it enables him to shift workers from one line of work to another when necessary. Since the processes are easily learned in a comparatively short time, the advantages of giving to beginners a systematic training in several, if not in all, of the simpler processes, would seem to be sufficient to warrant the adoption generally in the factories of a regular system for providing such training.

It will be apparent from the analysis of separate occupations as well as from the tabulation of the data relating to schooling gathered upon the individual schedules,[2] that the principal need of the workers in the tobacco factories is for elementary courses

---

[1] See Table 106, p. 278, for percentages.

[2] See Appendix J, p. 324.

equivalent to the grammar and high-school grades. Many young workers have a desire also for special household arts courses in such subjects as cooking and sewing. To these subjects should be added recreational courses, to counteract, so far as possible, the influence of the unvarying monotony of simple processes and of the daily routine of the factory work. Continuation courses for the tobacco operatives should aim principally to prepare them for the varied interests and employments of the home. Many of the workers entering the industry at an early age spend the greater part of their time in the factories, away from the home environment in which they should normally learn the home arts. Continuation courses should therefore provide such training in home making as will foster an interest in home life and prepare the workers for home responsibilities which many of them will ultimately assume in their own homes. This does not mean that for these workers the field of education is narrowed or restricted. As compared with strictly industrial continuation work, training for home making is necessarily broad in scope and varied in character, embracing as it does all the arts and interests of home life.

OPERATIONS IN THE TOBACCO INDUSTRY.

There are three general types of work in the tobacco industry which may be characterized as follows: (1) The productive processes involved directly in the manufacture of the product; (2) the secondary processes involved in packing and shipping the product; and (3) the auxiliary processes involved in making containers such as boxes and cartons. The extent to which the auxiliary processes are carried on in a factory is determined largely by the size of the plant and its demand for boxes and cartons. Hence the box-making department, for example, is usually found in large factories where the output justifies the installation of the necessary machinery.

The productive work in manufacturing tobacco products begins with the opening of hogsheads of tobacco as they come from the warehouses. The tobacco is shaken out and steamed. The leaves are next assorted according to size and quality and then stemmed. Where the tobacco is to be manufactured into cigars, bunch making or "breaking" follows, the filler, long or short, being bunched and wrapped in a binder. Lastly these bunches are rolled. This is the process of putting the wrapper around the bunch which when completed makes a finished cigar. Where the product is smoking or chewing tobacco, the stemmed leaves are flavored, partially dried and pressed into plugs, and in the case of smoking tobacco these plugs are sliced, cut, or granulated by machine. The properly prepared tobacco may be further manufactured into cigarettes.

The secondary processes in cigar making embrace packing, banding, labeling, stamping, and shipping, which are sequent processes in the order enumerated. The cigars are packed into various receptacles according to their style, brand, and quality. Assorting of the cigars and shading on a given color basis form the biggest portion of this work. After cigars are packed into their boxes or cartons, the brands that are to be banded are taken to the banding department. The boxes and cartons are then sent to the labeling room, if they are to be labeled, where they have decorative labels pasted on them. The pasting of the stamps on every box and on every package is the last step in the making and packing of cigars. This last process completed, the product is then ready to be marketed or stored in the humidor—a large storage room of uniform temperature and humidity. In the manufacture of smoking tobacco, packing and stamping are the principal secondary processes.

The principal auxiliary operation in the manufacture of cigars is box making. This work is done in progressive steps. The boards are cut by machines, the parts nailed together with small nails, sometimes by machine and sometimes by hand. The boxes are then sent to the trimming department where a cloth hinge is attached to the cover, the edges of the box covered with plain or fancy strips, a decorative picture pasted on the inner side of the cover, and the lining paper pasted in place.

PRODUCTIVE PROCESSES.

Handling and Steaming.

Dry tobacco leaf tied in bunches by the ends of the stems is taken from hogsheads, leaves examined, bad ones removed, the bunch untied and leaves shaken out and placed in piles ready for steaming. This work is done by colored women who have learned to detect bad leaves.

Steaming.—Steaming is a machine process for dampening. The worker, a colored man or woman, feeds the leaves into the drum, a revolving tube-like machine through which steam passes and comes in contact with the leaves as they are carried along and distributed by the drum. When the leaves emerge from the opposite end of the drum, they are moist, soft, and ready for stemming.

This work is done by day laborers and requires no training whatever. It does, however, require considerable endurance to stand the dust from the dry tobacco and the heat and moisture from the steam of the drum. Care is taken, however, to ventilate the workrooms so that dust and steam are carried off, thus minimizing the discomforts of the workers.

Stemming by hand.—Much of the tobacco, especially the leaf that is used for the manufacture of smoking and chewing tobacco is stemmed by hand by colored women. This process consists of folding the leaf along the midvein, the underside of the leaf outermost, and while holding the tip of the folded leaf in one hand, the thumb and forefinger of the other grasp the midvein and with a quick, deft turn of the wrist the midvein is torn out, leaving the leaf as little broken as possible.

Stemming by machine.—In stemming by machine the worker (usually a colored woman) inserts the tip of the midvein of a moistened tobacco leaf between two knives in the drum of the machine, which, as the drum revolves, cut out the midrib of the leaf. As the leaf is passing through, the worker spreads it out and it is carried in and held by the rollers until a given quantity has accumulated. The worker then stops the machine by means of a lever, takes out the two bundles of leaf, smooths them out, folds them over once, ties them with a bit of string, and lays them in rows in a tray.

The machine is then started by reversing the lever and the process begins again. This process is very simple and requires practically no training and skill that can not be acquired by a few hours' experience at the machine. The work is paid for on a day basis, hence there is practically no computation of earnings.

Stemming by machine represents the highest type and highest paid work for colored women in the tobacco factories and employs for the most part the younger women.

Stemming by hand involves more manual skill than stemming by machine, but like the machine process requires practically no training and not a great deal of experience. A fairly high degree of skill in this work may be attained in a few days in the factory, and is frequently done by older colored women who do not care to use the stemming machine.

Assorting.—Tobacco leaf is assorted while damp and graded for its various uses. This process consists of opening the leaf so as to see the size and quality, the large perfect leaves being graded for wrappers, the smaller and imperfect leaves being used for filler, and bad leaves are discarded. This work, which is done by colored men and women, requires practically no skill and only a very limited knowledge of the leaf. Sufficient knowledge of this work can be acquired in a few days in the factory and facility increases with experience.

Flavoring plug and smoking tobacco.—Leaf which is made into plug and smoking tobacco is put into a bath of sweetened flavoring of sugar, licorice, and other ingredients. Each manufacturer seeks to have a flavoring mixture of his own so that his tobacco may have an individual flavor. When the tobacco is sufficiently saturated with the flavoring the leaves are shaken out on a heated conveyer which deposits the partially dried leaf in a receptacle, ready to be taken to the press room.

The flavored leaf is weighed into standard units, a given number of ounces to the plug, packed into molds and submitted to hydraulic pressure which reduces the tobacco to blocks of uniform size and shape. The blocks are cut into plugs and packed into boxes for shipment and some are put into a cutting machine which slices the tobacco into thin flakes called sliced plug, or the slices may be recut by the cutting machine and put through a granulator, reducing it to granulated smoking tobacco.

These processes carried on by colored men and boys in these departments, although so important in the industry, require physical strength but practically no skill on the part of any of the workers except the foreman, of whom responsibility and a limited amount of general intelligence are required. The proportions and to some extent the ingredients used in the flavoring are secret; machinery is easily handled, and the fact that its adjustment and care are always in the hands of a machinist reduces most of the work to mere manual labor.

Bunching by machine.—The bunch is the middle or main part of the cigar and is made up of two parts, i. e., the filler or central part and the binder or outer covering which holds the filler in place. Two kinds of filler are commonly used; long filler which is tobacco leaf broken into cigar lengths by hand, and short or scrap filler, which is chopped tobacco leaf.

In bunching long filler, the operator, seated in front of her machine, takes a piece of leaf from the receptacle for a binder, spreads it in proper position on the apron of the machine, a small sheet of rubber cloth attached to two small rollers, selects another leaf, breaks it into lengths for filler and lays it on the binder. The machine, which works automatically when started by a foot lever, rolls the filler into the binder, drops the finished bunch in front of the operator, and stops. The operator places the finished bunch in a groove in a wooden mold, which usually holds 20 bunches of like size and shape, and when the 20 places are filled, closes the mold with a fitted cover which gives just enough pressure to shape the bunches. They are allowed to stand in the molds until the bunches are "set" into a desirable uniform shape when they are ready for the next process, which is rolling.

Bunching short filler differs slightly from long filler bunching, the difference being in the method of placing the filler on the binder. The leaf is selected for the binder and laid on the apron of the bunching machine. The operator by means of a foot lever starts the machine, which automatically drops from the hopper the right amount of chopped filler on the binder, rolls the binder around the filler and drops the bunch on the table in front of the operator, who, like the long-filler buncher, places it in the mold.

Bunching is a semiskilled operation involving also a certain amount of judgment. The long-filler buncher breaks the filler without a guide and the amount is determined entirely by experience through which she must learn to put in just enough filler, as too much chokes the cigar and prevents combustion, and too little filler makes combustion too rapid.

The machine is simple and, where levers are adjusted properly, does not necessarily cause strain, the only disadvantage to the worker being the constant use of one foot.

Economy of motions is important both for the comfort of the worker and in its effect upon output. These important features, however, are studied and adjusted almost exclusively by the management which makes individual adjustments to meet the physical needs of the workers when required, thus reducing to a minimum the necessity on the part of the workers to plan for themselves.

Bunching short filler can be learned in a day or two at the machine and a comparatively short time is necessary to acquire the requisite skill.

The long-filler process is more difficult, as the amount of filler is determined entirely by the worker. This, too, is largely a matter of experience, as no way to determine accurately the amount of the filler beyond the feel of it in the hand has been used. It requires from six weeks to two months practice to acquire skill in this operation.

Rolling by automatic or suction table.—Rolling by the automatic or suction table machine is largely a mechanical process involving considerable skill and judgment on the part of the worker. The operator seated in front of the machine begins the process by spreading smoothly over a suction table, a device made the size and shape of a cigar wrapper, a piece of damp leaf which is held in place by air suction supplied through small holes in the table, then by means of a lever starts the machine. The die corresponding in size and shape to the table descends upon the leaf, the wrapper is cut and carried by means of an arm (also supplied with suction) to the roller, which rolls the wrapper around the cigar, deposits paste on the end of the wrapper leaf for fastening the end, and carries the cigar to a device which cuts off the ends and drops the finished cigar on the table near the worker, who inspects it and places it in a rack near by. Except in placing the leaf on the table and laying the finished cigar in the rack, the operator has not touched the cigar.

Rolling large cigars is the same process as rolling little cigars and differs only in having two additional processes, one of which involves some handwork. When the wrapper has been cut and rolled around the bunch as described above, the small end is left to be finished into a pointed end called the head. The unfinished cigar is dropped automatically near the operator, who picks it up, inserts the tip in a revolving device called the thimble, which makes the head. Any bit of leaf that may be left loose after this process is fastened by hand and the finished cigar is placed in the rack near at hand.

Although the machine does a larger share of the skilled work involved in rolling, several important demands are made upon the worker. She must know how to lay the leaf on the suction table so as to get the greatest number of wrappers out of each piece, and, as the leaf varies in size and quality, the problem is somewhat variable, and the proper handling of the leaf requires considerable care and skill. In some factories charts showing how the leaf may be laid on the machine to produce the greatest number of wrappers are used.

The machine, too, is complex and performs so many operations that the worker's entire attention is required while the machine is in motion. Machinery and seats are adjusted to suit workers, thus minimizing the danger of overfatigue or strain.

From two to four weeks' experience under the direction of an instructor or foreman is necessary to become a machine roller. The rolling of rights and lefts, which is important in handmade cigars, is also provided for by the machine and the worker is relieved of that responsibility.

This process, while one of the most important in the cigar industry and also largely automatic, requires skill, care in handling the leaf, for it must be spread to exactly the right smoothness—not too much stretched, because it spoils the cigar, nor left too loose, for it wrinkles and spoils the appearance of the cigar—and it must be cut so as to save this the most expensive part of the cigar as much as possible.

Making cigars by hand.—Here and there are found small groups of old-time cigar makers who make the entire cigar by hand. By this method the worker does not as a usual thing perform all the processes of preparing the leaf for the cigar, but he selects the leaf he uses, makes the bunch, and rolls the cigar, using only a gauge to determine the length, a knife to trim the leaf, and a metal thimble to shape the head. As the same side of the leaf must always be on the outside of the cigar, the worker must be careful to lay the leaf in the right position, and, since the two halves of the leaf are reversed in shape, the rolling involves some skill, one being rolled toward the right to bring the face and margin of the leaf outside and the other toward the left. Some workers can roll both lefts and rights; others only rights or only lefts as their skill has been developed. The same problem is involved in making the bunches, as they must be rolled to correspond with the wrapper so as to avoid loosening or unrolling the bunch when the wrapper is put on.

The cigar maker of to-day is the craftsman of his trade, possessing a wide knowledge of tobacco leaf, of blends, and of methods. The hand method is much slower than the machine method, but it is thought to make a better cigar; hence the price paid for the work is relatively higher than for the machine product.

In this work a period of two years' apprenticeship is required, and to be a full-fledged maker the worker must know how to make and finish a cigar. Schools for cigar makers existed in Belgium at one time, but elsewhere no attempt has been made to instruct cigar makers outside the shop.

SECONDARY PROCESSES.

Packing cigars.—For the two types of cigars—cheroots and big cigars—different methods are used, the big cigars for the most part being packed in wooden boxes, sometimes in tin boxes, and occasionally in imitation wood boxes. Little cigars are packed in cardboard boxes of various kinds or in paper cups which are packed in wooden boxes.

Packing big cigars, which in past years ranked below bunch making and rolling in skill, has taken first place in the modern factory, and so long as the appearance of cigars in the box is an important element in selling and the factors which determine shades and grades so entirely beyond the power of machinery, packing of choice cigars will remain an important occupation.

Finished cigars in lots of one, two, or more thousand are laid on a table over which a northern light falls. The cigars are laid in rows of 500 or 1,000. The worker then selects the cigars nearest alike in color and shade and places the entire number in rows, first selecting those of like color. This is called grading.

When the entire lot has been graded each grade is shaded, that is, arranged in rows or scales of intensity of color, the darkest being at the left and the lightest at the right. This is done by laying the cigars side by side and matching them so that to the unpracticed eye the cigars seem to be the same shade and color. These scales contain from 7 to 10 or more shades, the closeness of the shading depending upon the quality of the cigars.

When each grade has been shaded satisfactorily, the packer selects from them the rows of cigars that are to be placed in the boxes. This involves a little further shading and when completed they are laid neatly in a temporary box called a shell, if they are to be banded, usually 10 in a row, or if not to be banded they are put in boxes ready for sale. The packer places the lower layers in the box, presses them in place by means of a small block and hand press, then the top row or facing is put in, pressed in place, the box is nailed by hand and again placed under pressure to make the package neat, compact, and uniform. The cigars to be banded are then ready for the bands; others are ready for labeling and stamping.

Packing big cigars is the most skilled work in the cigar factory. It requires a good eye for color and the tints and shades, and never under any conditions can it be done automatically; but requires for each lot of cigars equal care and attention, though the speed with which the work can be done increases greatly with experience.

The extent to which preliminary training in the use of colors could prepare for this work is a question. At any rate the amount of shading to be done and the limitations of colors would hardly warrant instruction other than that which is given in the factory under an experienced person.

Little cigars are packed in a variety of ways, chief of which is the cardboard box, made in two parts called the slide and shell, and the paper envelope called a cup. These small packages which hold from 5 to 10 cigars are in turn packed in cardboard cartons holding from 10 to 50 packages.

The slide-and-shell method of packing, though mechanical, is the most complicated. The worker places the part called the slide on the table and lays on it a piece of waxed paper, or tin-foil, sometimes both, and places upon it an open gauge on which are five cigars. Five other cigars are then chosen and laid on top of the first row, after which the lining is folded over the cigars and the gauge slipped back leaving the cigars on the slide, the sides and ends of which are folded into position. The slide is then slipped into the shell, a four-sided cardboard cover open at each end, the end of the slide turned in and the finished package placed on a rack. When a given amount of packages are finished they are put under a hand press and enough pressure is applied to make the packages uniform in size and shape. They are then packed in paper cartons which hold 10 to 50 packages or in wooden boxes which hold 60 or more packages.

The cup method of packing is simpler than the slide-and-shell method, the process consisting of choosing three or four cigars of like grade and shade, placing them in the cup or envelope in uniform order, and folding in the cover or flap of the cup. Occasionally the cup has no cover or flap, which simplifies the process.

This shading and packing of little cigars is a minor process as compared with the same processes in packing big cigars. The cigars are chosen quickly and not laid upon the table for inspection, and as they are not exposed to the eye in a layer in the cigar box close shading is less important. Training for this work may be given in a few days, and one or two weeks' experience is sufficient for a fair degree of accuracy and skill.

Inspecting.—This process, as the name indicates, consists of inspecting finished product to see that it is up to standard. Cigars are carefully inspected, counted, and credited to the operator and to the firm. This work involves a thorough knowledge of cigar making and a quick accurate eye, for cigars in bundles are not counted unless the bundle looks too small. It also requires a little knowledge of simple accounting. As it involves considerable responsibility, it is done by the most experienced and reliable workers. Experience and a working knowledge of the most important operations, combined with general intelligence and initiative, are necessary for this work and count more than instruction in qualifying the worker for the job. Workers, therefore, grow into this position and the personal qualifications are too important to make training practicable.

Packing cut plug in tin boxes.—Plug tobacco is cut in slices of varying thickness crosswise of the plug and used in a variety of ways under different names, as sliced plug, cut plug, etc. Slices, or flakes as they are sometimes called, packed in flat tin boxes which keep the tobacco clean and preserve its flavor and strength, are called sliced plug.

The boxes open on the flat side and two strips of waxed or thin parchment paper are laid in by the worker, one strip from front to back and the other from end to end. This work is usually done by a girl, who prepares the boxes for the packer. It is an extremely simple process and requires neither skill nor intelligence, instruction nor experience.

Packing cut plug tobacco consists in weighing the thin slices of cut plug on balanced scales, turning back the lining papers of the box, and placing slices of tobacco in the box in neat rows, taking care not to break the pieces. The packer then folds the ends of the lining paper over the tobacco and lays a strip of fancy paper over the tops so as to hold the lining paper in place. If a coupon is used, she also inserts it in the box. The cover is then closed and the package is finished ready for stamping.

Lining, weighing, packing, and putting on the strip of fancy paper are all done by one person in small factories. In other factories these tasks are allotted to two or three persons, usually one task for each person. The latter method insures greater speed in turning out work. It is a very low grade of work, requiring very little skill and, except for the weighing, very little judgment and responsibility.

Packing granulated tobacco.—Granulated tobacco, which is cut-plug tobacco cut up very fine and granulated, is used for chewing and smoking and is packed in tin boxes or paper packages lined with waxed paper or foil to preserve the flavor. The tin box opening at one end is usually used. For this process the tobacco is weighed, the box lined by the packer or a helper, the tobacco dropped into the box through a fitted funnel, and pressed down by a block which fits into the package, the lining paper folded over the tobacco, and the package, if it is to be sealed on the inside, closed with a revenue stamp. The cover is then pressed down and the product is finished. In some factories the tobacco is weighed and placed in the package by machine. Where this method is used the worker has only to close the box and put on the revenue stamp, or where bags are used, to tie the strings and put on the revenue stamp. It is a very low grade of work, requiring very little skill, no initiative, no responsibility to speak of, and very little experience.

Banding cigars.—Cigars are banded after they have been packed and pressed. Usually only the highest grades of big cigars are banded, though occasionally small cigars are banded also. The bands, which are made of decorative paper printed in bright colors, are used to designate the brand of the cigar and to make it look more attractive. Cigars are banded both by hand and by machine.

Cigars packed in boxes by the worker who graded and shaded the rows with great care are taken out of the box by the bander who must take great care to keep the cigars in their respective places and respective rows. These she lays on the table, wets the bands, usually a bunch at a time, wraps them one by one around the cigars and fastens the ends, taking care to place them exactly the same distance from the head of the cigar. When all have been banded she places them in the box in the order in which they were originally and closes and nails the box.

This work requires considerable manipulative skill of a simple sort and a fairly accurate eye as bands are placed on the cigar without a guide to insure uniformity, but the operation is very simple and so little varied that it is quickly learned. This work is done by the youngest girls in the industry who require very little instruction and experience to make them efficient enough for the work required.

When banding is done by machine the cigars are removed from the box with as much care as in the hand method, placed in order in the banding machine, which wraps and fastens the band around the cigar and deposits it on a conveyor which carries it to a second worker who repacks the cigars in their original order and closes and nails the box.

Although this work requires care and close attention, it does not require a great deal of skill. The youngest workers in the factory do this part of the work and will doubtless be replaced by the machine as it comes into more general use.

This process is more mechanical and requires much less skill than hand banding. Probably not more than a day's experience is necessary for either one of the workers at this machine to learn the process.

Labeling.—The process of placing pictures or other decorative material on the outside of the box is called labeling. One, two, or even three fancy pictures or strips may be placed on a box. The labeler wets the gummed labels one by one, or dips them on a pasting board, pastes them on the box in proper position, and rubs the surface until the label is smooth and the edges pressed flat to the box. She then piles the labeled boxes in piles ready to be sent to the stamping department. This is a very simple process, though it requires quite a little skill to handle the labels and to place them accurately on the boxes, for rarely if ever are there any marks to guide them in the work.

Stamping.—Stamping is the placing of the revenue stamps on the box, carton, or package into which the cigars are packed. This stamp is placed on the outside of the cigar box or on individual packages when cigars are packed in small packages and is the last process in making the product ready for the market.

When cigars are packed in packages the packer opens the carton, removes the packages, wets or pastes the revenue stamps on each package so as to seal it. All forms of tobacco are sealed with a revenue stamp which bears a legend indicating the kind of tobacco and the rate of revenue. The sealing is done to protect the manufacturer and the Government against fraud. The packages are then replaced in the carton and cartons are piled up ready to be taken to the shipping department.

All these pasting processes are extremely simple and require almost no training. The extent to which an accurate eye contributes to success is very difficult to determine, and as few fail through inability to place labels or stamps, it is probably of relatively small importance.

Cigarette making.—Cigarette making is for the most part an automatic machine process though a few cigarettes are partly handmade. Rice paper resembling narrow white tape unwinds automatically from the roll and is carried into the machine on a belt of corresponding width. As the paper passes along on this belt the machine feeds in the tobacco and distributes it evenly on the surface. At a point a little farther along the belt a simple device turns the edges and seals them. The filled cigarette is carried along through a tube to a revolving circular knife which cuts it into uniform lengths and drops them in order in a tray near the operator. These machines are operated by a man who has enough knowledge of the use and care of the complicated machine to stop it when it needs attention and adjust minor parts. The machine itself, which is complicated, is cared for by a skilled machinist.

A simpler device sometimes used to make cigarettes is called handwork, though, strictly speaking, there are very few handmade cigarettes. No training whatever is necessary for this work, hence it represents a really automatic process inasmuch as the product is dependent upon the machine and not the worker.

Packing cigarettes.—Cigarettes are packed by machines which make the slide-and-shell carton and the soft paper or tin-foil covered package. Cardboard strips being fed into the machine automatically, the die cuts the slide, which, with the lining paper or foil, is placed in position under the chute through which the cigarettes are carried. The machine then lays two rows of cigarettes on the slide and turns up the sides, making a box. A revolving circular table carries the filled slide to a second device which folds the foil, lining, etc., in place, and onto a third device which pushes the filled shell into a slide, thus completing the package. The finished package is then dropped on a conveyor which carries it to a girl who slips in a coupon or fancy card.

This machine is operated by a feeder and a tender, both girls; one who feeds cigarettes into the hopper of the chute, and the other who watches the filled boxes to see that they are uniformly packed and removes any that are imperfect. The machine is so perfect and the work so simple that little labor and practically no skill are required of either worker, nor is training or experience necessary.

AUXILIARY PROCESSES.

Box making.—In large factories where the amount of product justifies it, the boxes and cartons used in packing tobacco and making it marketable are made in the factories. Boxes of cedar and imitation woods are cut in quantity and put together by machine. Labels printed on the wood and gold letters are also done to some extent in the factories. This work requires men having a knowledge of the wood machinery, and to some extent experience in handling wood, as well as ability to lay out plans for cutting the wood to the best advantage and the setting of the machines to cut pieces of different sizes.

Cardboard boxes.—Cardboard boxes and cartons are to some extent made in the factory. When this is done the factory has its own print shop and box-making department, equipped with printing and box-making machines, the kinds varying to suit the kinds and sizes of boxes desired. For the most part these processes are performed by an automatic machine attended by an unskilled worker; occasionally they are made on complicated machines which require a man somewhat experienced in the use of machinery. Folding boxes made in one piece require an operator to tend the machine; boxes made in pieces and set up require the worker to make plans for cutting the cardboard, workers to cut the board on cutting machines, and another set of workers to cover them. Covered boxes are used to a limited extent only, usually for fancy holiday boxes, hence is a relatively unimportant part of the work. When planning the layout for cutting, some ability for figuring is required, but as this is usually done by the foreman, little is required of the man who operates a cutting machine. Such ability requires a knowledge of the fundamentals of arithmetic and simple fractions, which may be acquired in night classes if desired.

Trimming.—Trimming is a process of putting fancy strips and labels on the outside of the cigar boxes. This work consists of dipping the fancy strips of paper on the pasting board, and pasting them over all the edges of the box. Labels also are dipped on a pasting board and pasted on the inside of the box lids. Lining paper is pasted in to protect the cigars from the box. These processes though simple require skill in the use of paste and accuracy in placing the strips and labels on the box, for it is all done with no guide but the eye. Like labeling and stamping little training for this work is required. A few weeks' experience gives the necessary facility in handling the work.

STATISTICS OF WHITE WOMAN AND GIRL WORKERS IN THE TOBACCO INDUSTRY.[1]

Data gathered on schedules taken by agents of the survey from 150 white women and girls in the tobacco industry are presented in the following tables.

All of these workers reported that they were born in the United States. Ninety-six per cent of them were born in the State of Virginia and nearly two-thirds (62 per cent) in the city of Richmond itself.

If the proportions here shown apply to the total returned by the census,[2] more than 1,400 of the 1,496 white women and girls employed in the tobacco industry in 1910 were native Virginians and more than 900 of them were daughters of Richmond. While the corresponding numbers for 1914 may be somewhat greater, there is no reason to conclude that the proportions born in Richmond and in Virginia have materially changed. Clearly, the educational qualifications of these workers have been determined almost entirely by the public schools of Richmond and of neighboring counties in Virginia, and it may be safely assumed that the industry will be in the future dependent upon the local schools, for the training of its workers, in no less degree than it has been in the past.

Conjugal condition.—With few exceptions the workers covered by these schedules were single, only 9 of the 143 reporting being married and 5 widowed. These proportions indicate that there are employed in the tobacco factories between 1,300 and 1,400 unmarried white women and girls.

Age.—The classification by age shows that 72, or 48 per cent, of the white women and girls covered by the returns were between the ages of 16 and 20; 23, or 15.3 per cent, reported that they were under 16, and 55, or 36.7 per cent, that they were 21 or over. Of the latter group, 35 were from 21 to 25 years of age, only 20 of the 150 being over 25.

It appears that the tobacco industry does not to any considerable extent employ married women, and that girls do not commonly remain in the industry after the age of 25. Approximately nine-tenths of the workers from whom schedules were obtained were unmarried and nearly nine-tenths were under 26 years of age. Girls entering

[1] A few schedules taken from colored workers have been excluded in order to make the group of workers to which the compiled data apply homogeneous.

[2] See Table 95.

the industry, in a large majority of cases, remain in it only a few years, and leave it upon getting married. This may largely account for the preponderance, in the requests made by the workers for evening classes, of such subjects as sewing and cooking over commercial or industrial subjects.

Age at entrance.—It is true, also, that comparatively few women enter the industry after the age of 20. Only 14, or less than one-tenth of the number covered by the schedules, stated that they were 21 or over when they began working in the industry and only 7 that they were over 25. The number who began work under 14 years of age was 17, or 11.3 per cent; the number for the ages 14 and 15 years, 67, or 44.7 per cent, and for the ages 16 to 20 years, 52, or 34.7 per cent.

Occupation.—In the tables classifying workers by occupation, data relating to hand and machine workers, respectively, are tabulated separately. Of the 150 white women and girls, 93 were engaged in handwork and 57 in machine work. More than half of the hand workers were packers, and 47 of the 57 machine workers were either bunchers or rollers. While hand packing and machine bunching and rolling are the principal employments for white women and girls in the tobacco industry as carried on in Richmond, the numbers given for these and for other occupations can not be taken as indicating the proportions in the several occupations in the industry as a whole. At the present time, machines are being introduced which will supplant some of the hand workers.

As compared with the hand workers, a larger proportion of the machine workers are under 21 years of age. This results in part from the fact that the handwork is generally more skilled, and in part from the fact that the hand workers include such groups as inspectors and teachers, who are commonly selected from workers who have had a relatively long experience in the industry. As shown in Table 97, following, 78.9 per cent of the machine workers were under 21 years of age, the corresponding percentage for the hand workers being 53.8. A detailed classification by age period and occupation is given in Table 98.

TABLE 97.—AGE DISTRIBUTION OF 150 WHITE FEMALE HAND AND MACHINE WORKERS IN THE TOBACCO INDUSTRY.

Age group.	Number.			Per cent.		
	Hand workers.	Machine workers.	Hand and machine workers.	Hand workers.	Machine workers.	Hand and machine workers.
13 to 15 years	8	15	23	8.6	26.3	15.3
16 to 20 years	42	30	72	45.2	52.6	48.0
Total, under 21 years	50	45	95	53.8	78.9	63.3
21 to 30 years	31	11	42	33.3	19.3	28.0
31 years and over	12	1	13	12.9	1.8	8.7
Total, 21 years and over	43	12	55	46.2	21.1	36.7
Total, all ages	93	57	150	100.0	100.0	100.0

TABLE 98.—AGES OF 150 WHITE FEMALE WORKERS IN THE TOBACCO INDUSTRY, BY OCCUPATION.

Occupation.	Under 16 years.	16 to 20 years.	21 to 30 years.	31 to 40 years.	41 years and over.	All ages.
Hand workers.						
Pen or stock girls		1	2	1		4
Rollers		1	1	1		3
Packers:						
Big cigars		2	1	1		4
Little cigars		4	6	2		12
Cheroots		1	1			2
Cigarettes		4	3		1	8
Sliced plug		1	2			3
Granulated tobacco	2	7	7	3		19
Banders	6	3				9
Stamp issuers				1		1
Liners		9	1			10
Weighers			1			1
Folders, cartons		1				1
Shoulderers		2	1			3
Trimmers		5	2			7
Teachers		1	1			2
Inspectors			2	1	1	4
Total, hand workers	8	42	31	10	2	93
Machine workers.						
Bunchers	6	15	3			24
Rollers	6	11	5	1		23
Feeders, cigarettes and coupons	2	3	1			6
Feeders, paper	1					1
Packers, cigarettes			1			1
Banders		1				1
Box makers			1			1
Total, machine workers	15	30	11	1		57
Grand total	23	72	42	11	2	150

Years in the industry.—More than one-third of the 150 workers reported that they had been in the industry not over 18 months, the proportion who had been in the industry not over 18 months being higher among machine workers than it was among the hand workers. Of the machine workers 86 per cent had been in the industry less than 4½ years, and of the hand workers 60.2 per cent. In the following table is given the classification by years in the tobacco industry:

TABLE 99.—YEARS OF EMPLOYMENT IN THE TOBACCO INDUSTRY OF 150 WHITE FEMALES.

Years in the industry.	Hand workers.	Machine workers.	Hand and machine workers.
	Number.	*Number.*	*Number.*
Under 6 months	8	6	14
6 months to 1½ years	20	21	41
1½ to 2½ years	9	11	20
2½ to 3½ years	8	8	16
3½ to 4½ years	11	3	14
4½ to 5½ years	14	3	17
5½ to 6½ years	4	1	5
6½ to 7½ years	4	3	7
7½ to 8½ years	3	1	4
8½ to 9½ years	3		3
9½ to 14½ years	6		6
14½ to 19½ years	2		2
32 years	1		1
Total	93	57	150
	Per cent.	*Per cent.*	*Per cent.*
Under 4½ years	60.2	86.0	70.0
4½ to 9½ years	30.1	14.0	24.0
9½ years and over	9.7		6.0
Total	100.0	100.0	100.0

The data relative to the different occupations in the tobacco industry at which each of these 150 white women and girls worked indicate that while there is considerable shifting from one occupation or process to another among the hand workers there is comparatively little among the machine workers. Of the 93 hand workers 33 had been employed at more than one sort of work in the tobacco industry, while only 6 of the machine workers had done any work in the tobacco industry other than that which they are now doing. Among hand workers the proportion who had worked at two or more occupations is greater for those who had been in the industry not over 4½ years than it is for those who had been in the industry a longer period. This is accounted for by the fact that in some factories the policy has been adopted in recent years of shifting the new girls from one hand process to another. There is no evidence in the data that the acquirement of skill in one process usually leads to promotion to another line of work. Although the several processes are with few exceptions easily learned, girls who have acquired facility in one line of work find it to their advantage, so far as immediate wage-earning capacity is concerned, to remain in that line of work. The following table shows the number of different occupations worked at in the tobacco industry by hand and machine workers, classified by years of experience in the industry:

TABLE 100.—NUMBER OF DIFFERENT OCCUPATIONS AT WHICH 150 FEMALE HAND AND MACHINE WORKERS HAVE WORKED, BY YEARS IN THE TOBACCO INDUSTRY.

Years in the industry.	Number who have worked at—							Total number reporting.
	One occupation only.	Two or more occupations.						
		Two occupations.	Three occupations.	Four occupations.	Five occupations.	Six occupations.	Total.	
Hand Workers.								
Under 6 months	6	2					2	8
6 months to 1½ years	13	6	1				7	20
1½ to 2½ years	4	3	2				5	9
2½ to 3½ years	3	3	2				5	8
3½ to 4½ years	7	4					4	11
4½ to 5½ years	10	2		1		1	4	14
5½ to 6½ years	3	1					1	4
6½ to 7½ years	3	1					1	4
7½ to 8½ years	3							3
8½ to 9½ years	2	1					1	3
9½ to 14½ years	5		1				1	6
14½ to 19½ years	1		1				1	2
32 years		1					1	1
Total, hand workers	60	21	7	1		1	33	93
Machine Workers								
Under 6 months	6							6
6 months to 1½ years	17	1	2	1			4	21
1½ to 2½ years	11							11
2½ to 3½ years	8							8
3½ to 4½ years	3							3
4½ to 5½ years	3							3
5½ to 6½ years	1							1
6½ to 7½ years	2				1		1	3
7½ to 8½ years		1					1	1
Total, machine workers	51	2	2	1	1		6	57
Grand total	111	26	9	2	1	1	39	150

Only a small proportion of the white women and girls from whom schedules were taken reported that they had at any time worked in a wage-earning pursuit outside of the tobacco industry; 127, or 85 per cent, of 150 reported that they had not been so employed.[1]

[1] The remaining 23 reported the following occupations or places of employment outside of the tobacco industry: Department store, 5; biscuit factory, 2; bookbinding, 2; stenography, 2; cake factory, 2; and 1 each the following: Bakery, hosiery mill, shirt factory, underwear mill, butter-tray factory, dress-

Hours of labor.—The regular working time per week and per day is shorter in summer than it is in winter, and generally throughout the industry Saturday is a short day. As reported by the workers in the several occupations, the regular hours per day in summer on days other than Saturday range from 6½ to 10, the usual working time being 8 or 8½ hours; in winter the hours range from 8½ to 10, the usual working time being 9 or 9½ hours. Hours on Saturday in both summer and winter range from 4 to 6. Hours per week in summer range from 35 to 56, the usual working time being 45 to 48 hours; in winter the range is from 48 to 56, the usual working time being 50 to 54 hours. No uniform regular scale of hours obtains throughout the industry, the working time varying from establishment to establishment and being reduced irregularly in the slack season. In Table 101 are given by occupation the regular hours per day, on Saturday, and per week, in summer and in winter, according to the returns made by the workers. The irregularity in hours is so considerable that the reports of individual workers are not entirely consistent. The inconsistencies arise in part from the fact that, where the hours vary irregularly, the several reports refer to different times, and, in part, from the fact that in some cases average working time, or range of hours, is reported. The returns as tabulated give, nevertheless, a fairly accurate account of the condition prevailing in the industry as regards working hours. In making up Table 101, which follows, reports of hours by some workers from whom complete schedules were not obtained have been included.

TABLE 101.—HOURS OF LABOR IN THE TOBACCO INDUSTRY, BY OCCUPATION, AS REPORTED BY WHITE WOMEN AND GIRLS.

Occupation.	Regular hours of labor.					
	Per day (except Saturday).		On Saturday.		Per week.	
	Summer.	Winter.	Summer.	Winter.	Summer.	Winter.
Hand workers.						
Pen or stock girls	8½	8½-9½	5½	5½	[1] 48	48-53
Rollers	8	9½	5	5½	45	53
Packers:						
Big cigars	8-8½	9⅗-10	5-5½	5-6	45-48	53-54-55-56
Little cigars	8½	9-9½-9⅘	4½-5½	5-5½	47-48	50-53-54-55½
Cheroots	8½-10	9⅘-10	5½-5	5	47½-48-55-55½	54-55
Cigarettes	8	9½-9⅘-10	5-6	4½-5-6	45-46	52-54-55-56
Sliced plug	6½-8½	9½-10	5	5	37½-47½	52½-55
Granulated tobacco	8-8½-8¾-10	8½-10	5-5¼-6	4-5-5½-6	45-45½-48¾-56	46½-48-54-55-56
Banders	8½	9⅘-10	5½	5	48	54-55
Stamp issuers	8½	8½	5½	5½	48	48
Liners	8½	8½	5½	5½	48	48
Weighers	9½	9⅘	5½	5	53	54
Folders, carton	8½	8½	5½	5½	48	48
Shoulderers	7½-10	9½-9⅘	5-5½	5-5½	37½-43-55-55½	52½-53-54-54½
Trimmers	8-8½	8½-9½-9⅘	5-5½	5-5½	45-45½-48	47½-48-53-54-54½
Teachers	8-8½	8½-9½	5-5½	5½	45-48	48-53
Inspectors	7-8½-10	8½-9½-9⅘-10	5-5½	5-5½	40-48-55½	47½-53-54-55½
Machine workers.						
Bunchers	8-8½	8½-9½-9⅘-10	5½-6	5-5½	45½-46-48-48½	47½-48-53-54-55½
Rollers	8-8½	8½-8¾-9½-9¾-9⅘-10	5-5½-6	4½-5-5¼-5½	45-45½-46-48½	47-49-52-54-55½
Feeders, cigarette and coupon	7-8-8½	8½-9½-9⅘-10	5-5½-6	5-5½	40-46-48-48½	47½-48-53-55½
Feeders, paper	9	9½	5	5½	50	53
Packers, cigarette	8½	9½	5½	4½	48	52
Banders	8½	(2)	5½	(2)	48	....
Box makers	8½	(2)	5½	(2)	48	....

making, embroidery, telephone, 5 and 10 cent store, mattress factory, awning factory, tailor shop, paper-bag factory, bottling company, envelope factory, teaching, optical company, boarding house, shoe factory, candy packing, morocco factory, commercial employment. In this list 5 workers are included twice, 1 is included four times, and 1 five times.

[1] As low as 35, July to October, 1914. [2] Not reported.

Separate reports of hours worked are obtained from each of 18 establishments in the tobacco industry. These reports, which are tabulated in Table 102, are in general consistent with the reports of individual workers tabulated in Table 101. In the case of each establishment included in Table 102, the statement of hours was obtained from at least four individuals, including foremen, managers, and others holding positions of responsibility. Separate statements were obtained covering the hours worked by white and by colored employees respectively, indicating hours per day, on Saturday, and per week, in winter and in summer. The 18 establishments covered by these data reported an aggregate, exclusive of office force, shipping clerks, and foremen, of 5,266 employees, of whom 3,126 were white and 2,140 were colored. The aggregate reported by them is thus approximately equal to the total number (5,355) of laborers and semiskilled operatives in cigar and tobacco factories in 1910, as reported by the Federal census.

TABLE 102.—REGULAR HOURS OF LABOR IN SUMMER AND IN WINTER IN 18 ESTABLISHMENTS ENGAGED IN STEMMING, MANUFACTURING, AND SHIPPING TOBACCO.

Establishment No.	Hours worked by employees.											
	Per day (except Saturday).				On Saturday.				Per week.			
	Summer.		Winter.		Summer.		Winter.		Summer.		Winter.	
	White.	Colored.	White.	Colored.	White.	Colored.	White.	Colored.	White.	Colored.	White.	Colored.
1	7	(1)	9½	10	5	......	5	5	40	......	52½	55
2	7	......	9½	......	4½–5	......	5½	......	39½–45	......	53	......
3	8½	8	10	9½–10	4½	5–6	5	5	47	45–46	55	52½–55
4	7–7½	(1)	9½	9½–9¾	4½	......	5½	4½–5	39½–42	(1)	53	52–54
5	8½	8½	8½	8½	5½	5½	5½	5½	48	48	48	48
6	9½	8	9½	9½	5½	5	5½	5½	53	45	53	53
7	7⅓	......	9⅓	......	5	......	5	......	41⅔	......	51⅔	......
8	8	8	9–9½	9–9½	4½	4	4½–5	4½	44½	44	49½–52½	49½–52
9	8½	(1)	10	10	5	......	5–5½	5	47½	(1)	55–55½	55
10	8½	9	9½	9½	5	5	5	5½	47½	50	52½	53
11	9	8	9½	9½	4½–5	5	5	5–5½	49½–50	45	52½	52½–53
12	......	8¾	......	9¾	......	4½	......	5	......	48¼	......	53¾
13	......	[2] 11½	......	......	......	6	......	6	......	63½	......	63½
14	......	10	......	......	......	5	......	5	......	55	......	55
15	......	(1)	......	9¾	......	......	......	5¼	......	......	......	54
16	......	8½	......	9½	......	4½	......	5½	......	47	......	53
17	......	(1)	......	9½	......	......	......	5½	......	(1)	......	53
18	......	9	......	9½	......	4	......	5½	......	49	......	53

[1] Shut down. [2] Night and day shifts.

Wages.—White women and girl workers in the tobacco industry are paid generally by the piece, but in some cases by the hour, day, or week.

The piece rates for cigar workers are per hundred or per thousand cigars, bunched, rolled, banded, or packed. The rates vary with the size and quality of the cigar, and with the style of the packing, being relatively higher for the finer grades of cigars, which require more skill and care in bunching and rolling, and must be carefully shaded in packing. For cigarette packing by hand, rates are usually per hundred boxes; for machine packing rates are either by piece or by day. For packers of sliced or cut-plug tobacco, rates are per hundred boxes or bags. In one shop, a system of bonus paying is reported, bunchers being paid 10 cents on a dollar earned, provided they had worked full time during the week; the same rule obtaining in the case of rollers, provided in addition that they have made a good average. In Table 103, which follows, the data relating to wages have been taken off the schedule by occupations. Reports of earnings and wage rates in the different occupations were obtained, also from a considerable number of workers from whom complete schedules were not taken, and these reports have been incorporated in the table.

TABLE 103.—EARNINGS OF WHITE FEMALE WORKERS IN THE TOBACCO INDUSTRY, BY OCCUPATION.[1]

Occupation.	Earnings per week or wage rate per day or hour.	Piece rate.
Hand workers.		
Pen and stock girls.	$7.50 to $10.50 per wk.; 15c. to 18c. per hr.	
Rollers and bunchers.	$8 to $10.50 per wk.; $16 highest	11c., 11½c., 12c., 25c. to 30c. per 100 for rolling; 15c. per 100 for bunching short filler; 25c. for long filler.
Packers, big cigars.	$7 to $12 per wk.; $16, highest; $1.25 per day.	15c., 20c., 25c., 30c., 40c., 50c. to 65c. per 1,000.
Packers, little cigars.	$6 to $6.25 per wk., slow worker; $7 to $9, average; $10, high; $15, highest.	9c., 12c., 15c., 17c., 17½c., to 30c. per 1,000; 15c., usual.
Packers, cheroots	$1.20 per day, average	15c. to 17c. per 1,000.
Packers, cigarettes.	$5.28 per wk., lowest; $7, slow packer; $15, highest; 7c., 11c., to 16c. per hour; $1.25 per day.	8c. to 9c. per 1,000 cigarettes; 8c. to 16c. per 100 boxes.
Packers, sliced plug	$5.28 to $8 per wk., usual; $12 to $14, very fast packers; 11c. per hour; $1.25 per day.	7½c. to 9c. per 100 boxes.
Packers, granulated tobacco.	$5.28 to $8 per wk.; $18, highest; 11c. per hr., usual.	15c. per 200 boxes or bags.
Banders	$4 to $8.50 per wk.; $11 to $12, highest	15c., 20c. to 25c. per 1,000.
Stamp issuers	$5.28 per wk	Where the issuer puts on the stamps, 15c., 18c., 20c., to 25c. per 1,000.
Liners	$5.28 per wk.; 11c. per hr	
Weighers	$7 to $8 per wk	7c. (7½c.) per 100 ounces in lots of 1 ounce (or 2 ounces).
Folders, cartons	$5.28 per wk.; 11c per hr	
Shoulderers	$7 per wk., low; $9.50, high	50c. to $1.20 per 100 boxes.
Trimmers	$6 per wk., low; $7 to $9, usual; $11, high.	50c., 80c., $1 to $1.20 per 100 boxes.
Teachers	$10.10 to $10.50 per wk.; 18c., to 20c. per hour.	
Inspectors	$6 to $10.50 per wk.; 15c. to 20c. per hr	
Machine workers.		
Bunchers	$6 to $7 per wk., low; $8 to $10, usual; $12, high; $20, highest.	12c., 14½c., 15c., 16c., 17c., 20c., 30c., 32c., 34½c., 35c., 38c., 50c. to 60c. per 1,000.
Rollers	$6 per wk., low; $7 to $9, usual; $10 to $12, high.	11c., 12c., 14c., 15c., 16c., 38c., 40c., 50c., 60c., 70c., 80c. to 90c. per 1,000.
Feeders, cigarette and coupon.	$5 to $8 per wk.; $1.25 per day. Learners, $4 per wk.; 75c. per day.	
Feeders, paper	$7 to $11 per wk	
Packers, cigarettes.	$4 to $8 per wk., piecework; $1.25 per day. Choice of day or piece rate.	47c. per 100,000 cigarettes.
Banders		25c. per 1,000.
Box makers	20c. per hr	

[1] For comparison the wage of colored workers in the tobacco industry may be noted. The principal employment of colored women workers is machine or hand stemming. For machine stemming, according to reports from five stemmeries, these workers are paid 2 and 3 cents per pound, or a rate of 8 cents per hour; for hand stemming, according to reports from 9 stemmeries, the rates are from 1 to 3½ cents per pound, the union rate being 9 cents per hour or $1.25 per 100 pounds. In some stemmeries workers have been paid by the day or week, the rates being 75 cents or $1 per day, and from $3 to $5 per week. For colored men employed chiefly in handling, sorting, steaming, and flavoring, the rates are $1, $1.25, and $1.50 per day, or $7.50 per week, the range in the shipping room being from $7.50 to $10 per week. Coopers are paid 35, 55, and 75 cents per hogshead, according to size.

Earnings for individual workers vary from week to week, being determined in part by the number of hours worked, in part by the varying speed of the worker, and in part by the varying qualities of the materials used. The quality of the wrappers, for example, which varies more or less from week to week, is an important factor in determining the number of cigars which can be rolled in a given time. While workers vary in their capacity to work fast, it seems to be generally true that individual workers vary their speed within certain limits more or less at will. These factors in combination account for the wide range of earnings reported severally for the different occupations.

Comparatively few workers earn regularly, or even occasionally, the highest rates specified in some of the occupations, and many of the workers regulate their work so as to earn a fairly uniform wage from week to week, which is considerably below the maximum of which they are capable on occasion when working at their maximum speed. The earnings of the average worker in different weeks are fairly indicated by the ranges shown in the table. The earnings or ranges of earnings are given in the table as reported by the workers, except that where reports from different workers show that the wage varies irregularly within certain fairly well-defined limits, only the limiting wages are specified. The data are not presented as a complete statement of earnings or rates of wages of white women and girls in the tobacco industry, but only as a summarization of the earnings and rates reported by workers to agents of the survey. In machine bunching, for example, where the production per worker is limited to a certain number of bunches per day, or where difficult, tender foreign wrappers are used, rates per thousand run considerably above those specified in the table.

Conditions of employment.—In answer to the question "Does your work involve physical strain?" 138 of the 150 white women and girl workers replied "No;" 130 of these workers answered "No" to the question, "Does your work involve nervous strain?" and 148 stated that their work did not impair health. In Table 104 the answers to these inquiries are tabulated by occupation. Only 3 of the 93 hand workers and only 1 of the 57 machine workers stated that their work involved physical strain; 14 of the hand workers and 6 of the machine workers stated that their work involved nervous strain; only 1 of the 150 workers stated that her work impaired health. It is clear from these replies that in the opinion of the workers conditions of employment in the tobacco industry for white women and girls are satisfactory.

TABLE 104.—CONDITIONS OF EMPLOYMENT THAT INVOLVE PHYSICAL OR NERVOUS STRAIN, OR THAT TEND TO IMPAIR HEALTH AMONG WHITE FEMALES EMPLOYED IN THE TOBACCO INDUSTRY, BY OCCUPATION.

Occupation.	Number who reported in answer to question—									Total number.
	Does work involve physical strain.			Does work involve nervous strain.			Does work tend to impair health.			
	Yes.	No.	No report.	Yes.	No.	No report.	Yes.	No.	No report.	
Hand workers.										
Pen and stock girls		4		3	1		1	3		4
Rollers	1	2		1	2			3		3
Packers, big cigars		4			4			4		4
Packers, little cigars	2	9	1	3	9			12		12
Packers, cheroots		2			2			2		2
Packers, cigarettes		8		2	6			8		8
Packers, sliced plug		3			3			3		3
Packers, cut plug		19		2	17			19		19
Banders		9			9			9		9
Stamp issuers		1		1				1		1
Liners		10			10			10		10
Weighers		1			1			1		1
Folders, cartons		1			1			1		1
Shoulderers		3			3			3		3
Trimmers		5	2		7			7		7
Teachers			2	1	1			2		2
Inspectors		4		1	3			4		4
Total, hand workers	3	85	5	14	79		1	92		93
Machine workers.										
Bunchers	1	21	2	4	20			24		24
Rollers		22	1	1	22			23		23
Feeders, cigarette and coupon		6			6			6		6
Feeders, paper		1			1			1		1
Packers, cigarettes		1			1			1		1
Banders		1			1			1		1
Box makers		1		1					1	1
Total, machine workers	1	53	3	6	51			56	1	57
Total, all occupations	4	138	8	20	130		1	148	1	150

Schooling.—Age at the time of leaving school was reported by 144 of the 150 workers. Approximately one-fourth—24.3 per cent—of those reporting left school under 14 years of age; nearly one-half—45.1 per cent—left school at the ages of 14 and 15, and 29.9 per cent at the ages of 16, 17, or 18. One worker reported no schooling whatever. The age 15 is given more frequently than any other. The data relating to age at leaving school are tabulated in Table 105, which follows:

TABLE 105.—AGE AT LEAVING SCHOOL OF 150 WHITE FEMALE WORKERS IN THE TOBACCO INDUSTRY.

Age at leaving school.	Hand workers.	Machine workers.	Total, hand and machine workers.	
			Number.	Per cent.
No schooling	1		1	0.7
11 years	2	1	3	
12 years	6	4	10	
13 years	15	7	22	
Total, under 14 years	23	12	35	24.3
14 years	15	16	31	
15 years	22	12	34	
Total, 14 and 15 years	37	28	65	45.1
16 years	20	9	29	
17 years	5	5	10	
18 years	4		4	
Total, 16 to 18 years	29	14	43	29.9
Total reporting age	90	54	144	100.0
Age not reported	3	3	6	
Total, all ages	93	57	150	

Owing to the fact that some workers had attended ungraded schools, or schools in other communities organized differently from those in Richmond, some uncertainties attach to the classification of individual workers according to grade reached before leaving the school. The error in the classification of individual workers is, however, not sufficient to invalidate materially the significance of the statistics given in Table 106. While 18, or 12.6 per cent, of the workers reporting had taken work beyond the seventh grade of the grammar school, which in Richmond would imply entrance to the high school, no worker reported a complete high-school course, and 49 had not gone beyond the fifth grammar grade; 40 left school on completing the sixth grade, and 35 on completing the seventh. These figures indicate that the primary need of a very large proportion of these workers as regards schooling is for general elementary courses equivalent to the grades of the grammar school. From the data presented in Table 108 it is apparent that this need for general elementary courses is very generally felt by the workers themselves.

TABLE 106.—GRADE REACHED BEFORE LEAVING SCHOOL BY 150 WHITE FEMALE WORKERS IN THE TOBACCO INDUSTRY.

Grade reached.	Hand workers.	Machine workers.	Total.	
			Number.	Per cent.
No schooling	1		1	0.7
Grammar school.				
First				
Second		1	1	.7
Third	2	3	5	3.5
Fourth	12	5	17	11.9
Fifth	14	12	26	18.2
Sixth	24	16	40	28.0
Seventh	24	11	35	24.5
Total, grammar school	76	48	124	86.7
High school.				
First year	9	6	15	10.5
Second year	2		2	1.4
Third year	1		1	.7
Fourth year				
Total, high school	12	6	18	12.6
Total reporting grade	89	54	143	100.0
Grades not reported	4	3	7	
Grand total	93	57	150	

To the question, "Is any high-school training of value in your occupation?" 146 replies were made, of which in only 7 cases the answer was "Yes"; only 10 of the 143 replying to the question, "Is a complete high-school training of advantage?" answered "Yes." The negative answers should not be understood as indicating that the workers attach no value to high-school training, but only as indicating their estimate of high-school training as preparation for work in the tobacco industry.

Only 21 out of 150 workers reported that they had taken courses of study of any kind since leaving school. In the following table is shown the number who had taken courses and the character of the courses taken:

TABLE 107.—COURSES OF STUDY TAKEN SINCE LEAVING SCHOOL BY WHITE FEMALE WORKERS IN TOBACCO INDUSTRY.

School and course.	Number of workers.
School.	
Public night school	18
Business college	2
Telephone school	1
Course.	
General elementary	12
Stenography and typewriting	4
Millinery	3
Bookkeeping	1
Household arts	1
Commercial (not specified) [1]	1
Total taking courses	21
Had taken no courses	129
Total number reporting	150

[1] Reported by a worker who reported also a general elementary course.

FINDINGS ABOUT OPERATIONS IN THE TOBACCO INDUSTRY IN RICHMOND, VA.

[This chart is intended to summarize the statements and opinions of employers and employees in the trades in Richmond. The chart does not, therefore, necessarily represent the views of the Survey Committee, nor conditions and opinions of the trade elsewhere.]

ANALYSIS OUTLINE.	HANDLING AND STEAMING.	ASSORTING.	STEMMING OR STRIPPING.	FLAVORING AND MAKING PLUG AND SMOKING TOBACCO.	BUNCHING.	SUCTION-TABLE ROLLING.
1. Process	Dry tobacco leaf, tied in bunches by the ends of the stems, is taken from hogsheads, leaves examined, and bad ones removed, the bunch untied and leaves shaken out, and placed in piles ready for steaming. Steaming is a machine process for dampening the leaves and rendering them pliable and ready for stemming. The worker feeds the leaves into the drum, a revolving, tube-like machine, through which steam passes and comes in contact with the leaves as they are carried along and distributed by the drum. Work is done by colored men, women, and boys.	Tobacco leaf is assorted while damp and graded for its various uses. This consists of opening up the leaf so as to see the size and quality, after which it is graded, placed in piles according to grade and nature of use, then placed in trays ready for stemming. Work is done by colored men and women.	Stemming is removing midvein of leaf. The hand stemmer takes a dampened leaf, doubles it along the midvein, catches the leaf near the tip in one hand and with the other grasps the midvein near the tip, and gives a quick turn of the wrist, which wraps the midvein about the hand; the circular motion prevents unnecessary tearing of leaf. To remove midvein by machine the operator spreads out the dampened leaf, inserts tip in a groove on the drum of the stemming machine, smooths out and feeds in the leaf as drum revolves; takes leaf from machine, ties in pads, and places in tray. Work is done by colored men and women.	Stemmed leaves are put in a bath of sweetened flavoring. As the leaves are taken from the flavoring bath they are shaken out, spread on a conveyor, which carries them through the drying apparatus, where the moisture is taken out; when dried, the tobacco is ready to be made into plug or smoking tobacco, cigars, or cigarettes. Flavored tobacco is weighed, packed into molds, covered with lead blocks, and the filled molds are put under hydraulic pressure, which reduces the tobacco in the molds to blocks of uniform size and weight. Granulated or sliced smoking tobacco is made from plug run through a granulating or slicing machine. Work is done by colored men and boys.	Bunching scrap filler consists of two operations: The operator selects a piece of leaf for the binder, places it in the machine, starts the machine which deposits the right amount of filler in binder and rolls the binder about filler, and deposits bunch on the table. Bunching long filler consists of three operations: The operator selects a piece of leaf for the binder, places it in the machine, breaks sufficient leaf into lengths for filler, and places filler in binder; starts the automatic machine which rolls the binder about the filler, and deposits bunch on table. The worker places the finished bunches in molds to set.	In this process the operator places the leaf on shaped suction table, stretching the leaf to desired smoothness while doing so; she starts the machine, which causes the suction die to descend over the table, cutting wrapper; meanwhile the machine has placed a bunch in position to receive the wrapper, which is also carried by the die to the rolling device, where the wrapper is rolled about the bunch; the end is then fastened by paste, trimmed, and the finished cigar dropped on a shelf. At intervals the operator places the cigars in racks, ties them in bundles, and lays them in trays for packing. In making cigars with heads the head is inserted into a revolving cone, called a thimble, which shapes the head.
2. Product or specialties	Tobacco leaf	Tobacco leaf	Tobacco leaf	Tobacco leaf, plug, and smoking tobacco.	Big and little cigars	Big and little cigars
3. Importance of trade (number employed).	About 1,300 handlers, stemmers, and sorters.	About 1,300 handlers, stemmers, and sorters.	About 1,400	Making plug, about 100	About 430	About 410
4. Conditions of employment— (a) That involve physical or nervous strain.	None	None	None	None	Noise of machinery	Noise and vibration of machinery.
(b) That stimulate intelligence and interest.	None	None	None	None	Making bunches uniform—bunching long filler is matter of judgment.	Economical use of wrapper leaf.
(c) That narrow or restrict mental development.	Monotonous repetition of simple movements.	Monotonous repetition of simple movements.	Monotonous repetition of simple movements.	Monotonous repetition of simple movements.	Unvarying monotony of the work.	Unvarying monotony of the work.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	High temperature is enervating, dust injurious, and odor of tobacco nauseating.	In poorly-ventilated rooms dust is injurious and odor of tobacco sometimes causes nausea.	In poorly-ventilated rooms dust is injurious and odor of tobacco sometimes causes nausea.	In poorly-ventilated rooms humidity and odor of tobacco sometimes cause nausea.	In poorly-ventilated rooms dust and odor sometimes cause nausea.	Dust and odor largely carried away by suction of the machine.
5. Wages	Per day (men), $1, $1.25, and $1.50; per hour (women), 8 and 9 cents; per day (boys), 75 cents.	Per day (men), $1, $1.25, and $1.50; per hour (women), 8 and 9 cents; union scale, 9 cents per hour.	Hand stemming, 60 cents to $3.50 per 100 pounds; per day, $1, $1.25, and $1.50; union scale, $1.25. Machine stemming, 8 cents per hour; union scale, 8 and 9 cents per hour.	Per day (men), $1, $1.25, and $1.50; boys, 75 cents.	Piece rates per 1,000, 12 to 60 cents; reported average weekly wage rates, July to September, $6 to $8.50, and October to July, $7 to $10.50.	Piece rates per 1,000, 11 to 90 cents; reported average weekly wage rates, July to September, $6 to $8.85, and October to July, $7 to $10.50.
6. Hours of labor (regular, per day; per week; on Saturday).[1]	9 and 10 hours per day; 5½ hours on Saturday; 54 to 60 hours per week.	9 and 10 hours per day; 5½ hours on Saturday; 51 to 60 hours per week.	9 and 10 hours per day; 5½ hours on Saturday; 54 to 60 hours per week.	9 and 10 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 51 to 60 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.
7. Seasonal activity— (a) Busy season	November to April	November to April	November to April	October to June	November to June	November to June
(b) Slack season	May to October	May to October	May to October	July to September	July to October	July to October
(c) Fluctuation in employment	In stemmeries the season runs about half the year; in other tobacco factories the season runs parallel with seasons in other operations in the industry.	In stemmeries the season runs about half the year; in other tobacco factories the season runs parallel with seasons in other operations in the industry.	Stemming factories run about half the year; in other factories stemming season runs parallel with other seasons.	Day shortened during the summer on account of slackness and of excessive heat.	Day shortened during the summer on account of slackness.	Day shortened during the summer on account of slackness.
8. Extent to which the workers are organized.	(2)	(2)	(2)	(2)	Unorganized	Unorganized
9. Entrance age	No workers under 20 years; greater number middle-aged or elderly.	No workers under 20 years	No workers under 20 years	No workers under 20 years	14 years by law, or 12 years by special working permit; 16 to 18 years the usual age.	14 years by law, or 12 years by special working permit; 16 to 18 years the usual age.
10. Time required to learn operations.	1 or 2 days	2 to 6 weeks	3 to 6 weeks	1 or 2 days	4 to 8 weeks	6 to 10 weeks
11. Age of maximum productivity	Not determinable	Not determinable	Not determinable	Not determinable	Not determinable	Not determinable
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	Yes	Yes	Yes	Yes	Yes	Yes
13. Is demand for labor increasing or decreasing?	About normal	About normal	About normal	About normal	About normal	About normal
14. What is the source of supply?	Negroes, from the city and the country.	Negroes, from the city and the country.	Negroes, from the city and the country.	Negroes, from the city and the country.	Native white girls and women, from the city and the country.	Native white women, from the city and the country.

ANALYSIS OUTLINE.	MAKING CIGARS BY HAND.	PACKING LITTLE CIGARS.	PACKING BIG CIGARS.	INSPECTING.	PACKING CUT PLUG.	PACKING GRANULATED TOBACCO.
1. Process	The cigar maker performs all the operations in the making of a cigar. He spreads the binder on the table, breaks the proper amount of leaf into lengths for the filler, and places it in the binder, and wraps the binder about the filler, making it either a right bunch or left bunch, according to the kind of wrapper; he rolls the wrapper about the bunch—a right bunch in a right wrapper, or a left bunch in a left wrapper—pastes the end of the wrapper, finishes the head, and thus completes the cigar. Bunches may or may not be placed in molds to set, the method being determined by the kind of cigar. The cigars are then placed in a rack, tied in bundles, and laid in trays ready for packing.	Two methods are used for packing little cigars. For the slide-and-shell method the slide, with lining paper or foil, is laid on the table, gage placed on the slide, ten cigars of like color chosen and laid in the gage, lining folded over, gage slipped back, and the slide folded and pushed into the shell; filled packages are placed under hand press and pressed into symmetrical form. For the cup method three cigars are chosen, wrapped in waxed paper or foil, and slipped into the fancy paper cup. Filled cups are placed in wooden boxes.	Packing big cigars consists of shading, grading, and putting cigars in boxes. One thousand to fifteen hundred cigars are placed on the table, graded into four or five grades, according to color, which indicates the strength of the tobacco. The entire number is carefully graded, and then shaded in a scale of shades—the darkest at the left. Ten or twelve cigars for each row are selected, the lower layers placed in the box, a small board laid on top and pressure applied by means of a hand press. The board is then removed, the top layer, called the facing, laid in the box, which is then closed and nailed by hand.	Finished cigars and cigarettes are inspected before packing. When finished they are taken to the inspector, who counts them, looks for flaws, turns back imperfect work, punches credit slip for operator, and keeps a corresponding record for her department.	The packer opens tin box, lays in lining paper (or box is lined by a helper), weighs needed quantity of tobacco slices, lays them in the box, folds over lining paper, seals with a fancy band, and closes the box.	Waxed lining paper is wrapped around a funnel built to fit the bag or box funnel and paper are inserted in the bag or box; tobacco is weighed, poured into the funnel, and a block run into the funnel to pack tobacco down; funnel and block are removed, strings drawn and tied, or box closed.
2. Product or specialties	Big and little cigars	Little cigars and cheroots	Big cigars	Big and little cigars, cheroots, and cigarettes.	Sliced plug	Granulated tobacco
3. Importance of trade (number employed).	About 150	About 270	About 80	About 100	About 550, packers of sliced and granulated tobacco.	About 550, packers of sliced and granulated tobacco.
4. (a) That involve physical or nervous strain.	None	None	Constant and close attention required in shading and grading causes eyestrain.	None	None	None
(b) That stimulate intelligence and interest.	Selection of materials and manipulative skill required in the handwork.	None	Recognizing colors and shades.	Alertness and accuracy required in inspecting and checking up finished work.	None	None
(c) That narrow or restrict mental development.	None	Monotonous repetition of simple movements.	Unvarying monotony of the work.	Unvarying monotony of the work.	Monotonous repetition of simple movements.	Monotonous repetition of simple movements.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	In poorly-ventilated rooms dust and odor sometimes cause nausea.	None where the room is properly ventilated.	Close and constant attention required in shading and grading sometimes causes eyestrain.	None where the room is properly ventilated.	None where the room is properly ventilated.	None where the room is properly ventilated.
5. Wages	Piece rates per 1,000, $4, $6, $7, $8, and $10; reported average daily wage rates, $2, $3, and $3.50; union scale, $7 and $8 per 1,000.	Piece rates per 1,000, 9, 12, 15, 17, 17½, and 30 cents for very high grade cigars; reported average weekly wage rates, July to September, $6 to $8, and October to July, $7 to $10.50.	Piece rates per 1,000, 15, 20, 25, 30, 40, 50, and, for very high grade, 65 cents.	Hourly rates, 15 to 20 cents; reported average weekly wage rates, July to September, $6 to $8.50, and October to July, $9 to $10.50.	Piece rates per 100 boxes, 7½ and 9 cents; reported average weekly wage rates, $5.28 to $8, usual, and $12, high; union scale, minimum 11 cents per hour; overtime paid at regular piece or hourly rate.	Piece rates per 100 packages, 7½ to 9 cents; reported average weekly wage rates, $5.28 to $8, usual, and $12, high; union scale, 11 cents per hour; overtime paid at regular piece or hourly rates.
6. Hours of labor (regular, per day; per week; on Saturday).[1]	8 hours per day; 5½ hours on Saturday; 45½ hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.
7. (a) Busy season	November to June	November to June	November to June	November to June	November to June	November to June
(b) Slack season	July to October	July to October	July to October	July to October	July to October	July to October
(c) Fluctuation in employment	Day shortened during the summer on account of slackness and of excessive heat.	Day shortened during the summer on account of slackness.	Day shortened during the summer on account of slackness.	Day shortened during the summer on account of slackness.	Day shortened in summer on account of excessive heat.	Practically constant, with exception of holidays.
8. Extent to which the workers are organized.	100 per cent organized	Unorganized	Unorganized	Unorganized	(3)	(3)
9. Entrance age	Not reported	14 years by law, or 12 years by special working permit; 14 to 16 years the usual age.	16 to 20 years	20 to 25 years	14 years by law, or 12 years by special working permit; 14 to 16 years the usual age.	14 years by law, or 12 years by special working permit; 14 to 16 years the usual age.
10. Time required to learn operations.	2 years	4 to 8 weeks	6 to 12 months	1 to 2 years	2 to 4 weeks	2 to 4 weeks
11. Age of maximum productivity	Not determinable	Not determinable	Not determinable	Not determinable	Not determinable	Not determinable
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	Yes	Yes	Yes	Yes	Yes	Yes
13. Is demand for labor increasing or decreasing?	Decreasing	About normal	About normal	About normal	About normal	About normal
14. What is the source of supply?	Native white men and women from the city and the country.	Native white girls and women, from the city and the country.	Native white women, from the city and the country.	Native white women, from the city and the country.	Native white girls, from the city and the country.	Native white girls, from the city and the country.

ANALYSIS OUTLINE.	BANDING.	STAMPING.	LABELING.	CIGARETTE MAKING.	PACKING CIGARETTES.
1. Process	Cigars are banded by hand or by machine. A girl opens the box, removes packed cigars, keeping them in their respective rows and places, lays cigars on the conveyor which carries them to the machine and deposits each in a groove; as the machine revolves each cigar is carried to the banding device, where the band is fastened in place; the conveyor then carries the cigars to another girl, who repacks them in original order. For the hand method the same care is used to keep cigars in rows and places; bands are moistened, wrapped, and fastened about the cigars, which are replaced in boxes or packages in original order.	Stamping is pasting the revenue stamps on the cigar box, carton, or package in such a way as to seal the box. Stamps are dipped on a pasting board, placed on the box, and smoothed into position; big cigars in boxes, smoking tobacco and little cigars in slide and shell, and little cigars in small boxes, are stamped on the outside of the package. Cut plug is usually stamped on inside of the package.	Labeling, like stamping, is done just before cigars are ready to be shipped. Fancy labels are dipped on a pasting board, placed on the box in proper position, usually over the edge of the box so as to seal it, and smoothed into place by hand.	Cigarette making is an automatic machine process. Rice paper, resembling narrow white tape, unrolls from a roll into the machine on a belt of corresponding width; as the paper passes along on this belt the machine feeds in the tobacco and distributes it evenly on the surface; a simple device turns the paper around the tobacco, and spreads paste on the edge and seals it; thence through a tube the roll is carried to a revolving circular knife, which cuts it into 2¾-inch lengths and drops the cigarettes in order in a tray. These machines are run by men who have knowledge of the use and care of complicated machinery.	Packing cigarettes by machine is an automatic process used for making and packing a slide-and-shell package. Cardboard strips are fed automatically into a die which cuts the shell; the shell, with lining paper or foil, is laid in position to receive the cigarettes from the chute; the machine then lays two rows of cigarettes on the slide, folds up the sides of the slide, folds the lining over the cigarettes, and pushes the slide into the shell which the machine has put in position to receive the slide, and drops the finished package on the table. The machine is operated by a feeder and a tender—both girls.
2. Product or specialties	Big and little cigars	Cigar and cigarette boxes and cartons.	Cigar and cigarette boxes	Cigarettes	Cigarettes.
3. Importance of trade (number employed).	About 60	About 100	About 60	About 80	About 600.
4. (a) That involve physical or nervous strain.	None	None	None	None	None.
(b) That stimulate intelligence and interest.	None	None	None	None	None.
(c) That narrow or restrict mental development.	Monotonous repetition of simple movements.	Monotonous repetition of simple movements.	Monotonous repetition of simple movements.	None	Monotonous repetition of simple movements.
(d) That are in other respects important as affecting the welfare of workers (i. e., liability to accident; occupational diseases).	Wetting bands in the mouth causes nausea.	None	None	None where the room is properly ventilated.	None where the room is properly ventilated.
5. Wages	Piece rates per 1,000 cigars, 15, 20, and 25 cents; reported average weekly wage rates, $4 to $5 in summer and $8 to $8.50 in winter.	Piece rates per 1,000, 15, 18, 20, and 25 cents; reported average weekly wage rates, $5.28 to $9.50; union scale, 11 cents per hour; overtime paid at regular piece or hourly rate.	Piece rates, 15, 20, and 25 cents per 1,000; reported average weekly wage rates, $5 and $6.	Machine operator $12 per week, $2 per day; helper $5.50 per week.	Hand packing, 8 and 16 cents per 100 boxes; machine packing, 47 cents per 100,000 cigarettes, or $1.25 per day; reported average weekly wage rates, $4 to $7, summer, and $6 to $8, winter; overtime paid at regular price.
6. Hours of labor (regular, per day; per week; on Saturday).[1]	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.	8½ and 9 hours per day; 5½ hours on Saturday; 5 to 7 hours per day in summer; 48 to 54 hours per week.
7. (a) Busy season	November to June	November to June	November to June	November to June	November to June.
(b) Slack season	July to October	July to October	July to October	July to October	July to October.
(c) Fluctuation in employment	Day shortened in summer on account of slackness.	Practically constant, with exception of holidays.	Day shortened in summer on account of slackness.	Day shortened during the summer on account of slackness and of excessive heat.	Day shortened during the summer on account of slackness and of excessive heat.
8. Extent to which the workers are organized.	Unorganized	(3)	(3)	Unorganized	Unorganized.
9. Entrance age	14 years by law, or 12 years by special working permit; 14 years the usual age.	14 years by law, or 12 years by special working permit; 16 to 20 years the usual age.	14 years by law, or 12 years by special working permit; 14 to 16 years the usual age.	14 years by law, or 12 years by special working permit; 16 to 20 years the usual age.	14 years by law, or 12 years by special working permit; 14 years the usual age.
10. Time required to learn operations.	2 to 4 weeks	4 to 6 weeks	4 to 6 weeks	Not reported	By hand, 4 to 8 weeks; by machine, 2 to 4 weeks.
11. Age of maximum productivity	Not determinable	Not determinable	Not determinable	Not determinable	Not determinable.
12. Is supply of labor adequate to meet demand? (Cause of deficiency, if any.)	Yes	Yes	Yes	Yes	Yes.
13. Is demand for labor increasing or decreasing?	About normal	About normal	About normal	About normal	About normal.
14. What is the source of supply?	Native white girls, usually from the city.	Native white women, from the city and the country.	Native white girls and women, from the city and the country.	White men and boys, from the city and the country.	Native white girls, usually from the city.

FINDINGS ABOUT EDUCATION FOR OCCUPATIONS IN THE TOBACCO INDUSTRY.

ANALYSIS OUTLINE.	HANDLING AND STEAMING.	ASSORTING.	STEMMING OR STRIPPING.	FLAVORING AND MAKING PLUG AND SMOKING TOBACCO.	BUNCHING.	SUCTION-TABLE ROLLING.
15. What does worker need to equip him properly for trade: (a) General education	Elementary education	Elementary education	Elementary education	Elementary education	Elementary education	Elementary education
(b) Trade and technical education.	None	None	None	None	None	None
(c) Manipulative skill	None	None	None	None	Nimble fingers	Nimble fingers
(d) Other requirements: Qualities essential, such as accuracy, etc.	Endurance	Patience	Patience	Strength and endurance	Patience and endurance	Accuracy, patience, and endurance.
16. What the industry gives: (a) Provision made in the factories for systematic instruction of apprentices.	No apprenticeship	No apprenticeship	No apprenticeship	No apprenticeship	No apprenticeship	No apprenticeship
(b) Trade and technical knowledge.	None	A limited knowledge of tobacco leaf.	A limited knowledge of tobacco leaf.	None	A limited knowledge of tobacco leaf.	Some knowledge of the kinds and economical use of wrapper leaf.
(c) Manipulative skill	None	None	None	None	Practice that develops necessary native dexterity.	Practice that develops necessary native dexterity.
(d) Extent to which operations can be learned in the factory.	The little that is necessary	The little that is necessary	The little that is necessary	No training required	Technique of the processes taught by "teachers" and foremen.	Technique of the processes taught by "teachers" and foremen.
(e) Line of promotion	None	None	None	None	None	None
17. Common deficiencies of workers.	Carelessness and indifference	Carelessness and indifference	Carelessness and indifference	Carelessness and indifference	Unevenness in work, and carelessness.	Carelessness, and waste of wrapper leaf.

ANALYSIS OUTLINE.	MAKING CIGARS BY HAND.	PACKING LITTLE CIGARS.	PACKING BIG CIGARS.	INSPECTING.	PACKING CUT PLUG.	PACKING GRANULATED TOBACCO.
15. (a) General education	Elementary education	Elementary education	Elementary education	Elementary education	Elementary education	Elementary education
(b) Trade and technical education.	None	None	None	None	None	None
(c) Manipulative skill	Nimble fingers	Nimble fingers	Nimble fingers	Little required	Nimble fingers	Nimble fingers
(d) Other requirements: Qualities essential, such as accuracy, etc.	Special adaptability, accuracy, patience, and keenness of sight.	Keenness of sight, and patience.	Mental alertness, special adaptability, accuracy, keenness of sight, and patience.	Mental alertness, accuracy, keenness of sight, patience, and initiative.	Patience and accuracy	Patience and accuracy
16. (a) Provision made in the factories for systematic instruction of apprentices.	Two years' apprenticeship; 1 apprentice to 6 journeymen.	No apprenticeship	One year in hand-cigar trade having an apprenticeship; in other factories no apprenticeship.	No apprenticeship	No apprenticeship	No apprenticeship
(b) Trade and technical knowledge.	Opportunity to learn the different kinds and qualities of leaf and their uses.	None required	Knowledge of cigar colors and scale of colors.	Knowledge of well-made cigars, checking up, and crediting work.	None	None
(c) Manipulative skill	Practice that develops necessary native dexterity.	Practice that develops necessary native dexterity.	Very little required	Very little required	Practice that develops the necessary native dexterity.	Practice that develops the necessary native dexterity.
(d) Extent to which operations can be learned in the factory.	Technique of all processes learned through long apprenticeship.	Taught by "teachers" and foremen.	Taught by "teachers" and foremen.	Ability to inspect gained through experience and thorough knowledge of cigar making.	All that is necessary	All that is necessary
(e) Line of promotion	Apprentice to journeyman; journeyman to foreman.	None	None	None	None	None
17. Common deficiencies of workers.	Carelessness, indifference, and lack of dexterity.	Unevenness in handwork, carelessness, and indifference.	Lack of color sense	Inaccuracy and lack of initiative.	Carelessness and indifference	Carelessness and indifference

ANALYSIS OUTLINE.	BANDING.	STAMPING.	LABELING.	CIGARETTE MAKING.	PACKING CIGARETTES.
15. (a) General education	Elementary education	Elementary education	Elementary education	Elementary education	Elementary education.
(b) Trade and technical education.	None	None	None	Practical knowledge of machinery.	None.
(c) Manipulative skill	Nimble fingers	Nimble fingers	Nimble fingers	Little required	Nimble fingers.
(d) Other requirements: Qualities essential, such as accuracy, etc.	Patience and accuracy	Patience and accuracy	Patience and accuracy	Patience	Patience and accuracy.
16. (a) Provision made in the factories for systematic instruction of apprentices.	No apprenticeship	No apprenticeship	No apprenticeship	Helper trained by machine operator.	No apprenticeship.
(b) Trade and technical knowledge.	None	None	None	Practical training	None.
(c) Manipulative skill	Practice that develops the necessary native dexterity.	Practice that develops the necessary native dexterity.	Practice that develops the necessary native dexterity.	Little required	Practice that develops the necessary native dexterity for hand packing; machine packing is a mechanical process.
(d) Extent to which operations can be learned in the factory.	All that is necessary	All that is necessary	All that is necessary	All that is necessary	All that is necessary.
(e) Line of promotion	None	None	None	Helper, operator, general repair man.	None.
17. Common deficiencies of workers.	Carelessness and indifference	Carelessness and indifference	Carelessness and indifference	Not reported	Carelessness, indifference, inaccuracy, and lack of dexterity.

[1] Hours vary by seasons and establishments. The hours given are the usual working hours.

[2] Local union of tobacco workers (colored) in stemmeries and plug and smoking tobacco factories with approximately 300 members, 90 per cent of whom are women.

[3] Local union of tobacco workers (white) in plug and smoking tobacco factories with approximately 300 members, 90 per cent of whom are women.

Subjects suggested for evening classes.—Each of the workers interviewed was asked to express her preference as regards subjects to be taught in evening classes, assuming that she herself were to attend such classes. One or more subjects were specified by each of 99 workers, 51 workers expressing no preference. The subjects proposed are listed in the table following, which gives also the number of workers indicating each subject. In 63 cases, general elementary courses were specified, including such subjects as writing, spelling, and arithmetic. Sewing was specified in 40 cases, and cooking in 17 cases. Other subjects proposed were millinery, dressmaking, bookkeeping, telegraphy, elocution, and singing.

TABLE 108.—SUBJECTS TO BE TAUGHT IN EVENING CLASSES, SUGGESTED BY WHITE WOMEN AND GIRLS IN THE TOBACCO INDUSTRY.

Subjects suggested.	Number of requests for spefied subjects.		
	Hand workers.	Machine workers.	Total.
General education	36	27	63
Sewing	26	14	40
Cooking	10	7	17
Stenography	3	1	4
Commercial	1	2	3
Millinery	1	2	3
Dressmaking	2	1	3
Bookkeeping	1		1
Telegraphy		1	1
Physical work	1		1
Elocution		1	1
Singing	1		1
Total	82	56	[1] 138

[1] Fifteen hand workers and 8 machine workers reported 2 subjects each; 3 hand workers and 5 machine workers reported 3 subjects each; 32 hand workers and 19 machine workers reported no subject.

APPENDIX G.—PLAN FOR A DIVISION OF INDUSTRIAL EDUCATION IN RICHMOND.

During the progress of the industrial survey, when schedules were being taken from the workers either at their places of employment at the noon hour or at their meetings at night, many individual requests came to those engaged in making the survey for courses of instruction relating to specific trades. Carpenters asked for plan readings, plasterers for drawing and estimating, electricians and steam fitters for subjects relating to the theory of their trade, and mechanics in other lines of work made similar requests. Later, requests for specific courses came from trade groups of workers, the group being large enough in most cases to justify the organization of the class and the employment of a teacher. These requests seemed to be so sincere and the demand for instruction so general that the superintendent of the schools formally requested those engaged in making the industrial survey to undertake the work of organizing a certain number of classes and of securing teachers with practical experience in the shop, and to make a report to him after the classes had been organized, indicating the courses of instruction outlined for each class.

In compliance with the request from the superintendent of schools, a plan was outlined and classes were organized. A brief description of the proposed organization and courses of instruction is given below. The plan, it should be understood, was not a recommendation of the general survey committee.

PLAN OF ORGANIZATION.

For the purpose of securing the highest possible efficiency in the conduct of the special classes which are to be established, and the highest possible quality of instruction, it is proposed to organize a division of industrial education, under the direction of the superintendent of public schools.

ASSISTANTS TO THE SUPERINTENDENT.

The classes to be established, and the special problems to be studied, group themselves naturally under three heads: (1) Industrial education for men and boys; (2) trade classes and household arts for women and girls; and (3) vocational classes in colored schools. The plan provides, therefore, for assistants to the superintendent, who will be his representatives in charge of the three groups specified.

FACULTY.

Since there are many new situations to be met and new problems to be solved it is essential that provision be made for frequent and purposeful discussion, in which each person concerned with the work of administration or of teaching shall feel free to contribute his share to the common fund of knowledge and experience, and assume his share of responsibility. In this, as in many other situations, there is wisdom, or, at least, the minimum of liability to error of judgment, in the counsel of many.

There should be regular meetings of the faculty, at least once each week, which should include all instructors, under the leadership of the superintendent and his assistants. The work to be undertaken in faculty meetings should be carefully planned and outlined for at least several weeks in advance. In addition to consideration of the necessary details of school management and routine of instruction and keeping records, there should be systematic and continuous study of industrial and economic conditions in their relation to education and of the special problems of industrial education. Thoughtful reading and discussion of the best current literature on vocational education should be stimulated.

ADVISORY COMMITTEE.

An advisory committee should be organized for the purpose of assisting the superintendent and the faculty in the development of whatever plans for industrial education may be decided upon. The advisory committee is to consist of one or more employers and one or more employees from each of the principal occupations represented in the classes that may be established under the division of industrial education. It is expected that the advisory committee will render assistance in the following ways: (1) The members of the committee will meet with the superintendent and the faculty from time to time in order to consider general questions of policy and development; (2) the members of the committee will offer advice and suggestions as to courses of study to be given, and as to special groups of workers to be served (this will usually be accomplished by individual members serving on the special committees, as noted hereafter); and (3) the members of the committee will follow up the work done in the classes as organized and offer suggestions as to possible improvements and desirable modifications.

SPECIAL COMMITTEES.

In each of the three groups composing the division of industrial education it is proposed to organize a number of special committees, for the purpose of intensive study of certain features of the work. The special committees will bring in reports on their studies to the faculty from time to time. Each special committee will include one or more members designated by the faculty and one or more members designated by the advisory committee. In each case the chairman of a special committee will be a member of the faculty. The special committees to be organized include:

Vocational research and guidance: An outline of the work of this committee, in some respects the most important of all, has been submitted in a separate report.

Elementary industrial classes: A study of the place, purposes, and methods of the elementary industrial (or so-called prevocational) classes.

Apprenticeships: A study of apprenticeship agreements in force in this community or elsewhere, and possible improvements or extensions. Because of special conditions this committee will probably not be organized in connection with classes for women and girls at present.

Library: The collection of helpful books, periodicals, and reports; arrangement of the same in such a way as to render the greatest possible service to students and instructors; maintenance of a suitable room for reading and study.

Continuation classes for journeymen: A study of the problems of evening classes.

Part-time classes: A study of the possibilities of part-time day classes for apprentices or others in such occupations as will lend themselves to the necessary adjustments.

ORGANIZATION OF CLASSES.

After careful consideration it was decided to organize the classes by trade groups in order that each class should be composed of men who would have the same common interests as regards class instruction bearing upon their regular occupations. It was also decided to have one instructor in complete charge of each class and to secure, if possible, men for teaching who knew the daily work of their class from practical experience. It was also thought best to adopt the plan, as a general policy, of preparing daily lesson outlines on mimeographed sheets, the problems in drawing, in mathematics, and in all subjects to be secured as far as possible from the experience of the members in the class. It was realized that exception to this would have to be made in some cases—for example, electricians—and textbooks used at least for reference.

With this method of instruction decided upon, the men who had applied were called together and the proposed work explained to them. The selection of the class night was made, some classes coming two or three nights per week. It seemed that three nights per week was more time than most men could afford to give because of the various other meetings they attend, but it was thought best to experiment on the plan and to omit one night should it seem advisable after a fair trial had been made.

The difficulty of this plan is the proper grading of the members of the class in arithmetic and the similar subjects. This difficulty is partly minimized, however, by limiting the classes to about 15 members, thus providing for much individual instruction. It seemed that the three salient points of the plan (1) common interests of the members of the class, (2) the ability to make the instruction fit the needs of the class by making the lesson outline from the daily experiences of the men, and (3) the personal contact that obtains between teacher and members of the class were such as to demand for the plan a fair trial.

One difficulty, whatever the method of instruction, is that encountered in securing men as teachers who possess the trade and technical knowledge necessary for the proper instruction of the class and who are at the same time capable of teaching the subjects asked for and stimulating the interest of those enrolled in the class.

In the case of two classes where enough men had applied for instruction to justify the employment of teachers, business conditions became such that it was necessary for a number of these men to be laid off before the classes were fully organized. As a consequence, most of them left Richmond to seek employment and the classes were started with a very small number enrolled. It was thought advisable to start work with the small number and try to build up the classes during the first month rather than wait for an indefinite period to begin.

Molders.—The first class organized consisted of a group of stove molders, 12 in number. A peculiar situation exists in the stove foundries of Richmond in that the molders practically never work on Saturday. Consequently the men asked for permission to meet Tuesday and Thursday nights from 7.30 to 9.30 and on Saturday mornings from 10 to 12. This was the first part-time or day continuation work organized. The courses of instruction asked for consisted of shop or trade arithmetic, blueprint reading, and composition, spelling, punctuation, and kindred subjects, all as closely related to the trade as possible. This class desired to start arithmetic at the very beginning to give a review to those who needed one and to teach those fundamental principles to the men who had not learned them previously. Problems have been drawn from the daily work of the men and they are being encouraged to bring to the class all problems that give them difficulty at their work. These problems will be kept and the course of study next year can be greatly improved.

Papers on different aspects of the trade have been written for the work in composition and these corrected for spelling, punctuation, phraseology, and mistakes commonly made in writing. The misspelled words have also been copied in the lesson outlines, so that the class may keep, from day to day, a list of such words. Later in the course a brief study of some of the most common metals will be made and the hygiene of the molders' trade discussed by the class and by some physician who has made a study of the actual conditions in Richmond. Simple blue prints have been given the men to work from and to study in order to acquaint them with the symbols used, the views required, and the manner of showing the different views of an object. It is the expectation that with drawing of this character the men will be able to understand simple working drawings in the near future. As they progress in their work more difficult problems will be given.

Although 18 molders applied for admission to the class, only 12 enrolled—some of the remaining ones being compelled to seek work in other towns temporarily, when a slump came in the stove manufacturing business, because of the depressed business conditions at that time.

Carpenters.—Twenty-seven carpenters have formed a class for instruction in trade arithmetic, leading to estimating, plan reading, and composition, spelling, punctuation, and other work of this character. These men desired above all other things to learn to read plans of buildings and to make estimates therefrom. Consequently, they are now working from plain, easy, working drawings, leading up to the drawing of simple plans. They will be encouraged to bring to the classroom drawings of the buildings they are at that time working on, and instruction will be given them on those plans. Sample drawings from architects have also been secured and these will serve to show the methods used by different draftsmen. This class began with a review of the fundamental operations in arithmetic, and as soon as they became proficient enough they were given work in estimating from plans. The composition work has included a description of the tools used by the carpenter, an account of some of his daily work, a letter of application for a position, and other topics of equal importance. The same method of correcting papers is used as in the class for molders, and these papers are to be kept, to note the improvement made by the class in six months. The carpenters' class meets Monday, Wednesday, and Friday nights, from 7.30 to 9.30.

Plasterers.—Twenty-five colored plasterers formed themselves into a class for instruction in trade arithmetic and estimating, plan reading, composition, spelling, and punctuation. Some of the men requested instruction later in the course in free-hand drawing as applied to ornamental work. As in the case of other classes, a review of arithmetic was first given them, in order to find out how to group them for this instruction. Many were able to undertake simple problems in estimating, as, for example, figuring the cost of plastering a room when the size was given them. They could not, however, estimate on the same room when shown the plan of it. Their work, therefore, has been and will continue to be a close correlation of plan reading, estimating, and composition work, spelling, writing, and punctuation. Later, talks from practical plasterers on ornamental work will be given, and the men who desire it given the opportunity to study free-hand drawing. This class meets Tuesday and Thursday nights from 7.30 to 9.30.

Electrical workers.—Twelve electricians made application for instruction two nights per week in the theoretical and technical phases of their work, together with the mathematics and drawing necessary to read and to estimate from the prints the material needed on a job. After these men have progressed far enough in their drawings, they will study plans furnished by local architects and from them will make simple wiring diagrams and plans. The code will be studied to acquaint the men with the rules and regulations in force. Other subjects, to be determined by the men themselves, will include a study of the three-wire system, transformers, formulas for determining size of wire needed, theory of the dynamo and motor, and many other topics that a well-rounded electrician should know. This class meets Wednesday and Friday nights.

Metal workers' apprentices.—A class of 15 apprentices, representing workers in the metal trades, has been organized for the study of drawing and shop mathematics, together with other important and interesting work that will be studied from time to time. It is the plan to map out a progressive course for these apprentices to cover several years, or during the term of apprenticeship. It is very important that a machinist be able to work from blue prints and to make all necessary calculations required in his work. The drawing and mathematics are so important and so closely related that special stress must be put on these subjects. The drawing must lead from simple problems to advanced ones in machine design. The use of formulas will be explained and the men encouraged to use them whenever possible. The mechanism of the machines used in metal work is to be studied with a history of the development of such machines. Subjects such as high-speed steel tempering and annealing, metallurgy of iron, steel, and brass, proper feeds and cuts, and all other kindred topics will be studied from time to time. This class meets Monday, Tuesday, and Thursday nights.

Machine-shop practice.—Fourteen men and boys formed a class for instruction in machine-shop practice. This class consisted largely of machinist apprentices, who desire to supplement their work of the day with instruction at night in shop practice, theory and mechanics of the machines, and blue-print reading. Modern methods in machine work are taught and difficult problems met with in the shop are solved in the classroom. This class meets Monday, Tuesday, and Thursday nights.

Plumbers.—Sixteen plumbers applied for instruction in plan reading, arithmetic and estimating, composition, spelling, writing, and punctuation, all instruction to be as closely related to the trade as possible. The men were especially desirous of having a good strong course in plan reading and estimating. In accordance with these requests, a class for plumbers was formed and the men given simple drawings to work from. As soon as the symbols and conventions are mastered, work in reading and drawing plans is given. Architects' plans, showing the plumbing diagrams and specifications, are used at all times in the classroom. The arithmetic leads up to the estimating of the amounts and size of materials needed on a job, and papers written on the interesting phases of this trade. This class meets Monday and Friday nights.

Cooking.—Twelve men (colored) at Maury School requested a course in the cooking and serving of foods. The men were in the academic work in the school, and they wished to devote one or two nights per week to cooking and the remaining time to academic subjects. The class was formed and the men were given work leading up to the preparation of menus. As the men become proficient they will be given advanced work in the planning and preparation of menus and in the correct way of serving food. This class meets on Thursday nights.

Woodworking.—A sufficient number of men and boys applied for woodworking to form several classes. None of these classes is composed altogether of wookworkers, as there are a number of boys who work at other occupations during the day. This work, however, will tend to hold the boys in their academic work, for practically all of them take academic work on the school nights when they are not taking woodworking. The work consists of problems of a thoroughly practical and useful nature, graded to meet the needs of the members. The practical woodworkers are given work in advance of the boys not in the woodworking trades. As far as the time will permit, instruction in reading drawings, etc., is given and simple drawings made.

PLAN FOR PREVOCATIONAL INDUSTRIAL SCHOOL.

OBJECTS AND PURPOSES.

The necessity of vocational guidance and direction for children who are likely to face early the complexities of our modern industrial and commercial life points to the need of securing for these children the kind of life experiences which will give them some basis upon which an intelligent choice of a life career may be made.

A second very important purpose of the prevocational school is to organize a course of study that will appeal to boys who have lost interest in the work of the regular graded school and who have either left school because of such dissatisfaction or are contemplating early withdrawal. The results of the experiment made here in Richmond last year offer a suggestion as to what may be accomplished in this direction. These results duplicate the experience of other cities in which similar work has been undertaken.

If a course of training is to be formulated which will help boys to find themselves and enable them to make an intelligent choice of their work in the future, it must be a varied one. What is needed is not a course in woodworking, or a course in metal work, or printing, but rather an organized training in the practical arts, which will include experiences from many fields of employment, such as woodworking, cement and concrete work, metal work, printing and bookbinding, and electrical construction. Such a plan should consist of a series of jobs, projects, or enterprises, which, in their accomplishment, will give to the boy an appreciative understanding of fundamental processes in the more important industries.

One-half of the time in school should be given to related work in language, mathematics, industrial geography, industrial history, and, in general, to preparation for active and intelligent understanding of civic and social responsibilities. From the outset the success of all the bookwork will depend upon the degree in which it is interpreted in terms of the industrial and social relationships. If the interest and capacity of the boy are to be properly tested, in the process of self-discovery, the experiences in the shops must be as real as possible.

EXPERIENCE OF ONE YEAR.

The experience of one year with an experimental class along these lines in Richmond has already established not only the value of this kind of effort in interesting boys who had in part lost their interest in what the regular school had to give them, but also the importance of certain factors in determining the success or failure of such a scheme. There are now in the schools a sufficient number of boys who were in this experimental class, and who are eager for the resumption of the work, to form the nucleus of a second-year group as soon as a school is organized.

ENTRANCE REQUIREMENTS.

Boys to be admitted to this school should have completed the work of the 5B grade. This particular form of instruction is planned for boys who look forward to leaving school at a relatively early age in order to go to work, and who desire the help of the school in reaching a decision as to what line of work they may enter with the greatest prospect of success. In no sense is this school to be considered as a provision for defective, delinquent, or incorrigible boys.

RELATION TO THE HIGH SCHOOL.

The rank of this school corresponds to the last two years of the regular elementary-school course and requires the same amount of time for its completion. Graduates from this course should be admitted to the manual-arts courses of the regular high schools, upon the recommendation of the principal of the prevocational school and the superintendent of schools. If at any time in the future the public-school system of Richmond should be reorganized so as to provide for intermediate or junior high schools, covering the last two years of the elementary-school period and the first year of the present high-school period, the plan proposed herein for the prevocational school is adapted to fit in admirably with such reorganization.

EQUIPMENT.

The equipment for the academic classes should provide seats and desks at which certain kinds of work can be carried on under the same conditions that obtain in other school rooms. In addition, there should be tables and chairs to accommodate the special kinds of group work and drawing. The construction of the tables will afford excellent problems for the shop classes. There should also be provided the necessary equipment of blackboards, wall charts, maps, teachers' desks, bookcases, and storage facilities.

The woodworking shop should be provided with the necessary equipment of benches and hand tools for the preliminary instruction in the use of tools and materials, and for handling practical problems of repairs and construction. In addition, there should be installed a carefully selected, but not necessarily expensive, equipment of woodworking machines, including band saw, circular saw, planer, tool grinder, and mortising machine.

The equipment for the printing and bookbinding shop should be complete enough to provide for the handling of small job work, such as would be useful in the school system. This equipment, in addition to the necessary type, furniture, cases, stands, etc., should include one or two job presses, stock cutter, wire stitcher, and the necessary bookbinding equipment of sewing frames, presses, etc.

The equipment of the metal-working shop should provide for the handling of the class in small groups engaged in a variety of processes. The benches can be constructed and installed, and the vises mounted, by the boys. The sheet-metal equipment should include a break, punches, soldering outfits, etc. There should be installed not to exceed two or three hand-blown forges, with outfit of blacksmith's tools, and equipment for tempering and hardening metals. Instead of the usual elaborate and costly machine-shop equipment, it is proposed to install simply a few typical machines, to make possible the handling of practical repairs and construction jobs, and to give an insight into the fundamental machine operations. The machines selected might include two lathes, a small planer, drill press, and tool grinder.

The equipment of the electrical construction shop should be sufficient to provide for the handling of a variety of problems in telephone, telegraph, lighting, and power work. Frames and stands can be constructed by the shop classes. There should be, in addition to the small tools, supplies, fittings, etc., one or two small motors, switchboards, testing apparatus, and electrical appliances.

An estimate on the cost of the suggested equipments is presented on page 288.

COURSE OF STUDY.

The outline of the proposed course of study is as follows:

First Year.

a. Woodworking, half-year, three hours per day.
b. Printing, half-year, three hours per day.
c. Bookwork, entire year, three hours per day.

Second Year.

a. Metal work, half-year, three hours per day.
b. Electrical construction, half year, three hours per day.
c. Bookwork, entire year, three hours per day.

Suggested Third Year.

It is believed that the experience of the next two years will develop a demand for a third year of more advanced work on the part of those boys who shall have completed the course as outlined, and who wish further training. Such a third-year class could be organized to great advantage, and might take either, or both, of two forms, as follows:

(1) A day vocational class, in which the pupil definitely specializes in some one line, chosen by himself, in the light of his experiences during the first two years. Two-thirds of the time of the course should be taken up with intensive work in the shop and drafting room and the remainder with related bookwork and such other study as will best aid him to prepare for the vocation in which he has chosen to specialize.

(2) A part-time class, which should be arranged to dovetail in with a working program involving a wage-earning occupation. The details will have to be worked out as the conditions arise, but in certain occupations it would undoubtedly prove feasible

to dismiss pupils from their places of employment for one or more half days per week in order to permit of school attendance. In such a class the time might be devoted entirely to bookwork, or divided between bookwork and shopwork, or bookwork and drafting or otherwise adapted to the special needs of the group.

The following condensed outlines suggest the way in which it is proposed to treat the work of the first two years:

Academic work (approximately half time).

English: Language work based on reading, much of the reading to bear upon industries. Composition, dealing with the occupational work of the school, business correspondence, business forms, spelling, and penmanship.

Arithmetic: To be of a very practical nature, including fundamental processes, short methods used in business, business and trade arithmetic, with emphasis on immediate application to the industrial work of the school.

Geography: Chiefly industrial, and closely related to history.

History: Closely related to geography, and dealing with the industrial and commercial development of the city, State, and country.

Civic and social duties: Relation of the individual to the country, State, and community; relation of the worker to his work, to his employer, and to his fellow workmen; duties and responsibilities, both civic and social, with special reference to sanitation, personal hygiene, etc.

Industrial work (approximately half time).

Woodworking: To consist principally of carpentry, including such other forms of work as may be called for by the projects undertaken. Study of tools, machines, and materials; problems in laying out and erecting small frame structures, such as garage, poultry house; problems in framing, truss construction, and repair work, with emphasis on the latter.

Metal working: To consist of work in hot and cold bar metal and sheet metal; practical problems in repairs and construction which develop in the equipment of the school will supply work for some time to come. This will include such work as the making of brace and angle irons, bolts, machine and belt guards, simple tools, pipe cutting and threading, metal parts of electrical and other apparatus.

Printing and bookbinding: To consist of the simpler forms of job work, mainly the printing of forms, cards, announcements, etc., required for the school; this work to be supplemented by special work in English, proof reading, design, and color harmony.

Electrical construction: To consist of elementary work in battery construction, magnetism, induction, small motor and dynamo construction, wiring, and electrical measurements and testing. Experiments with batteries, induction coils, and the wiring of bell, telegraph, telephone, and other circuits will be worked out on specially-constructed frames.

Cement and concrete: To consist of simple repair and construction problems, to be developed in connection with the work in the wood shop, including such projects as the laying of concrete walks, curbs, coping, together with the building of a number of small models to illustrate principles of building and bridge construction. The needs of the school will offer opportunity for every variety of practical work for some time to come.

Drawing: To be elementary in character, but practical, and related directly to the projects undertaken by the pupils in the various shop courses.

PROGRAM.

The following table shows the arrangement of classes suggested for first and second year work. There should be a shop teacher and a teacher of bookwork for each year. Classes should be limited to 15 to 18 pupils each:

Schedule of Classes.

	First year.		Second year.	
	Section 1.	Section 2.	Section 1.	Section 2.
Mondays, Wednesdays, and Fridays:				
Morning	Shopwork	Bookwork	Shopwork	Bookwork.
Afternoon	Bookwork	Shopwork	Bookwork	Shopwork.
Tuesdays and Thursdays:				
Morning	do	do	do	do.
Afternoon	Shopwork	Bookwork	Shopwork	Bookwork.

While section 1 of the first-year class is receiving instruction in the woodworking shop during the first half year, section 2 is in the printing shop. During the second half year the two sections are reversed. Similarly, the two sections of the second-year class alternate between the metal shop and the electrical shop. In all cases one half of each day is spent in the shop and the other half in bookwork, as already noted.

It has been previously mentioned that if the interest and capacity of the boy is to be fairly tested, the experiences given him must be as near like the actual shop as possible, otherwise that experience will lack reality. Therefore the instructors must be men who possess not only a general acquaintanceship with and knowledge of the industries represented in the courses of study, but they should give evidence of ability to make intelligent study of the progress in methods and processes of work in industry. This would insure the teaching of methods of working which are abreast of the times rather than obsolete methods for which many schools are criticised. Salary increases and promotions in rank for instructors should to a large extent be based upon such studies. These studies should be made, at least in part, by actually working in industrial establishments during vacation periods.

In order that the closest relationship may be maintained between the bookwork and shopwork, instructors, so far as possible, should teach both branches. In addition to the requisite knowledge and abilities outlined, the success of prevocational work is dependent in large degree upon the teacher's power to hold and interest the pupils and upon his qualities of adaptability, originality, initiative, and keen interest in the successful handling of the problem. The uninterested teacher should be eliminated from this service.

ESTIMATED COST OF EQUIPPING PREVOCATIONAL SCHOOL.

A. Shops.

1. Carpentry and woodwork:	
(*a*) Machinery	$1,000
(*b*) Tools	300
(*c*) Special supplies [1]	300
2. Concrete: Tools and supplies	200
3. Printing and bookbinding: Equipment	1,500
4. Metal work: Equipment	1,450
5. Electric work: Equipment	400
6. Drawing: Equipment	275
7. Office and library: Equipment	175
8. General supplies	300
9. Installation of machinery	300
Total	6,200

[1] Including vises and materials for making work benches, drawing tables, and cabinets.

B. Academic.

In addition to the cost of equipment for industrial purposes it is estimated by the school department that the cost of equipping two classrooms for academic work would amount to $213.

PLAN FOR CONTINUATION CLASSES FOR PRINTERS' APPRENTICES.

Printing, more than most other industries, demands for successful and efficient service a body of broadly educated and skilled workers. Ever since the days of Benjamin Franklin the printing industry, more than any other, has shown an appreciation of its own needs by providing schools and courses of instruction for the training of apprentices. It is necessary only to point out the work that has been accomplished in this direction by the United Typothetæ and Franklin Clubs of America to emphasize the advanced position which has been taken by these organizations.

The training of the apprentice, as contemplated by the leaders in the industry, includes the giving of broad "general education, technical equipment, and practical knowledge of processes in the typographical arts," much of which has already been organized into units of instruction and adapted to the use of the school.

In order to be most effective, instruction in printing should consist of both classroom work and work in the shop, closely correlated and supplementing each other. Both are needed to give an apprentice a balanced training. The boy who enters the printing office usually does so in order to earn some money. His educational background is often meager, because his parents can not afford to educate him further in the public schools or he has lost interest in what the schools are equipped to give him.

In developing a plan to meet the local situation careful consideration has been given to the following:

1. Schedules secured from the printing establishments of Richmond and from individual workers during the progress of the industrial survey.
2. Numerous conferences with individuals and groups representing all interests for the purpose of ascertaining local needs and demands.
3. The facilities at present available.
4. The possibilities so far as the public schools are concerned.

It appears that the present demand for training will be best met by the establishment of courses for apprentices in English, mathematics, and elementary design, presented with direct application to the printing industry.

The following brief outlines will suggest the kinds of topics to be studied and the method of treatment. These suggestions are taken from the reports previously referred to and from other sources:

1. *Grammar and word study:* Spelling, phrases pertaining to compositors' work; vowels, consonants, accented letters; brief list of arbitrary spellings; prefixes and suffixes; parts of speech; sentences—simple, compound, and complex; examples and study; common errors of grammar; how to use a dictionary.
2. *Punctuation:* The various points and their uses; illustrative sentences and paragraphs; use of quotation marks, parenthesis, brackets, etc.; omission of points in title-pages and display; punctuation for special work, directories, etc.
3. *Capitals and small capitals:* Usual rules for use in English language, capitals for nouns, adjectives, etc.; consistent use in typography, capitalization of display lines, capitalization of poetry, spacing of capitals, use of small capitals.
4. *Division of words:* Rules for word division at end of line; study of spelling, syllabication, etymology, and pronunciation; objectionable divisions and word spacing.
5. *Compound words:* The hyphen and its use; natural and arbitrary word combinations; rules and their application.

6. *Abbreviations and signs:* Common abbreviations, contractions, and signs; "office style" and special requirements; colloquial and dialect composition; abbreviations in technical and scientific work; unnecessary abbreviations.

7. *Uses of italic:* Origin and general purpose; mismated with roman letters; foreign words, names of ships, periodicals, etc.; italic in scientific work; for emphasis, extracts, subheads, etc.; difficulties with kerned letters.

8. *Proof reading:* Handling proof and copy; proof readers' marks and explanations; example of use; reference books.

9. *Preparation of printers' copy:* Page numbering; approved usages; paragraphing; changes in manuscript, how indicated; insertions, erasures, transpositions; marking copy for style.

10. *Typographic design:* An introduction to the study of design; type faces; harmony; appropriations; tone and contrast; proportion; balance; ornamentation, etc.

11. *Essentials of good design:* Good printing must be well planned, appropriate, attractive; examples analyzed; definitions; balance; spacing; relationship of parts; proportion; borders; repeating of units; ornaments, spacing; book plates; bibliography.

12. *Layouts:* Methods of laying out margins; planning dummies for books, catalogues, etc.; proportions of pages, title-pages, etc.; layouts for books, catalogues, circulars, posters, advertisements, cards, calendars, letterheads, tables, envelopes, labels, business forms, dummies, etc.; display; emphasis by the size of type; kind or style of type; position, spacing; contrast; color.

13. *Rudiments of color printing:* Theory of color; spectrum; pigments; definitions; scales, tests; artistic phases; definitions; hue, value, intensity (chroma); contrast, harmony, discord; color schemes; inks on tinted papers, bibliography.

A few selected topics in the history of printing could be introduced with great profit. The following suggestions will serve to indicate the possibilities:

14. *Ancient writing and printing:* First methods of communicating with the absent; picture writing; birth of the alphabet; books, their manufacture and ornamentation; preservation in ancient, classic, and medieval times.

15. *The invention of typography:* Account of the invention, spread, and progress of printing in the fifteenth century; story of Gutenberg, Faust, and Schöffer.

16. *Stories of early printers:* The first presses; the hand press and its successors; stories of early American type makers and inventors.

17. *Shop mathematics:* Such examples as the following: To measure composed type; to charge for composition; to estimate the amount of type for a page; to cast off copy—approximate number of words in a square inch; to determine the number of leads required for a page; to determine a well-proportioned page; to find the equivalent weight of paper in another size; trade customs; basis weight of paper, special sizes and colors; estimating the amount of stock necessary for a job.

PLAN FOR ELEMENTARY NIGHT SCHOOLS FOR GIRLS AND WOMEN.

This report presents a brief analysis of the following features of the elementary night schools of Richmond:

I. The organization: Covering (1) admission and enrollment of pupils; (2) grouping of pupils into classes for effective work; (3) grading of pupils; (4) class organization; and (5) courses of instruction.

II. Extension of night instruction in industrial and general vocational subjects.

III. Brief analysis of courses for the night schools.

IV. Qualifications for teachers in the night schools.

RECOMMENDATIONS.

This report recommends:[1]

(1) That the long, continuous term of the elementary night school be organized on the short-unit basis with courses carefully planned in units of 10 lessons, or a multiple of 10 lessons, and that the entire program for the school year be arranged on that basis.

(2) That pupils be arranged in carefully selected groups according to occupation, to choice of course, to previous instruction, experience, and age, so that pupils having common interests and relatively equal ability may study together to mutual advantage.

(3) That the instruction in industrial work be increased so as to give every community within the city an opportunity to receive practical instruction.

(4) That selected schools agreed upon by the authorities establish "type classes"; that is, classes made up of pupils qualified to pursue a course which has as its aim preparation for a definite type of work, as cooking, for experienced and prospective professional cooks; dressmaking, for seamstresses and prospective seamstresses; mechanical drawing for the carpenter; trade art for the printer, etc. Type classes should be organized in schools for colored as well as for white pupils. The types should differ, however, to meet the ability and prospects of the pupils.

(5) That teachers for night classes be selected on the basis of (*a*) personal qualifications and interest in social welfare; (*b*) actual experience in subjects to be taught. This is especially necessary for teachers of industrial subjects who should have actual business experience in the subjects they are to teach.

(6) That uniform methods of admission and enrollment of pupils, the keeping of attendance records, the dismissals from classes, and the recording of grades, and summaries of all kinds, be used in all schools in order that reports for all the schools for any given month and for the school year may be interpreted in the same way in order to make necessary facts uniform, comparable, and exact.

(7) That all schoolrooms used for night classes be adequately lighted for both handwork and bookwork, preferably with electric lights.

ORGANIZATION OF NIGHT SCHOOLS.

Under present conditions night schools are a very important feature of the public-school system for these reasons:

(1) They furnish the only means of reaching and training wage earners and others who for various causes can not attend day classes.

(2) They give an opportunity to reach large numbers of people at a comparatively small total annual cost.

The organization of a night school is a difficult task. It presents a much greater variety of problems than a day school; the time necessary for carrying out plans is limited and the varying ages and interests as well as the wide diversity of ability of the pupils who throng the classes make it a stupendous problem. Each year should strengthen the organization, however, as the new ideas and improvements gained by past experiences are incorporated. These gradual changes will also help to bring about higher standards of instruction and greater and more desirable uniformity than exist at present.

Admission and Enrollment of Pupils.

The yearly session of the night schools should open with at least two nights for enrollment of pupils of the previous year and for the admission and enrollment of pupils not previously enrolled in night classes. It is necessary and advisable usually to make it possible for pupils, at other times in the year, to enroll at any time they appear at the school, thus the next year's enrollment may be begun before the close

[1] The plan and recommendations here given do not necessarily represent the views of the survey committee.

of the present year. This plan enables the principal to arrange classes before the opening night for the pupils already attending school.

Admission to night classes should be made periodically rather than every night, unless some special provision can be made for late comers. Constant interruptions and the frequent reviews necessary to inform new pupils about the work take too much time and effort, besides not being fair to those who have been in the class from the beginning of the session.

Admission should be granted after conference with the principal and teachers assisting the principal. The conference should result in a record of the applicant for file in the office and should contain a simple history of the pupil to which the teachers should have access in order to understand more fully the needs of the pupils who come to them night after night. This method can be used quite successfully where the constant-enrollment plan is used.

Where large numbers of pupils are gathered into classes for a short night session it is practically impossible for the teacher to know pupils well enough to be sure she is meeting their needs by the instruction she is giving them. The application card with its brief history very materially helps to meet this problem.

With the application cards in hand and a brief conference with each pupil they can be placed for the first tryout in the class which seems to be best suited to their individual needs. If, however, pupils have not found the type of work they desire in one class, provisions should be made, through the principal's office, for necessary transfers.

Admission to classes should be made through the principal's office after the application card and conference have determined where the pupil belongs. A small printed form or the application card itself may be used for this purpose. When the application cards are used this way they should be collected and filed in the office for permanent records.

Enrollment of pupils is completed in the classroom and record of it kept by the teacher as well as in the office of the school.

Instead of depleting the classes as is sometimes argued when this more rigid system of admission and enrollment is used, it makes those who have gained a place anxious to keep it and new pupils more desirous ot gaining entrance to the classes.

Enough pupils should be admitted in the beginning to allow for a normal drop in enrollment. When the decrease very appreciably exceeds the normal rate of 20 to 25 per cent, the course should be discontinued and reorganized on a different basis at the beginning of the next unit-course session.

The records should be made to show the number of pupils dropped and the number of new pupils admitted to the course, and under no circumstances should pupils be admitted to courses merely to keep up the record of attendance. As night schools increase and the work becomes more efficiently organized, the success of the work will be less and less rated on attendance and increasingly on accomplishment. Much as every earnest principal and teacher wishes to make education reach every boy and girl, man and woman in the community, he realizes that getting pupils into a school room does not educate them. A good organization of the night school, as good or better if possible than that of the day school, care with regard to admitting and enrolling pupils, and proper grouping of the pupils will go far to put the night schools on a really efficient basis.

Grouping of Pupils.

A very important factor in night-school work is the grouping of pupils for the purpose of establishing a bond of interest and cooperation in the student body of each class. This applies to all types of night-school work and should have the serious attention of principals as well as teachers, as much of the failure of night classes is due to mixed groups of people wholly indifferent to, and to some extent antagonistic to, each other.

Groups may be determined in the following ways:

1. By daily occupation—when advancement in the occupation is desired.

2. By choice of courses made by applicant. This method is possible, however, only in proportion to the care with which courses are planned and defined. They may be arranged so as to indicate in a general way the reason for the applicant's choice.

3. By previous instruction and experience.

4. By social ties outside the school—for friends like to be together. Girls frequently will not attend night school unless they have friends in the classes, and parents are often unwilling to allow girls to attend night classes unless there are friends with whom they can return to their homes.

5. By age. Age alone can not be used as a basis for grouping pupils, but it is an important feature in subdividing groups. Older women of experience and judgment can not, as a rule, be expected to work successfully with young, incapable girls.

Grading of Pupils and Class Organization.

As pupils return to night classes year after year, the grading of classes and arrangement of courses in sequence become necessary and are perhaps as desirable and important factors in getting the right people in the right place in night classes as in the day schools. Conditions, advancement of pupils, and courses in the night schools differ somewhat from the same factors in the day school, hence the methods for grading and arranging classes for night schools should parallel rather than copy methods used in the day school.

Courses arranged so as to fit into one another, leading from step to step, give the serious, earnest pupil an opportunity to make his work count in a desirable way by making it possible to take a number of subjects for a full course and graduation.

Grading the academic elementary courses is relatively easy where the straight elementary course is being followed as in the case with many young men and women who look forward to completing the work of the grade school or high school. Records of work and credits given for courses completed should be added to the application or office record blanks.

When academic study is being alternated with manual training or household arts courses, care should be taken to have groups coincide so that academic instruction may be related to the practical work in a desirable and profitable way.

Games, reading rooms, recreation rooms, and moving pictures should be arranged so as to accommodate a group or groups that have corresponding interests. Athletic games should group together those best suited to play together. Table games and story-telling and folk dancing all need grading, in a sense, so as to keep a relatively keen interest.

Important as grading of night classes may be, it should never be allowed to stand out as the most important issue; it should not be used in such a way as to discourage those who find it possible to attend night classes in a more leisurely fashion than the younger, more robust pupils. In the hands of a wise and sympathetic supervisor or principal, the grading as well as the grouping of pupils may be made adequate for the proper management of the school and the best interests of the pupils without being too evident to the pupils. Some pupils may be eliminated through a closer organization and grading of the work, but the earnest pupils for whom the school has something real and vital to give will far outnumber those who resent restrictions.

In industrial classes all that applies to the grading and grouping of pupils in general courses should also be applied to the practical work. Effort should be made to determine the fitness of the pupil for the course. It is not enough that the girl wishes to make her winter dress, she should know something about sewing in order to undertake such a large and difficult task. Some preliminary work or simple test may be used to determine the fitness. Shifting pupils in industrial classes to work for which they are fitted and discouraging them from trying the impossible, is largely a matter of tact in dealing with the individuals for which change of grade or class is necessary.

How to Determine the Courses Given in Night Schools.

The demands of pupils usually serve as a pretty safe guide in determining the courses. If, however, pupils are not ready to undertake work which they elect, the teacher or the supervisor should show the pupils the futility of attempting to do what they are unprepared for and tactfully guide them into the type and grade of work they are capable of performing acceptably.

The pupils' choice of courses is frequently governed by what they hear from others, or because friends have chosen them. Relatively few venture to ask for courses not advertised. For this reason it is well to anticipate—to suggest a number of courses from which they may choose, always of course with the stipulation that the number of applicants must justify the organization of a class. A printed folder may be used for this purpose. A good sized bulletin outside the schoolhouse door is an excellent means of advertising courses, and, when enrollment for night classes begins, lists of courses may be placed conspicuously on the blackboard, where applicants may read them readily and make a choice of courses intelligently.

In order to plan courses that are really of interest and worth to the pupils in any community, the one in charge of the school should know the social life of the district, the conditions of living, types of amusement favored, the probable educational bent of the people, and their daily occupations. With some knowledge of these things as a background, suggestive courses may be made to conform with the lives of the people.

There should be careful study of the success of the courses, their adequacy to meet existing conditions and the varying ability and interests of pupils. From term to term and year to year changes and adjustments should be made accordingly.

EXTENSION OF NIGHT INSTRUCTION IN INDUSTRIAL AND GENERAL VOCATIONAL SUBJECTS.

Courses for the night schools should be made to conform to the wishes of the pupils who attend them as far as possible and consistent. Many of them are adults who know their deficiencies and the demands of everyday life well enough to choose what they need and can use. For them choice is relatively a simple matter.

In studying their needs it is important to know their day occupations and to choose as their teachers men and women having a knowledge of and sympathy with the daily work as well as the social life of the neighborhood in order that proper correlation may be made. This applies to purely academic courses as well as to industrial, continuation and general household arts courses.

Type of Courses.

Night-school courses should be organized on a short-unit basis; that is, a definite and relatively small number of lessons forming the course, which deals with a definite subject or part of a subject in a given time. Such a course should cover a definite amount of work with a definite aim or result in view, as 10 lessons in bread making, or 10 lessons in shirt-waist making. Each course of lessons should have only the number of definite points which can be taught satisfactorily in the time set. Courses should be made to follow one after another in desirable sequence so that pupils completing one course acceptably may continue in the next course of related work of higher grade and thus avoid confusion in the school organization or loss of time on the part of the pupil.

The best results will not come through a long course with a more or less undefined and a distant aim, but results will be realized by dividing the work up into short courses as described.

The unit-course system lends itself to academic courses as readily as to industrial courses, and when any given course or grade includes both academic and industrial instruction they may readily be arranged so as to coincide in length. Promotion in one should not depend upon promotion in the other, however. This irregularity can be adjusted as in any departmental plan or by the subject promotion method.

Scope of Night-School Courses.

Night-school courses may be divided broadly into three types:

1. Academic courses, which include (*a*) graded work looking toward the completion of the elementary-school course; (*b*) continuation or related academic courses, in which the demands of the day occupation are used to form the basis of instruction; (*c*) General academic courses, ungraded; and (*d*) reading room and story telling.

2. Industrial or practical arts courses: (*a*) Trade continuation courses, as cooking for cooks, dressmaking for dressmakers, and millinery for milliners. (*b*) Household arts courses for housekeepers; for women at work in offices, stores, and factories during the day these courses may be cooking, dressmaking, sewing, millinery, household decoration and sanitation, keeping accounts, the family budget, home nursing, first aid. (*c*) Household management for the home or boarding house.

3. Recreation and physical education: (*a*) Personal hygiene; (*b*) athletic games, such as ringtoss, tag, pass ball, volley ball, handball, basket ball, tether-ball, folk dancing, dramatic games, and others; (*c*) table games, such as checkers, crokinole, backgammon, chess, etc.

4. Clubs and lectures, such as (*a*) civic or current-events club; (*b*) neighborhood club; (*c*) mothers' club; (*d*) fathers' club; (*e*) clean-up club, cooperative street cleaning; (*f*) lectures, preferably with pictures—science, art, literature, history, and biography.

Academic courses, both graded and ungraded, are highly desirable, especially when the subject matter of the courses can be used to have some bearing on the affairs of the life cf the pupil.

It is more desirable, however, to have the latter type of related academic work than the purely formal grade work whenever possible, as it tends to vitalize the work for the pupil. To be able to put to use daily the things which are learned at night makes for real education, which fact brings emphasis again on the importance of knowing the day occupation of the pupils.

Industrial and practical vocational courses in the night schools as well as in the day schools are becoming more deisrable and necessary for those who leave school to go to work often before completing the grade work. Continuation work in the day occupation is more desirable, especially when the industry lends itself to night instruction, as drawing for the carpenter and the machinist, design for the dressmaker, and color study for the printer.

When the industry does not offer an opportunity for vocational instruction in the school, general courses, especially in household arts, as cooking and sewing for the women workers, are very helpful. These courses should be seriously planned, however, and real instruction and real serious study be the aim, and not merely new dresses and new hats, an occasional meal, and a good time, though pleasure in the class activities should be a part of the school work.

Industrial courses should be made vocational.—As much attention to preparation for wage earning should be given in evening classes as possible. Whenever an attempt in this direction is made, special provision for instruction that will lead toward employment in local establishments should be made. When a desirable degree of skill has been gained by individuals in the class, attention may also be given to placing pupils in positions. It is not too much to hope that this will some day be done in evening schools.

ANALYSIS OF COURSES FOR NIGHT SCHOOLS.

Industrial Courses for Night Classes for Girls and Women (White).

I. For women in the home:
  1. Cookery for the family.
  2. Family sewing.
  3. Care of the house.
  4. Hygiene for the family.
  5. Buying of food and clothing for the family.
  6. Household accounts—cost estimating, etc., for housekeepers and women who keep boarding houses.
  7. Household sanitation.
  8. Home nursing and first aid.

II. For women and girls at work outside the home:
  1. Continuation courses—junior and senior courses.
    A. For saleswomen and clerks:
      a. Salesmanship and business methods.
      b. History and theory of store occupations.
      c. Simple accounting.
      d. Personal hygiene and physical exercise.
    B. For office clerks and stenographers:
      a. Advanced stenography and typewriting for speed and accuracy.
      b. History and development of stenography.
      c. Modern methods of office work, their origin, etc.
      d. Business English—letter writing, punctuation, and spelling.
      e. Filing.
      f. Personal hygiene and physical exercise.
    C. For factory workers:
      a. Trade methods, when trade lends itself to such instruction.
      b. Factory system—routing of work, personal account of work and how to compute it.
      c. Simple accounting, checking up methods.
      d. Personal hygiene and physical exercise—their bearing on working efficiency.
      e. "Safety first" and "first aid."
  2. General household arts courses for women workers; home-making courses.
    A. Cooking:
      a. Simple home cookery, foods in season, left-overs.
      b. Preparation of the meal; menus, how to plan them.
      c. Cost of foods; how to buy; how to store.

      Cooking is probably most successfully taught by devoting a short course to the preparation and cooking of one type of food, as a course in vegetable cookery, one course for winter vegetables, and another for summer vegetables later on; a short course on the making of quick breads or raised breads; a short course on the making of soups and the like. Such courses may be concluded by a simple meal in which the foods prepared during the course form an important part of the meal, and a series of courses may be so arranged as to give instruction in all the main courses of a meal, and thus the series ends logically with a meal, every part of which has been studied.
    B. Household sanitation:
      a. Kitchen, sink, dish towels, floor plumbing.
      b. Cleaning, dusting, fresh air and sunshine as agents of cleanliness.

      Such a course will probably be more successful if incorporated with the cooking lessons.

II. For women and girls at work outside the home—Concluded.
  2. General household arts courses for women workers; home-making courses—Concluded.
    C. Sewing:
      a. Plain sewing:
        (1) Undergarments (three garments) or bed and household furnishings, table linen, curtains, etc.
      b. Shirt waists:
        (1) Elementary course, three garments—two plain, one fancy.
        (2) Advanced course, three garments—plain and fancy as desired. Emphasis placed on soft materials, as voile, silk, silk muslin, etc.
      c. One-piece dresses, cotton:
        (1) Elementary course, two garments—one of firm material, plain style; one of softer material with some trimming.
        (2) Advanced course, two garments—one semilingerie dress of cotton lawn, dimity, or batiste; one lingerie dress with lace or other trimming set in.
      d. Advanced dressmaking for experienced sewers, one cotton or linen dress and one woolen dress, or both.
        (1) Choice and use of commercial patterns. How to read patterns, how to alter patterns to suit individual.
        (2) Economical cutting.
        (3) Simple principles of fitting—waist; sleeve; skirt, plain, gored, draped.
        (4) How to choose and buy textiles—widths, qualities, etc.—for dresses and waists; for underclothing; for children's clothing; for the household.
        (5) How to alter ready-made dresses to suit the wearer.
      e. Repairing clothing:
        (1) Mending, sponging, pressing of clothing.
        (2) Brushing and pressing woolen, silk, and cotton materials.
        (3) Removing spots and stains.
        (4) Replacing hooks and eyes, buttons, skirt braid, etc.

The above courses should be organized on the unit basis and the work for them suggested here subdivided if necessary for successful work. Dresses to be made over should be provided for in a separate course.

III. Physical education and recreational courses to build up physical efficiency—to counteract wearing influence of monotonous labor:
  1. For girls engaged in work that requires standing position:
    A. Posture, standing and sitting, with practical demonstrations on the effect of bad posture.
    B. Exercises to improve posture; also breathing exercises.
    C. Rest exercises, in lying position.
    D. Folk dancing; other recreational exercises.
    E. Personal hygiene—bathing, sleep, fresh air.
    F. Diet; amount and kind of food.
  2. For girls engaged in work that requires sitting position:
    A. Posture, in sitting as well as standing, with practical demonstrations.
    B. Sitting exercises.
    C. Rest exercises, in standing and lying position.
    D. Dancing, games, etc., for recreation and physical reaction.
    E. Personal hygiene—bathing, sleep, fresh air.
    F. Diet; amount and kind of food.

III. Physical education and recreational courses to build up physical efficiency—to counteract wearing influence of monotonous labor—Concluded.

3. For older women:
   - A. Standing exercises and sitting exercises, as necessary.
   - B. Games suited to age and vigor of pupils.
   - C. Simple folk dancing and games to music.
   - D. Personal hygiene—bathing, sleep, fresh air.
   - E. Diet; amount and kind of food.

IV. Club work and general social activities.

Many pupils attending the night schools who do not care for serious progressive study may be reached through the clubs and general social activities of the school. This is especially true in communities in which the school is a social center. These pupils for the most part seek entertainment which may be turned to a sort of instruction without interfering with the recreational nature of the work if properly handled by the one in charge of the social activities. These pupils, though seemingly purposeless and frequently foolish, may be greatly benefited by their social hour in the school. Commendable work of this kind has already been started in Richmond. It needs extension, however, if it is to reach any considerable number of people.

The following suggestions indicate some of the ways in which these pupils may be reached:

Boys' clubs and boy scouts.
Clubs for boys and girls together when feasible and desirable.
Dramatic clubs.
Reading and story-telling clubs.
Singing clubs.
Civic clubs and clean-up clubs (cooperative street cleaning).
Girls' clubs and camp-fire girls.
Embroidery clubs, crocheting clubs, or fancy-work clubs.
Debating clubs.
Current-events clubs.
Illustrated lectures on popular science, on history and biography, or literary topics are most desirable.

The best literature is being dramatized for the moving-picture machine with great success. David Copperfield has met with great approval and many other equally famous classics have found their way to the public through this popular form of entertainment. Buildings equipped with a machine can be supplied with rented films, or a stereopticon, which is less expensive, and affords similar entertainment at lower cost, may be used.

Industrial Courses for Night Schools for Girls and Women (Colored).

Cooking, household service, and laundry work, both in the steam laundry and at home, are done almost entirely by the colored women of the city and give lucrative employment to very large numbers. There are also a great many colored women who do not go out to work. Simple courses in cooking and housekeeping suited to the needs of the members of the class should be planned. Many colored women are engaged in dressmaking and a number of them as seamstresses, so that this is also a lucrative form of employment for which the school may give training.

I. For women in the home:

1. Cookery for the family.
2. Family sewing.
3. Care of the house and household sanitation.
4. Care of children; hygiene for the family.

II. For women at work:
1. For laundresses:
A. Simple chemistry of washing; hand washing.
B. How to take out spots—ink, rust, fruit stains.
C. How to iron fine dresses and waists by hand.
D. How to mend laundered clothes.
E. Sorting and listing clothes; how to make and check up lists.
2. For cooks:
A. Plain cookery.
B. Advanced cookery—Desserts, jellies, breads, pastry, fancy dishes, cakes, salads, etc.
3. For housemaids:
A. Care of household linen, soiled and clean; how to hem table and bed linen and towels; how to mend linen as it comes from laundry; accounting for linen, especially in large household or hotel; sorting and listing, marking of linen.
B. Care of bedrooms—sweeping and dusting; care of bedclothes—airing and sunning.
C. Care of dining room; table linen; silver and glass; setting the table; serving the meal.
D. Care of the bathroom.
4. For seamstresses and dressmakers and women who sew at home:
A. Shirt waists—elementary course, three waists; advanced course, three waists.
B. One-piece dresses—elementary course, two cotton dresses; advanced course, one wool dress and one lingerie dress, optional.
C. Children's aprons and dresses, four garments—two aprons, two dresses.
D. Planning and cutting of dresses and waists—one dress and one waist, or two dresses; use of commercial patterns; how to lay patterns on the cloth—so as to save cloth; so as to cut right way of the grain to get the best effect; how to buy cloth to suit the pattern; fitting—waist, sleeve, skirt, one-piece dress; course in mending and making over dresses—ripping, sponging and cleaning, pressing, recutting by pattern.
5. For nursemaids (16 years and over):
A. Dressing and adjusting clothing of child—hot-weather clothing, cold-weather clothing.
B. Bathing child.
C. Preparation of food and feeding of child.
D. Putting child to sleep.
E. Simple games and busy work for the child.

III. General industrial courses; home-making courses:
A. Cookery for girls engaged in factory work.
Plain cookery for family—vegetables, breads, meats, simple desserts, left-overs.
Planning and serving simple family meals.
B. Sewing courses.
Plain sewing.
Other courses same as A, B, C, D, for seamstresses. Differences should be made in grouping of pupils, not mixing experienced and inexperienced workers.
C. Home sanitation—care and decoration of the home.

This course to be of value to the class should be made as practical as possible. A cottage near the school to be decorated, cleaned, and cared for, and used perhaps as a day nursery for children whose mothers go to work, could be made to teach some of the fundamental things which make for cleanliness and beauty in the home.

QUALIFICATIONS FOR TEACHERS IN THE NIGHT SCHOOLS.

Physical and social qualifications.—Night-school work is exacting and heavy and should be undertaken only by teachers who are physically strong and robust. Furthermore, the night school is a social problem, and it is imperative that the men and women who undertake the task of instructing night-school pupils should be deeply imbued with a real love for social service as well as educational work. They should be able to interpret judiciously and truly, both social and economic conditions that surround their pupils, and be able to help men and women, boys and girls, to adjust themselves to the business of life intelligently and profitably; they should also throughout the school course be able to instill into their pupils a spirit of cooperation and of helpfulness to their fellows that will help them to attain the ideal of true education and citizenship. To do this successfully with tired people, for night pupils come to school after a long working day, requires enduring enthusiasm and a great deal of physical energy.

Educational qualifications.—The educational qualifications of teachers in the night schools should be as high as for teachers in the day schools. It does not follow, however, that the qualified day-school teacher of academic standing will succeed in night-school work. A combination of educational and personal qualifications and the ability to deal wisely, cheerfully, and sympathetically with adult pupils, with perhaps emphasis on the two latter points, is very essential for the work.

Trade qualifications for teachers of industrial subjects.—It is most important that teachers of industrial subjects should have had real business experience in the subjects they are to teach. To be successful in the teaching of dressmaking, the teacher must have had experience in making dresses for either her own customers or those of a dressmaking shop in which she worked as assistant to a dressmaker. For these teachers the ability to teach industrial subjects from the right point of view should take precedence over academic qualifications, though the two combined are desirable and applicants possessing both may be found.

Teachers for social work—clubs, etc.—These teachers need first of all a large social democratic spirit. They should be quick to interpret the needs and desires of the people who throng the night classes. They should be able to mingle easily with the people, and, above all, they should have the power of leadership, for all forms of recreational work, from free play and folk dancing to clubs and lectures, require a strong leader—a person who leads but keeps herself or himself as one of the crowd, thus putting the leadership as little in evidence as possible. These activities are of tremendous value in inculcating the art of cooperation, civic and social responsibility, and social good feeling, and should have their share of attention in the night schools, especially in districts where the homes do not afford space for amusements.

Attendance at night schools.—Regularity of attendance should be insisted upon, and continued absences unless accounted for satisfactorily should constitute dismissal from the class. Dismissal should be determined on a fixed number of absences based on the number of lessons in the course. Such devices as messages and visits to the home and personal interest in pupils by principals and teachers help to regulate attendance.

A pupil dismissed from a course should not be reinstated until the opening of the next unit course, when new classes are being formed and new pupils are being admitted. This method will invariably hold those who attend night school with serious intention, and the few pupils lost by the more rigid system in all probability are only those who drop out under the more lax system of absence without excuse or explanation.

Pupils' records.—Permanent individual records should be kept for every member of every class attending the night school. This record should contain on one side of the card the history of the pupil, and on the reverse side (or on two cards, if preferred,) should be placed the courses taken, the grade, quality of work, and general standing of the pupil. These cards should be kept year after year as permanent records of pupils who enter and leave the school. For those who take complete courses an accurate history of the entire course is most essential. Provision should be made for records, so that the question of credit may be met when complete courses are provided.

Class records.—Each teacher should be provided with a class book, in which she may keep the enrollment for the classroom and her own use, and for the office records.

Office records.—Office records should summarize teachers' records and keep on permanent file all data regarding attendance, admission, and enrollment of pupils in sufficient detail to show class fluctuations and changes. A standard method of dropping pupils automatically and reinstating them should be adopted and used with as much care as in the regular day school.

These records should be used as the basis for continuing courses—they should also indicate necessary changes and additions to be made to the school activities.

Forms of record cards should be uniform for all schools in the city. The number should be as few as possible and the forms simple. The admission card may serve for the history and grades for the pupil. The class record may contain attendance, class grades, amount of work done, and time expended, which are transferred to the admission cards in the office.

A recapitulation sheet made up daily or weekly should summarize general points as attendance, dismissals, enrollment of new pupils, and any other points needed for a summary of the year's work. This recapitulation planned and put into use in September and carried through the school year week by week should require only a few hours' work at the close of the year to state in statistical form such matter as is required for the year's report.

APPENDIX H.—ORGANIZATION AND WORK OF JOHN MARSHALL NIGHT HIGH SCHOOL.

The John Marshall Night High School was originally opened October 16, 1911, the enrollment for the first year being 728 students. During 1913–14 classes were open to men and women, and boys and girls at least 12 years of age.

The decision of the city school board to open the school was in response to a demand for further educational opportunities on the part of young people, as well as those of greater maturity, who had been obliged to leave school in order to take up the duties of life. The ready response, indicated by the rapid growth of the school during its three years of history, has more than justified the wisdom of the board in its establishment.

The enrollment figures for the three years, as reported in the circular of information for 1914–15, are as follows: 1911–12, 728; 1912–13, 827; 1913–14, 1,659.

ADMINISTRATION.

The school is nominally under the immediate supervision of an assistant superintendent, who is charged with direction of all night-school work. Practically, however, the responsibility for administration rests on the principal, who is aided by an assistant principal. All the records of the school were placed at the disposal of the survey committee, and both principal and assistant principal contributed wherever possible to the collection and interpretation of data.

The administration is to be heartily commended for energy and efficiency manifested in the organization and development of the night school. With very limited office equipment and clerical help a surprising amount of work has been accomplished.

With practically the entire plant and equipment of the day high school available, and with the already established confidence of the community, the John Marshall Night High School may be counted on for a substantial contribution to the development of plans for vocational education in Richmond.

COURSES.

The courses of study offered in 1913–14 included the following:

1. Language:
   - English, ten classes.
   - Latin.
   - French, two classes.
   - German, two classes.
   - Spanish, two classes.
2. Mathematics:
   - Rapid calculation.
   - Arithmetic, 6 classes.
   - Algebra.
3. Science: Physics.
4. Drawing: Mechanical.
5. Shopwork:
   - Machine shop.
   - Woodwork.
6. Household arts:
   - Millinery, three classes.
   - Sewing, three classes.
   - Cooking, three classes.
7. Stenography:
   - Stenography, six classes.
   - Typewriting, six classes.
8. Commercial:
   - Banking.
   - Bookkeeping, seven classes.
   - Writing, eight classes.
9. Grade classes:
   - 7th Grade, four classes.
   - 6th Grade, three classes.
   - 5th Grade, two classes.
10. Individual classes (common branches):
   - Advanced.
   - Beginning.

INSTRUCTORS.

Some idea of the personnel of the teaching staff may be gained by noting the occupations engaged in during the day. The following occupations were represented:

Commercial office positions	4
Engineer's office	1
Draftsman	1
Lawyer	1
Milliners	2
Housekeepers	4
Teachers in public schools:	
Principals, grammar school	2
Science, high school	1
Language, high school	3
Arithmetic, high school	1
Bookkeeping	2
Typewriting	1
Teachers in public schools—Concluded.	
Writing	1
Music	1
Cooking	1
Sewing	2
Shopwork	2
Grade teachers	4
Teachers in business college	2
Students, Richmond College	2
Students, medical college	6
Total	44

HOURS OF INSTRUCTION.

During the school year 1913–14 classes were scheduled for the evenings of Monday, Tuesday, and Thursday, for two hours—7.30 to 9.30—for 28 weeks, October to April. The school was in session 77 nights, exclusive of registration and examination periods.

Of 1,089 students enrolled at the end of the first month, October 30, 1913, 504, or 46.3 per cent of the total number, were enrolled in courses consisting of three subjects, each reciting 40 minutes three nights per week. Examples of these combination courses are: Stenography, typewriting, English; bookkeeping, writing, arithmetic; French, English, arithmetic.

Classes in fifth, sixth, and seventh grade work enrolled 246 students, or 22.6 per cent of the total number. These classes met for two hours three nights per week.

The remaining students, 339, or 31.1 per cent of the total, were enrolled in household arts and shopwork classes, meeting two hours one night per week.

During the year 1913–14 the night high school was open for purposes of instruction 154 hours, the equivalent of about 26 days of 6 hours each. For this period the total operating expenses were $8,907.16, as shown on page 310; averaging $57.84 per hour.

FACILITIES AND ENROLLMENT.

As already indicated, practically the entire building and equipment of the John Marshall High School are available for use by night classes. The table following presents a summary of the rooms available:

TABLE 109.—NUMBER AND CAPACITY OF ROOMS IN USE AND OF ADDITIONAL ROOMS AVAILABLE.

Classes.	Rooms used in 1913–14.		Rooms not used.		Total rooms available.		Enrollment Oct. 30, 1913.
	Number.	Capacity.	Number.	Capacity.	Number.	Capacity.	
Language	[1]7	702	[1]1	54	[1]8	756	354
Mathematics	[1]3	324			[1]3	324	209
Science	2	72	6	228	8	300	8
Drawing	1	24	2	50	3	74	36
Shopwork	[1]3	144	[1]2	108	[1]5	252	28
Household arts	[1]4	339			[1]4	339	275
Stenography	[1]5	474			[1]5	474	374
Commercial	[1]6	603			[1]6	603	566
Grade classes	11	396			11	396	246
Total	42	3,078	11	440	53	3,518	2,096

[1] Rooms used for 3 successive classes of 40 minutes each per night, or the equivalent of one 2-hour session per week for each class.

The amount of space available for classes in language, mathematics, stenography, commercial branches, and the grammar grades has made possible a greater development in these courses than in certain others. The work in household arts has been seriously hampered for lack of rooms and equipment, each class being limited to two hours' work per week. For the same reason it has not been possible to do more than make a beginning in the development of industrial courses for men.

It appears from this table that the commercial branches are the most popular, and next to these the household arts courses. Even those students reported as engaged in industrial pursuits are enrolled for the most part in commercial courses. The data contained in this table will well repay careful study in planning courses to be offered in the future. The figures seem to indicate a strong demand for instruction in the common branches for the purpose of making up deficiencies in early education.

AGE DISTRIBUTION OF STUDENTS.

The age distribution of students enrolled in 1913–14 is shown in the table which follows. The form in which the records are kept does not admit of a detailed classification of students by age, since many students have been permitted to enroll without making any declaration as to age. In these cases the principal's estimate is the only information available.

TABLE 110.—SUMMARY OF AGE DISTRIBUTION OF STUDENTS ENROLLED IN 1913-14.

Age group.	Number.			Per cent.		
	Males.	Females.	Total.	Males.	Females.	Total.
10 and under 15 years	86	72	158	11.9	9.0	10.4
15 and under 18 years	291	241	532	40.2	30.2	35.0
18 and under 20 years	130	94	224	18.0	11.8	14.7
20 years and over	216	391	607	29.9	49.0	39.9
Total	723	798	1,521	100.0	100.0	100.0

Of 1,521 students enrolled, only 607, or 39.9 per cent, were estimated at 20 years of age or over. The next largest group, 532, or 35 per cent, were 15 to 17 years of age.

The regulations of the city school board for 1913–14 specified 12 years as the minimum age for admission to evening classes. That this regulation is not rigidly enforced is indicated by finding pupils as young as 10 years of age enrolled.

Males outnumber females at each age period except 20 years and over. The largest group of males is at ages 15 to 17, 291 students, or 40.2 per cent of all males. The largest group of females is at ages 20 years and over, 391 students, or 49 per cent of all females. It is evident from the distribution that the male students constitute a much younger group than the female students.

OCCUPATIONS REPRESENTED.

Table 111, which follows, is a summary of occupations of students enrolled in 1913–14:

TABLE 111.—OCCUPATIONS OF STUDENTS.

Occupation.	Number of students.	Per cent of total.
Clerical	397	26.1
Farmer	1	.1
Housekeeper	131	8.6
Industry	322	21.2
Profession	40	2.6
Sales person	190	12.5
Transportation	27	1.8
Juvenile	192	12.6
Miscellaneous	44	2.9
Unemployed	177	11.6
Total	1,521	100.0

ATTENDANCE.

The number of nights the school was in session in each month, the enrollment reported, and the average attendance for each month and for the year are shown in Table 112, which follows:

TABLE 112.—RECORD OF ATTENDANCE AND ENROLLMENT, BY MONTHS, 1913–14.

Month.	Enrollment.[1]	Total attendance.	Nights in session.	Average attendance.
October	1,089	9,272	13	713.2
November	1,228	7,393	11	672.1
December	1,283	4,285	7	612.1
January	1,372	6,079	11	552.6
February	1,568	7,104	12	592.0
March	1,679	8,374	14	598.1
April	1,659	4,818	9	535.3
Total for year	1,521	47,325	77	614.6

[1] The enrollment as shown in this table includes duplications caused by some students being enrolled in more than one course. The net total for the year is 1,521. The duplications for each month are not reported.

The number and per cent of students attending each classified number of nights are shown by age groups in the following table:

TABLE 113.—DISTRIBUTION OF ATTENDANCE, BY AGE PERIODS.

Number of nights in attendance.	Ages 10 to 14.						Ages 15 to 17.					
	Number.			Per cent.			Number.			Per cent.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
1 to 10	14	22	36	16.3	30.6	22.8	61	70	131	21.0	29.0	24.6
11 to 20	11	13	24	12.8	18.1	15.2	41	38	79	14.1	15.8	14.9
21 to 30	13	12	25	15.1	16.7	15.8	32	32	64	11.0	13.3	12.0
Total, 1 to 30	38	47	85	44.2	65.3	53.8	134	140	274	46.0	58.1	51.5
31 to 60	33	17	50	38.4	23.6	31.6	75	51	126	25.8	21.2	23.7
61 to 77	14	7	21	16.3	9.7	13.3	71	48	119	24.4	19.9	22.4
Not reported	1	1	2	1.2	1.4	1.3	11	2	13	3.8	.8	2.4
Total enrollment	86	72	158	100.0	100.0	100.0	291	241	532	100.0	100.0	100.0

Number of nights in attendance.	Ages 18 and 19.						Ages 20 years and over.					
	Number.			Per cent.			Number.			Per cent.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
1 to 10	29	27	56	22.3	28.7	25.0	64	167	231	29.9	42.7	38.2
11 to 20	20	18	38	15.4	19.1	17.0	39	69	108	18.2	17.7	17.8
21 to 30	15	17	32	11.5	18.1	14.3	22	40	62	10.3	10.2	10.2
Total, 1 to 30	64	62	126	49.2	65.9	56.3	125	276	401	58.4	70.6	66.2
31 to 60	33	15	48	25.4	16.0	21.4	35	42	77	16.3	10.7	12.7
61 to 77	30	16	46	23.1	17.0	20.5	42	59	101	19.6	15.1	16.7
Not reported	3	1	4	2.3	1.1	1.8	12	14	26	5.7	3.6	4.3
Total enrollment	130	94	224	100.0	100.0	100.0	214	391	605	100.0	100.0	100.0

TABLE 113.—DISTRIBUTION OF ATTENDANCE, BY AGE PERIODS—Concluded.

Number of nights in attendance.	Total, all ages.					
	Number.			Per cent.		
	Males.	Females.	Total.	Males.	Females.	Total.
1 to 10	168	286	454	23.2	35.8	29.8
11 to 20	111	138	249	15.4	17.3	16.4
21 to 30	82	101	183	11.3	12.7	12.0
Total, 1 to 30.	361	525	886	49.9	65.8	58.2
31 to 60	176	125	301	24.3	15.7	19.8
61 to 77	157	130	287	21.7	16.3	18.9
Not reported	[1] 29	18	[1] 47	4.0	2.2	3.1
Total enrollment.	723	798	1,521	100.0	100.0	100.0

[1] Including 2 boys, ages not reported.

From Table 113 it appears that of 1,521 students, 886, or 58.2 per cent of the total attended 30 nights or less, or about 1 night per week. Of this group, the girls make a better record than the boys: Boys, 361 out of 723, or 49.9 per cent; girls, 525 out of 798, or 65.8 per cent.

The girls exceed the boys in number and percentage of those attending in each group up to 30 nights, and the boys exceed the girls in each group above 30 nights. A little more than four-tenths of the total number of students enrolled attended over 30 nights. These details are of interest in connection with the fact noted elsewhere that more than two-thirds of the students were enrolled in classes scheduled to meet three nights per week, or 77 nights. That is, of 1,089 students enrolled at the end of the first month, 750, or 68.9 per cent, were enrolled in classes at which they were due three nights per week. The table shows that with an enrollment of 1,521, the number of students present over 30 nights was 588.

The group having the largest percentage attending 30 nights or less is at ages 20 years and over, 401 students, or 66.2 per cent of all those belonging in this age period; the best showing is made by the group 15 to 17 years of age, 274 students, or 51.5 per cent.

The group having the lowest percentage attending 61 nights or over is at ages 10 to 14 years, 21 students, or 13.3 per cent of all those belonging in this age period; the best showing is again made by the group 15 to 17 years of age, 119 students, or 22.4 per cent.

RELATION BETWEEN ATTENDANCE AND NUMBER OF TEACHERS EMPLOYED.

In Table 114, which follows, is presented information on the relation between attendance of students and the number of teachers employed. It is, of course, not possible to engage a faculty for a night high school on conditions that admit of perfect flexibility and adjustment to a theoretical average number of students per teacher. Nevertheless, the records seem to show an unnecessarily liberal provision for teaching staff.

TABLE 114.—RELATION BETWEEN ATTENDANCE AND NUMBER OF TEACHERS EMPLOYED ON SPECIFIED DATES, OCT. 2, 1913, TO APR. 20, 1914.

Date.	Attendance.	Teachers employed.	Average attendance per teacher.	Date.	Attendance.	Teachers employed.	Average attendance per teacher.
Oct. 2	713	20	35.6	Feb. 2	531	40	13.2
6	905	30	30.1	9	663	39	17.0
13	660	33	20.0	16	576	38	15.2
20	675	35	19.2	23	538	38	14.1
27	704	37	19.0	Mar. 2	593	38	15.6
Nov. 3	656	37	17.7	9	661	39	16.9
10	684	37	18.4	16	636	39	16.3
17	699	38	18.4	23	622	39	15.9
24	662	38	17.4	30	635	39	16.2
Dec. 1	543	39	13.9	Apr. 6	568	39	14.5
8	607	39	15.5	14	437	39	11.2
15	612	39	15.7	20	549	39	14.1
Jan. 5	523	39	13.5				
12	544	39	13.9				
20	586	39	15.0				
26	555	39	14.2				

The number of teachers employed during the week ending October 30, 1913, the last week of the first school month, was 37. The subjects taught and the maximum attendance in each class on any night during the week specified are as follows:

TABLE 115.—SUBJECTS TAUGHT AND MAXIMUM ATTENDANCE DURING WEEK ENDING OCT. 30, 1913.

Subject.	Maximum attendance.	Subject.	Maximum attendance.
Stenography, 4	19	Grade 7B1	18
Stenography, 2	16	Grade 7B2	28
Stenography, 1A	31	Grade 7A1	20
Stenography, 1B	26	Grade 7A2	10
Stenography, 1C	33	Grade 6B1	20
Stenography, 1D	32	Grade 6B2	16
Banking and bookkeeping	25	Grade 6A	17
Advanced bookkeeping	30	Grade 5A	22
Bookkeeping, 1A	33	Grade 5B	26
Bookkeeping, 1B	37	Individual, advanced	10
Bookkeeping, 1C	30	Individual, beginning	10
Bookkeeping, 1D	22	Mechanical drawing	23
Writing	38	Machine shop	8
Latin	7	Wood shop	15
French	6	Millinery (2)	32
Algebra	14	Sewing (2)	31
Spanish	25	Cooking	24
German	10		

COST OF INSTRUCTION.

The cost per student-hour of instruction for salaries of teachers is shown in the following table:

TABLE 116.—COST, PER STUDENT-HOUR OF INSTRUCTION, FOR SALARIES OF INSTRUCTORS.

Class.	Enrollment Oct. 30, 1913.	Hours per week.	Total for year.		Cost of instruction per student hour.
			Hours.	Salary.	
I.—Language:					
English, 1A	36	2	2,016	$65.00	$0.0322
English, 1B	28	2	1,568	65.00	.0414
English, 1C	37	2	2,072	65.00	.0314
English, 1D	39	2	2,184	65.00	.0298
English, 2	22	2	1,232	65.00	.0527
English, 4	24	2	1,344	65.00	.0484
English, I	10	2	560	65.00	.1160
English, II	6	2	336	65.00	.1935
English, III	17	2	952	65.00	.0683
English, IV	17	2	952	65.00	.0683
Latin	8	2	448	65.00	.1451
French, I	28	2	1,568	65.00	.0414
French, II	6	2	336	65.00	.1935
German, I	10	2	560	65.00	.1160
German, II	10	2	560	65.00	.1160
Spanish, I	28	2	1,568	65.00	.0414
Spanish, II	28	2	1,568	65.00	.0414
Total	354	....	19,824	1,105.00	.0557
II.—Mathematics:					
Rapid calculation	35	2	1,960	65.00	.0332
Arithmetic, 1A	39	2	2,184	65.00	.0298
Arithmetic, 1B	38	2	2,128	65.00	.0305
Arithmetic, 1C	31	2	1,736	65.00	.0374
Arithmetic, 1D	8	2	448	65.00	.1450
Arithmetic, 2A	35	2	1,960	65.00	.0332
Arithmetic, 2B	6	2	336	65.00	.1935
Algebra	17	2	952	65.00	.0683
Total	209	....	11,704	520.00	.0444
III.—Science (physics)	8	2	448	65.00	.1450
IV.—Drawing (mechanical)	36	2	4,032	195.00	.0484
V.—Shopwork, men:					
Machine shop	12	4	1,344	162.50	.1209
Woodwork	16	2	896	81.25	.0907
Total	28	....	2,240	243.75	.1088
VI.—Household arts:					
Millinery, 1	38	2	2,128	130.00	.0611
Millinery, 2	33	2	1,848	130.00	.0703
Millinery, 3	40	2	2,240	130.00	.0580
Sewing, 1	27	2	1,512	130.00	.0860
Sewing, 2	35	2	1,960	130.00	.0663
Sewing, 3	27	2	1,512	130.00	.0860
Cooking, 1	26	2	1,456	65.00	.0446
Cooking, 2	23	2	1,288	65.00	.0505
Cooking, 3	26	2	1,456	65.00	.0446
Total	275	....	15,400	975.00	.0633
VII.—Stenography:					
Stenography, 1A	36	2	2,016	65.00	.0322
Stenography, 1B	29	2	1,624	65.00	.0400
Stenography, 1C	37	2	2,072	65.00	.0314
Stenography, 1D	39	2	2,184	65.00	.0298
Stenography, 2	22	2	1,232	65.00	.0528
Stenography, 4	24	2	1,344	65.00	.0484
Typewriting, 1A	36	2	2,016	65.00	.0322
Typewriting, 1B	29	2	1,624	65.00	.0400
Typewriting, 1C	37	2	2,072	65.00	.0314
Typewriting, 1D	39	2	2,184	65.00	.0298
Typewriting, 2	22	2	1,232	65.00	.0528
Typewriting, 4	24	2	1,344	65.00	.0484
Total	374	....	20,944	780.00	.0372

TABLE 116.—COST, PER STUDENT-HOUR OF INSTRUCTION, FOR SALARIES OF INSTRUCTORS—Concluded.

Class.	Enrollment Oct. 30, 1913.	Hours per week.	Total for year.		Cost of instruction per student hour.
			Hours.	Salary.	
VIII.—Commercial:					
Banking	28	2	1,568	$65.00	$0.0415
Bookkeeping, A	28	2	1,568	65.00	.0415
Bookkeeping, B	28	2	1,568	65.00	.0415
Bookkeeping, C	35	2	1,960	65.00	.0332
Bookkeeping, D	35	2	1,960	65.00	.0332
Bookkeeping, E	39	2	2,184	65.00	.0298
Bookkeeping, F	38	2	2,128	65.00	.0305
Bookkeeping, G	31	2	1,736	65.00	.0374
Writing, 1	35	2	1,960	65.00	.0332
Writing, 2	35	2	1,960	65.00	.0332
Writing, 3	39	2	2,184	65.00	.0298
Writing, 4	38	2	2,128	65.00	.0305
Writing, 5	31	2	1,736	65.00	.0374
Writing, 6	42	2	2,352	65.00	.0276
Writing, 7	42	2	2,352	65.00	.0276
Writing, 8	42	2	2,352	65.00	.0276
Total	566	....	31,696	1,040.00	.0328
IX.—Grade classes:					
7th grade, B (1)	26	6	4,368	195.00	.0446
7th grade, B (2)	30	6	5,040	195.00	.0387
7th grade, A (1)	28	6	4,704	195.00	.0415
7th grade, A (2)	14	6	2,352	195.00	.0829
6th grade, B (1)	23	6	3,864	195.00	.0505
6th grade, B (2)	19	6	3,192	195.00	.0611
6th grade, A	22	6	3,696	195.00	.0528
5th grade, B	30	6	5,040	195.00	.0387
5th grade, A	31	6	5,208	195.00	.0374
Total	223	....	37,464	1,755.00	.0468
X.—Individual classes:					
Advanced	11	6	1,848	195.00	.1055
Beginning	12	6	2,016	195.00	.0967
Total	23	....	3,864	390.00	.1009

SUMMARY.

A. General education, I, II, III, IX, X	817	....	73,304	$3,835.00	$0.0523
B. Commercial, VII, VIII	940	....	52,640	1,820.00	.0345
C. Household arts, VI	275	....	15,400	975.00	.0633
D. Industrial, IV, V	64	....	6,272	438.75	.1030
Total	2,096	....	145,600	7,068.75	.0485

The computation of the cost of instruction per student hour was made as follows: The number of students enrolled in each course at the end of the first month, October 30, 1913, was taken as the base, and it was assumed that this number of students remained constant throughout the year.

An examination of the records made it clear that the irregularity of attendance during the year was such that no average that could be found conveniently would fairly represent either the actual performance or the amount of instruction that the school was organized and prepared to offer. Actual attendance figures are not suitable for use, for the reason that while approximately two-thirds of the students are due three nights per week, nearly one-third are enrolled in classes that meet but one night per week.

The enrollment in each course at the end of the first month was a convenient figure to obtain, and while it gives an aggregate somewhat greater than the actual average attendance it is not excessive, and it represents an amount of instruction that the school was organized to furnish. If this number of students had remained constant throughout the year, the instructors could have handled the work without additional help.

Furthermore, this enrollment figure is taken at a date after the maximum attendance has been reached, but before the number includes any considerable proportion of dead names.

To return to the method of computation, the number of students enrolled in each class is multiplied by the number of hours of class session scheduled per week, and the product is multiplied by the number of weeks the school was in session. The amount of the total salary of the instructor for each class for the year divided by the total number of hours of instruction gives the cost per hour for salary.

The summaries for groups of classes are obtained by addition and division of the numbers involved, and not by averaging the costs of the component items.

The lowest costs are found in the commercial branches, the average being 3.2 cents per hour; the highest cost is for the small science class, 14.5 cents. The summary indicates that the general courses cost 5.2 cents per hour; commercial, including stenography and typewriting, 3.4 cents; household arts, 6.3 cents; industrial, 10.3 cents.

The summary of costs of instruction for all purposes follows:

SUMMARY OF COST OF INSTRUCTION PER STUDENT HOUR.

(145,600 hours in 1913–14.)

1. Salaries of instructors, year 1913–14, $7,746.53. Cost per hour, $0.0532.

The difference between the amount here reported for salaries of instructors ($7,746.53), and the amount reported in Table 116 ($7,068.75), represents classes organized and instructors employed after October 30, 1913.

2. Salaries for administration, office, janitor, etc., $640. Cost per hour, $0.0043.

Does not include any part of salary of city superintendent or general administrative staff.

3. Miscellaneous, school supplies, $520.63. Cost per hour, $0.0035.

Includes supplies for shopwork, $25; fuel, electric current, water, $495.63.

4. Total disbursements for year (sum of 1, 2, 3), $8,907.16. Cost per hour, $0.06117.

5. Annual charge 6 per cent on share of value of plant, $5,685.09 (6 per cent of $94,751.53). Cost per hour, $0.0390.

The proportion of the valuation of the plant to be charged against the night high school was estimated as follows:

The day high school was in session in 1913–14, 183 days, 4.75 hours per day; total, 869.25 hours. The night high school was in session 28 weeks, 3 nights per week, 2 hours per night; total, 168 hours.

The day high school, therefore, is charged with 83.8 per cent and the night high school with 16.2 per cent of the total amount invested in site, building, and permanent equipment. A similar division is made of the cost of fuel, electric current, and water for the year. The amounts are shown in the following table, which is succeeded by a final table showing the distribution of expenditures:

TABLE 117.—DISTRIBUTION OF ITEMS OF COST BETWEEN DAY AND NIGHT SCHOOLS, ON BASIS OF HOURS IN SESSION.

School.	Hours in session, 1913-14.		Distribution of items of cost on basis of proportionate number of hours in session.	
	Number.	Per cent.	Value of plant.	Fuel, electric current, water.
Day school	869.25	83.8	$490,134.47	$2,563.80
Night school	168.00	16.2	94,751.53	495.63
Total	1,037.25	100.0	584,886.00	3,059.43

6. Grand total (sum of 4, 5), $14,592.25. Cost per hour, $0.1002.

TABLE 118.—DISTRIBUTION OF EXPENDITURES, 1913-14.

	Amount.	Per cent of total.
Salaries, instructors	$7,746.53	53.1
Salaries, administration	640.00	4.4
Miscellaneous	520.63	3.6
Annual interest charge on plant	5,685.09	38.9
Total	14,592.25	100.0

APPENDIX I.—ORGANIZATION AND WORK OF VIRGINIA MECHANICS' INSTITUTE.

The Virginia Mechanics Institute was organized in 1854, and an act of incorporation was passed by the General Assembly of Virginia on January 12, 1856. A lot was obtained by the aid of the city, and in 1857 a building was erected. This building was occupied in 1861 by the war and navy departments and patent office of the Confederate States Government, and was destroyed by fire at the time of the evacuation of Richmond in 1865. Because of the losses which had fallen so heavily upon Richmond as the result of the war the institute was not reopened until the fall of 1884.

In January, 1902, the institute moved into its present building on Broad Street.

The original plan of the Mechanics Institute was to establish a school for apprentices. In the charter of 1901 the purpose of the corporation is stated to be "educating and training students in the scientific and mechanic arts, the encouragement and promotion of inventions and industrial exhibitions in the city of Richmond and the State of Virginia, and other scientific, educational, and benevolent purposes."

ADMINISTRATION.

The affairs of the Mechanics Institute are managed by a board of 24 directors, which constitutes practically a self-perpetuating body. The members are prominent business and professional men of Richmond. The board of directors employs a superintendent, and leaves the details of administration largely in his hands.

The following financial statement is published in the annual circular of information:[1]

In 1885 the city council appropriated $1,000 to pay the expenses of the night school of technology. This amount was increased from year to year, as the demands of the school increased, until, in 1905, an annual appropriation of $10,000 was made for the expenses of the institution.

From 1905 to 1913 annual appropriations of $10,000 a year were made for the support of the institution. This amount was increased to $11,500 in 1914, which, combined with sums of money annually received from other sources, makes a total income of about $15,000.

The value of the property of the institute as shown by the treasurer's books is: House and lot, $44,873.38; furniture, books, and apparatus, $18,445.89; total, $63,319.27 Since the erection of the building the increase in values will justify an estimate of $125,000 as the least sum with which the property might be replaced.

There is in the catalogue no itemized statement of receipts and expenditures, and the superintendent reports that no such statement is made public. The city council makes its annual appropriation to the institute without demanding or receiving any detailed report as to disposition made of the funds.

As an organization the Virginia Mechanics Institute is comparable with the Young Men's Christian Association, in that it is a private enterprise, not conducted for profit, engaging in certain social and educational activities, but with the striking difference that the former is practically supported by appropriations by the city government.

There is no organic connection between the board of directors of the Mechanics' Institute and the public school board of the city of Richmond, and no inspection or supervision of instruction or management on the part of any outside agency.

There is here intended no suggestion or implication that there has been improper or unwarranted use of funds, because not accounted for. On the contrary, there is every evidence of the strong position and enviable reputation which the Mechanics Institute enjoys in Richmond and in the State, which could have been earned in no other way than by faithful stewardship, efficient management, and helpful service.

[1] See catalogue for 1914-15, Virginia Mechanics Institute, Richmond, Va., p. 14.

POLICIES.

The board of directors and the superintendent of the Virginia Mechanics' Institute are to be commended for the very progressive attitude taken with reference to the problems before them, and for the comprehensive plans and policies for further development which are being perfected. The most cordial cooperation in the work of the survey has been manifest from the beginning, and an earnest desire to profit by any resulting suggestions. The superintendent has spared no pains to place all records and reports at the disposal of the survey committee, and has freely given of his own time and energy to the prosecution of the inquiry.

For all of these reasons, and others that might be mentioned, the Virginia Mechanics' Institute must be considered as an important factor in the formulation of plans for vocational education in Richmond.

COURSES.

The courses of study offered in the prospectus for the sixtieth year, 1914–15, are as follows:

1. Mathematics.
   - Arithmetic, three courses.
   - Algebra, two courses.
   - Geometry, two courses.
   - Trigonometry.
2. Science.
   - Physics, two courses.
   - Chemistry, three courses.
   - Electricity, two courses.
3. Drawing, designing, and modeling.
   - Free-hand drawing.
   - Interior decoration.
   - Commercial illustration.
   - Furniture design.
   - Clay modeling.
   - Mechanical drawing, two courses.
   - Architectural drawing.
   - Estimating and plan reading.
4. Engineering.
   - Field engineering.

Engineering—Concluded.
   - Elementary applied mechanics.
   - Strength of materials.
   - Machine design.
   - Steam machinery.

5. Mechanical shops.
   - Cabinetmaking.
   - Pattern making.
   - Blacksmithing and forging.
   - Machine shop.
   - Plumbing.
   - Automobile.
   - Electrical shop.
6. Language (English).
7. Commercial.
   - Bookkeeping, two courses.
   - Practical banking.
   - Commercial law.
8. Telegraphy.

INSTRUCTORS.

Some idea of the personnel of the teaching staff for 1913–14 may be gained by noting the occupations engaged in during the day. The following occupations were represented:

Employer or worker in mechanical trades	6
Engraver, 1; cabinetmaker, 1; machinist, 1; contractor and builder, 1; Plumbing contractor, 1; blacksmith, 1.	
Engineer, civil, mechanical, etc	6
Telegraph operator	1
Chemist	1
Accountant, financial	3
Teaching	10
Science, Richmond College, 1; mathematics, Richmond College, 1; drawing, shopwork, public schools, 4; principal, public grammar school, 4.	
Student, medical college	2
Total	29

HOURS OF INSTRUCTION.

During the school year 1913–14 classes were scheduled for the evenings of Monday, Tuesday, Wednesday, Thursday, and Friday, and the hours were from 7.30 to 9.30. The majority of the classes met for a two hours' session, twice each week, for 28 weeks, October to April. A few classes met for two one-hour sessions weekly. A similar schedule was arranged for 1914–15.

At present no instruction is offered in classes meeting during the day. Consequently the building and equipment are in actual use for purposes of instruction for a maximum of 280 hours, the equivalent of about 47 days of 6 hours each. For this period the total expenditures for operation in 1913–14 were $12,172.32, as shown on page 321, averaging $43.47 per hour.

FACILITIES.

The institute has been limited in its funds and has had to practice economy in all expenditures. Portions of the equipment now in use are not of the best type or quality for school purposes, and some of it is out of date and should be replaced.

The management has realized for some time that the library and reading room do not render the service that may be realized from them with improved methods of cataloguing, supervision, and administration. It is understood that plans are under consideration for more complete and satisfactory utilization of these facilities.

The auditorium is available for public use under certain restrictions, but this, too, might be rendered more serviceable.

Aside from the rooms mentioned, and the offices, practically the entire building is available for shop, laboratory, and class use. The list of classes that can be accommodated at one time, on the basis of evening school sessions lasting two hours, is as follows:

TABLE 119.—CLASSES THAT CAN BE ACCOMMODATED AT ONE TIME, ON THE BASIS OF EVENING SESSIONS LASTING TWO HOURS.

Courses.	Number of classes.	Number of students per class.	Hours per night for each class.	Number of students accommodated per night.
English	1	30	1	60
Mathematics	3	25	1	150
Commercial:				
Bookkeeping	1	28	2	28
Telegraphy	1	20	2	20
Drawing	5	25	2	125
Science:				
Chemistry	1	18	2	18
Physics	1	20	1	40
Electricity	1	20	1	40
Shopwork:				
Machine shop	1	20	2	20
Cabinetmaking	1	10	2	10
Plumbing	1	18	2	18
Blacksmith	1	6	2	6
Automobile	1	20	2	20
Electricity	2	20	2	40
Pattern making	1	10	2	10
Total	22			605

By remaining open five nights per week for 28 weeks the maximum number of student-hours of instruction possible is 105,200 for the school year. This maximum may be compared with 57,820, the number of student-hours of instruction estimated for 1913-14. (See Table 125, p. 320.)

The undeveloped possibilities of the existing plant may be suggested by pointing out that if the institute maintained classes for 3 hours each morning for 6 days per week, 3 hours each afternoon, and 2 hours each evening for 5 days per week, for 50 weeks in the year, the maximum aggregate number of student-hours of instruction would be 731,000, instead of 57,820, as in 1913-14.

AGE DISTRIBUTION OF STUDENTS.

From the records available in the superintendent's office it is possible to make a comparison of the students enrolled in 1913-14 with those enrolled in 1912-13 and 1911-12, distributed according to age. This is done in the table following:

TABLE 120.—AGE DISTRIBUTION OF STUDENTS ENROLLED IN 1913-14, 1912-13, AND 1911-12.

Age.	Number.			Per cent.		
	1913-14	1912-13	1911-12	1913-14	1912-13	1911-12
15 years	58	56	70	10.7	10.1	12.1
16 years	72	87	99	13.3	15.6	17.1
17 years	65	83	75	12.0	14.9	13.0
18 years	65	62	84	12.0	11.1	14.5
19 years	57	63	42	10.6	11.3	7.3
Total, 15 to 19 years	317	351	370	58.6	63.0	64.0
20 to 24 years	139	124	132	25.7	22.3	22.8
25 to 29 years	48	52	42	8.9	9.3	7.3
30 to 34 years	17	18	13	3.2	3.2	2.3
35 to 39 years	6	5	10	1.1	.9	1.7
40 years and over	10	7	7	1.9	1.3	1.2
Not reported	3		4	.6		.7
Total, all ages	540	557	578	100.0	100.0	100.0

From this table it appears that during the three years there has been a slight reduction in the percentage of students under 20 years of age, from 64.0 per cent to 58.6 per cent, and a corresponding increase in the percentage of students 20 years of age and over. In the age period 20 to 24 years the increase is from 22.8 per cent to 25.7 per cent; and 25 years and over, from 12.5 per cent to 15.1 per cent. The larger part of the reduction is shown to be at ages 15 and 16 years, from 12.1 and 17.1 per cent to 10.7 and 13.3 per cent, respectively.

Considerably more than one-half of the students have been under 20 years of age, during the three years under consideration, and less than one-sixth of the entire number of students enrolled have been 25 years of age or over in any one year. Of 1,675 students enrolled during the three years, 235, or 14 per cent, were 25 years of age or over.

At the present time, classes at the Mechanics Institute are open only to men and boys 15 years of age or over.

AMOUNT OF PREVIOUS SCHOOLING.

The distribution of students enrolled, according to amount of previous schooling, as reported on the form of application for admission, is shown in the following table. This information can not be regarded as of great significance, since, for example, attendance at evening school for one year and over is tabulated as a "year" of schooling. Furthermore, it can not be assumed that eight or more years of schooling implies graduation from the elementary school.

TABLE 121.—DISTRIBUTION OF STUDENTS ENROLLED IN 1913-14, 1912-13, AND 1911-12, ACCORDING TO AMOUNT OF PREVIOUS SCHOOLING.

Previous years of schooling.	Number.			Per cent.		
	1913-14	1912-13	1911-12	1913-14	1912-13	1911-12
1 to 3 years	41	48	34	7.6	8.6	5.9
4 to 7 years	229	218	221	42.4	39.1	38.2
8 to 11 years	167	187	218	30.9	33.6	37.7
12 years and over	30	25	41	5.6	4.5	7.1
Not reported	73	79	64	13.5	14.2	11.1
Total	540	557	578	100.0	100.0	100.0

Of those reporting, the largest single group have had four to seven years of schooling, 42.4 per cent of the total number enrolled in 1913-14; and this group has increased during the past three years at the expense of those who have had more schooling. That is, while those who have had four to seven years of schooling have increased from 38.2 per cent in 1911-12 to 42.4 per cent in 1913-14, those who have had eight years of schooling or over have decreased from 44.8 per cent to 36.5 per cent. Seven years is the usual length of the elementary school period in Virginia.

COURSES ELECTED.

An attempt was made to show tendencies in the kinds of courses elected, and especially the kinds of groups or combinations of courses. For this purpose the courses elected during the three years were classified as follows:

Group I.—English; Mathematics.

English.
Arithmetic.
Algebra.
Geometry.
Trigonometry.
Analytical Geometry.
Calculus.
Bookkeeping.

Group II.—Drawing.

Clay modeling.
Free-hand.
Instrumental.
Mechanical.
Architectural.
Estimating.

Group III.—Science.

Chemistry.
Physics.
Electricity.
Telegraphy.

Group IV.—Shopwork.

Cabinetmaking.
Pattern making.
Blacksmithing.
Machine shop.
Plumbing.
Automobile.
Practical electricity.

The students were then distributed according to the courses elected, and this distribution is shown in the following table:

TABLE 122.—NUMBER OF STUDENTS ELECTING SPECIFIED GROUPS OF COURSES.

Group in which one course is elected.	Number of students.						
	Electing one course only.	Electing two courses.				Electing three or more courses.	Total.
		I. English; Mathematics.	II. Drawing.	III. Science.	IV. Shopwork.		
1911-12.							
I. English; Mathematics	140	81	62	22	16	37	358
II. Drawing	80	....	13	4	9	....	106
III. Science	41	....	....	6	....	....	47
IV. Shopwork	65	....	....	....	2	....	67
Total	326	215				37	578
1912-13.							
I. English; Mathematics	132	72	46	12	24	25	311
II. Drawing	92	....	7	9	19	....	127
III. Science	46	....	....	3	2	....	51
IV. Shopwork	66	....	....	....	2	....	68
Total	336	196				25	557
1913-14.							
I. English; Mathematics	113	75	62	14	35	28	327
II. Drawing	59	....	12	4	8	....	83
III. Science	31	....	....	3	1	....	35
IV. Shopwork	92	....	....	....	3	....	95
Total	295	217				28	540

From this table it appears that considerably more than one-half of the students register for one course only, and thus receive not to exceed four hours per week of instruction, or a total of 112 hours. Of 1,675 students in the three years, 957, or 57.1 per cent of the total, enrolled in one course only.

The table shows a slight increase in the registration in courses in the shopwork group—from 67, or 11.6 per cent of the total number of students, in 1911–12, to 95, in 1913–14, or 17.6 per cent. The number of students attempting three or more courses has decreased from 37 in 1911–12, or 6.4 per cent of the total, to 28 in 1913–14, or 5.2 per cent.

So far as any tendency is discernible, therefore, it is in the direction of concentration of energy on some one line of work, with an increase in the demand for courses in the shopwork group, but with the courses in the English-mathematics group still predominating.

ATTENDANCE.

From the records available it is possible to distribute the students enrolled in 1913–14 according to number of nights present, by ages, as follows:

TABLE 123.—DISTRIBUTION OF ATTENDANCE, BY AGE PERIODS.

Number of nights in attendance.	Students attending classified number of nights.									
	15 to 17 years.		18 to 19 years.		20 to 24 years.		25 years and over.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
1 and not over 10	15	7.8	11	9.0	20	14.3	11	12.9	57	10.6
11 and not over 20	21	10.9	12	9.8	22	15.7	10	11.8	65	12.0
21 and not over 30	27	14.0	9	7.4	24	17.1	15	17.6	75	13.9
31 and not over 40	25	13.0	16	13.1	10	7.1	7	8.2	58	10.7
41 and not over 50	27	14.0	23	18.9	20	14.3	15	17.6	85	15.8
51 and not over 60	38	19.7	17	13.9	21	15.0	14	16.5	90	16.7
61 and not over 70	6	3.1	14	11.5	4	2.9	2	2.4	26	4.8
71 and not over 80	4	2.1	3	2.5	3	2.1	3	3.5	13	2.4
81 and not over 90	7	3.6	1	.8	3	2.1	1	1.2	12	2.2
91 and not over 100	9	4.6	5	4.1	3	2.1	1	1.2	18	3.3
101 and not over 110	8	4.1	4	3.3	4	2.9	2	2.4	18	3.3
111 and not over 120	4	2.1	6	4.9	1	.7	3	3.5	14	2.6
131 and not over 140	......	......	......	......	1	.7	......	......	1	.2
Not reported	2	1.0	1	.8	4	2.9	1	1.2	8	1.5
SUMMARY.										
1 and not over 30	63	32.6	32	26.3	66	47.1	36	42.3	197	36.5
31 and not over 60	90	46.6	56	45.9	51	36.4	36	42.3	233	43.1
61 and not over 140	38	19.7	33	27.0	19	13.6	12	14.1	102	18.9
Not reported	2	1.0	1	.8	4	2.9	1	1.2	8	1.5
Total enrollment	193	100.0	122	100.0	140	100.0	85	100.0	540	100.0

The information furnished by this table is incomplete, in that it does not take account of the number of nights each student should have been present in order to complete the work of the course or courses for which he was registered; and it is only approximate, in that records do not show accurately the number of times present for each student. The table does indicate, however, the approximate facts of attendance, and, to this extent, the amount of service rendered by the school.

Of those students falling in the age period 15 to 17 years, the model group in attendance is 38, or 19.7 per cent, at 51 to 60 nights; in the age period 18 to 19 years, 23, or 18.9 per cent, were present 41 to 50 nights; in the age period 20 to 24 years, 24, or 17.1 per cent, were present 21 to 30 nights; in the age period 25 years and over, 15, or 17.6 per cent, were present 21 to 30 nights, and 15 were present 41 to 50 nights.

The summary of Table 123 shows that only 18.9 per cent of the students enrolled in 1913–14 attended more than 60 nights. The students in the age period 18 to 19 years make the best attendance record, with the smallest percentage attending 1 to 30 nights, 26.3 per cent, and the largest percentage attending 61 to 140 nights, 27 per cent.

RELATION BETWEEN ATTENDANCE AND NUMBER OF TEACHERS EMPLOYED.

Table 124 which follows presents some figures to show the relation between attendance of students and number of teachers employed. The office records are kept in such form that the actual attendance of students for each night can be obtained only after considerable labor. The item "times present" consists of the aggregate number of persons attending classes on each night, counting each individual once for each class attended.

TABLE 124.—RELATION BETWEEN ATTENDANCE AND NUMBER OF TEACHERS EMPLOYED.

Month.	Total enrollment.	Number of students remaining on the roll, deducting withdrawals.	Attendance, "times present."[1]		Number of teachers employed.	Average attendance per teacher per night.	Capacity of teaching staff. (Number students attending month of October.)
			Month.[2]	Night.			
October	477	456	4,526	565.8	28	20.2	456
November	489	432	4,240	530.0	28	18.9	456
December	500	409	3,548	443.5	28	15.8	456
January	525	388	3,542	442.8	27	16.4	440
February	537	362	3,174	396.8	28	14.2	456
March	539	329	2,977	372.1	28	13.3	456
April	542	332	2,554	319.3	28	11.4	456

[1] Number of "times present" includes students counted more than once, because attending more than one class on same night.
[2] Divide by 8 to find "times present" per night.

The average attendance per teacher per night is found by dividing the number of "times present" by the number of teachers employed.

The net enrollment at the end of the first month is taken as the "capacity" of the teaching staff at that date, since it seems reasonable to assume that after one month the school is in fairly satisfactory running order, with necessary adjustments of classes.

COST OF INSTRUCTION.

Table 125 presents data on the cost per student hour of instruction for salaries of instructors. The costs were computed as follows:

The enrollment in each course at the end of the first month, October 25, 1913, was taken as the base, and it was assumed that the number of students remained constant throughout the year. To take the aggregate actual attendance in each class would involve more labor than the significance of the results obtained would justify. The total number of hours of instruction in each course was obtained by multiplying the number of students enrolled by the number of hours per week of class session, and multiplying the product by 28, the number of weeks the school was in session. The cost per hour for salaries was obtained by dividing the total salary for the year for each class by the total number of hours of instruction for the class. The costs for groups of courses were computed by addition and division of the numbers involved, and not by averaging the costs of component items. The table follows:

TABLE 125.—COST, PER STUDENT HOUR OF INSTRUCTION, FOR SALARIES OF INSTRUCTORS.

Class.	Enrollment Oct. 25, 1913.	Hours per week.	Total for year.		Cost of instruction per student hour.
			Hours.	Salary.	
I.—Language:					
English, A	43	3	3,612	$87.50	$0.0249
English, B	30	3	2,520	87.50	.0347
	73	....	6,132	175.00	.0285
II.—Mathematics:					
Arithmetic, special 1	8	2	448	70.00	.1563
Arithmetic, special 2	11	2	616	70.00	.1136
Arithmetic, A 1	31	2	1,736	87.50	.0504
Arithmetic, A 2	24	2	1,344	87.50	.0651
Arithmetic, B 1	14	2	784	87.50	.1116
Arithmetic, B 2	32	2	1,792	87.50	.0488
Arithmetic, C 1	10	2	560	87.50	.1563
Arithmetic, C 2	27	2	1,512	87.50	.0579
Algebra, A[1]	25	2	1,400	87.50	.0625
Algebra, B	18	2	1,008	87.50	.0868
Geometry, A	8	2	448	87.50	.1953
Geometry, B[2]	7	2	392	87.50	.2232
Trigonometry	7	2	392	87.50	.2232
	222	....	12,432	1,102.50	.0887
III.—Science:					
Chemistry	6	4	672	175.00	.2604
Physics, A	13	2	728	109.38	.1502
Physics, B	2	2	112	109.38	.9766
Electricity, A	22	2	1,232	109.38	.0888
Electricity, B	12	2	672	109.38	.1628
	55	....	3,416	612.52	.1793
IV.—Drawing:					
Free-hand, A[3]	20	4	2,240	175.00	.0781
Free-hand, B	15	4	1,680	218.75	.1302
Instrumental, 1	27	4	3,024	175.00	.0579
Instrumental, 2	15	4	1,680	175.00	.1042
Instrumental, 3	18	4	2,016	175.00	.0868
Architectural, B	16	4	1,792	218.75	.1221
Mechanical, 1	18	4	2,016	175.00	.0868
Mechanical, 2	10	4	1,120	175.00	.1563
Estimating	7	4	784	157.50	.2009
	146	....	16,352	1,645.00	.1006
V.—Shopwork, men:					
Practical electricity	36	4	4,032	385.00	.0955
Cabinetmaking, A	8	4	896	175.00	.1953
Pattern making, B	8	4	896	175.00	.1953
Machine shop, D	16	4	1,792	175.00	.0977
Plumbing, E	9	4	1,008	140.00	.1389
Automobile, F	36	3	3,024	322.50	.1066
	113	....	11,648	1,372.50	.1178
VI.—Commercial:					
Bookkeeping, A	32	4	3,584	175.00	.0488
Bookkeeping, B	27	4	3,024	175.00	.0578
Telegraphy	8	6	1,344	175.00	.1302
	67	....	7,952	525.00	.0660

SUMMARY.

A General Education I, II, III	350	....	21,880	$1,890.02	$0.0864
B Commercial VI	67	....	7,952	525.00	.0660
C Industrial IV, V	259	....	27,988	3,017.50	.1078
	676	....	57,820	5,432.52	.0940

[1] Algebra, A and B, include 4 special.
[2] Geometry, B, includes 2 special.
[3] Free-hand, A, includes 3 clay modeling.

The lowest costs are for the language group, averaging 2.8 cents per hour; the highest costs are for the science group, averaging 17.9 cents per hour.

The summary of Table 125 shows that the general education courses average 8.6 cents per hour; the commercial courses, 6.6 cents; and the industrial courses, 10.7 cents.

The total number of hours of instruction for 1913–14, as indicated in Table 125 was 57,820. On this basis, the total cost per hour of instruction, including salaries of instructors, administration, supplies, and interest charge of 6 per cent on the reported valuation of the plant is 28.7 cents, as is shown in the following summary:

SUMMARY OF COST OF INSTRUCTION PER STUDENT HOUR, 1913-14.

(57,820 hours in 1913-14.)

1. Salaries of instructors, year 1913–14, $5,432.52. Cost per hour, $0.0940.
2. Salaries for administration, office, janitor, etc., $3,613.42. Cost per hour, $0.0625.
3. Miscellaneous, school supplies, etc., $3,126.38. Cost per hour, $0.0541.
4. Total disbursements for year (sum of 1, 2, 3), $12,172.32. Cost per hour, $0.2105.
5. Annual charge 6 per cent on value of plant, $4,442.08. (Six per cent of $74,034.64.) Cost per hour, $0.0768.
6. Grand total (sum of 4, 5), $16,614.40. Cost per hour, $0.2873.

The following table shows the distribution of expenditures in 1913–14:

TABLE 126.—DISTRIBUTION OF EXPENDITURES, 1913-14.

	Amount.	Per cent of total.
Salaries, instructors	$5,432.52	32.7
Salaries, administration	3,613.42	21.7
Miscellaneous	3,126.38	18.8
Annual interest charge on plant	4,442.08	26.7
Total	16,614.40	100.0

APPENDIX J.—SCHEDULES USED IN THE INDUSTRIAL SURVEY.

MACHINISTS AND BOILER MAKERS.

Name of firm ....
Date ....

INDUSTRIAL SURVEY OF RICHMOND, VA.

[NOTE.—All information furnished in this questionnaire will be held strictly confidential and used only for the purpose of determining the kind of industrial education which will best meet the needs of persons engaged in the specified trades of Richmond, Va.]

[INSTRUCTIONS.—Please fill in all blanks and return as soon as possible to Charles H. Winslow, director vocational survey, Administration Building, 805 East Marshall Street. Where space for reply is insufficient, please give information on separate sheets by referring to the number of question answered.]

Name of person to whom future inquiries may be addressed. ....

PART I.—*General information.*

1. What are your specialties? ......
2. Number of employees other than office help:
   (*a*) At present time ......
   (*b*) Maximum number in service in 1913 ......
   (*c*) Minimum number in service in 1913 ......
3. What is the slack season with you? From ...... to ......
4. What is the busy season with you? From ...... to ......
5. Is difficulty experienced in obtaining efficient journeymen workmen for permanent employment? ......
   (*a*) If so, in what occupations? ......
   (*b*) Is this difficulty due to—
      (1) Lack of an apprenticeship system in the shop? ......
      (2) Lack of opportunity to learn the trade in the shop? ......
      (3) Other causes? (Specify.) ......
6. What is the age period of maximum productivity for workers? (Indicate age at which the journeyman commonly begins to earn full wage, and age at which earning power begins to decline.)
   From age .... years, to age .... years. Are there exceptional occupations to which the age limits specified do not apply? If so, indicate the limits for these exceptional occupations. ......
7. After how many years' experience as an apprentice and journeyman does a journeyman ordinarily earn his maximum wage? ......
8. In what occupations is the demand for more workers likely to increase most rapidly during the next five years? ...... (Explain why.) ......
9. Is the supply of unskilled labor becoming greater or less relatively to the demand for it? ...... The supply of skilled labor? ...... Why? ......
10. Are promotions frequently made in your establishment from one occupation to another? ......
11. What is the usual line of promotion for a journeyman? ......
12. Are individual workmen frequently shifted from one process, or machine, or occupation to another? ......
13. What trades can a boy learn in your shop thoroughly? ......
14. Can untrained beginners be used? ...... In what occupations can they be used? ......

15. Is the foreign-trained worker a better workman? If so, why? (Is it, for example, due to superior natural ability, or to better training in school, or in shop? ......
What are the deficiencies of the native Americans? ......
16. Can you retain thoroughly trained efficient workmen permanently in your employ, or do you find it necessary to lay off such men at certain seasons? ......

PART II.—*Conditions under which the work is performed.*

[In answering questions 17 to 24 specify in each case occupations and conditions.]

17. What conditions involve peculiar physical strain? (Specify jobs and conditions.) ......
18. What conditions involve peciluar nervous strain? (Specify jobs and conditions.) ......
19. What conditions tend to impair health? (Specify jobs and conditions.) ......
20. What conditions especially stimulate the intelligence of the workers? (Specify jobs and conditions.)......
21. What conditions, if any, narrow and restrict the mental development of the worker? (Specify jobs and conditions.)......
22. What conditions tend to kill out the worker's ambition and interest in his trade? (Specify jobs and conditions.)......
23. What conditions, if any, are to be guarded against as exerting morally unwholesome influences? (Specify jobs and conditions.)......
24. What other conditions of work are important as affecting the welfare of the workers? (Specify jobs and conditions.)......

PART III.—*How workers are trained.*

25. Does the worker receive any instruction or training in your establishment more than he can pick up on the job?....... If so, who gives it to him? (Indicate nature of training.)......
26. What occupations in your shop can be learned in the shop with little or no instruction?......
27. What are the terms of any agreement of apprenticeship under which apprentices are now working in your shop? (If possible, provide copies of such agreements.)......
28. Do you find that those who are apprenticed have a better attitude toward their work than those who are not? (Specify advantages and disadvantages of formal apprenticeship.)......

PART IV.—*Relation of occupation to school training.*

29. In what ways have you found the industry hampered by a lack of elementary school education on the part of beginners?......
What knowledge that beginners should have is most frequently lacking? (Specify occupations and deficiencies in detail.)......
30. In what occupations, if any, is general school training beyond the seventh grade of value in increasing efficiency as workers?......
31. Assuming that school training beyond the seventh grade is an advantage, what subjects should be taught?......
32. What kind of a school would most help workers in the various occupations during the apprenticeship period?
Day schools......
Part-time day schools......
Night schools......
Other schools (specify)......
For which occupations do you believe that such schools could be provided to best advantage?......
In your opinion what should be taught in such a school?......

33. If a part-time day school were established, would you, as an employer, be willing to enter into an agreement providing for a definite period of attendance of apprentices at such a school for a definite number of hours each week, paying them the usual wage while in school?......
34. For what occupations would you enter into such an agreement?......
35. If a part-time day school were established, in your opinion how many hours per week should an apprentice attend?......
36. In your opinion what should the schools do for the worker before he enters the shop? (Consider what amount of general education the school should give, what amount of vocational or industrial training, etc., and in general what the schools should give that is needed in the shop but can not be acquired in the shop.)......
37. What do you believe a night school should teach to help the journeyman who wants to advance in his trade?......
38. What questions do you ask applicants for work?......
39. What tests do you apply to determine fitness or efficiency of applicants?......
40. What records are kept in your shop to determine efficiency of workmen?......
41. How can the worker be given an interest in his work? Can you suggest a modification of conditions in the shop, or in shop practice, or in school training?......
42. Would you be willing to cooperate with the schools in an effort to organize shop practice so as to develop interest and efficiency on the part of the worker?......

Industrial Survey of Richmond, Va.

INDIVIDUAL SCHEDULE.

[Note.—All information furnished on this card will be held strictly confidential, and used only to determine what kind of industrial education will best meet the needs of persons engaged in the industries of Richmond.]

Name ....

1. Age .... years.
2. Place of birth: (a) City ...... (b) State ...... (c) Country ......
3. Occupation ......
4. Member of what union? ......
5. Name of employer ....
6. (a) Regular number of hours of labor per day (except Saturday)? .... (b) On Saturday? .... (c) Total per week? ....
7. (a) Wage per hour? ...... (b) Overtime wage per hour? ...... (c) Wage per week, not including overtime? ......

[Note.—Pieceworkers should give approximate estimate of earnings, and state "piecework."]

8. How many weeks of work did you lose during the year ended June 1, 1914, through:

[Note.—Estimate number of weeks where you can not give exact number.]

(a) Sickness, ... weeks. (b) Accident, ... weeks. (c) Factory shut down, ... weeks. (d) Temporarily laid off, ... weeks. (e) .... weeks. (f) Total time lost, ... weeks.

9. (a) If you were on part time during any portion of the year, how many weeks? .... (b) How many weeks overtime? ....
10. How many years have you been in your present trade, including apprenticeship? .... years.
11. How many years did you serve as an apprentice? .... years.
12. At what age did you begin to learn your trade? ....

13. (a) Name of city in which you learned your trade? ...... (b) In how many shops were you employed during your apprenticeship? .... (c) What were your reasons for changing your place of employment? ......
14. (a) Is your present occupation one for which you feel that your training, experience, and ability best fit you? ...... (b) If not, specify occupation for which you are better fitted ......
15. (a) If you had had opportunities for suitable training, do you feel that you would have been more successful in some other occupation? ...... (b) If so, in what occupation? ......
16. Does your work involve peculiar physical or nervous strain? ...... (Specify in detail the nature and consequences of such strain) ......
17. Are there conditions of your work which tend to impair health? ...... (Specify in detail.) ......

18. Mention below the different occupations at which you have worked. (Specify names of occupations.)	Length of employment in occupation.	Occupations (continued).	Length of employment in occupation.
(a) Present occupation		(g) Occupation before that	
(b) Occupation before that		(h) Occupation before that	
c) Occupation before that		(i) Occupation before that	
(d) Occupation before that		(j) Occupation before that	
(e) Occupation before that		(k) Occupation before that	
(f) Occupation before that		(l) Occupation before that	

19. Check (√) those qualities most essential to success in your trade: (a) Mental alertness ...... (b) Special adaptability ...... (c) Initiative ...... (d) Accuracy ...... (e) Patience ...... (f) Strength ...... (g) Endurance ...... (h) Keenness of sight ...... (i) Dexterity ...... (j) ......
20. (a) While learning your trade did you receive proper help and instruction? ...... (b) What kind of help or instruction that you should have received was not given? (Specify any difficulties encountered by you in learning your trade.) ......
21. Can a boy learn your trade thoroughly in the shop? ......
22. At what age did you leave school? ......
23. What grade did you complete? ....
24. In what ways, if at all, have you found yourself hampered by a lack of knowledge or of school training? ......
25. Indicate below any school courses, including correspondence courses, taken since leaving school:

Name of school.	Kind of school.	Course taken.	Did you complete this course.	Who paid the tuition.	Cost.

26. Why did you take these courses? (Specify reasons for each course.) ....
27. Did this school work result in increase of wages? .... (State if possible amount of increase in wages due to this work.) ......
28. What other benefits did you receive from these courses? ......
29. In your opinion, what should the schools teach to help the worker before he begins to learn your trade? ....
30. What do you think a part-time school should teach a beginner during his apprenticeship? ......
31. What could an evening school teach to help you in your occupation? ......

INDEX.