UNITED STATES DEPARTMENT OF LABOR
Frances Perkins, *Secretary*

BUREAU OF LABOR STATISTICS
Isador Lubin, *Commissioner* (on leave)
A. F. Hinrichs, *Acting Commissioner*

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Hourly Earnings in the Ammunition-Loading Industry 1944

Bulletin No. 827

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Letter of Transmittal

UNITED STATES DEPARTMENT OF LABOR,
BUREAU OF LABOR STATISTICS,
Washington, D. C., April 12, 1945.

The SECRETARY OF LABOR:

I have the honor to transmit herewith a report on hourly earnings in the ammunition-loading industry in 1944. The report was prepared in the Bureau's Division of Wage Analysis by Edith M. Olsen under the supervision of Victor S. Baril.

A. F. HINRICHS, *Acting Commissioner.*

HON. FRANCES PERKINS,
Secretary of Labor.

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Bulletin No. 827 of the
United States Bureau of Labor Statistics

[Reprinted from the MONTHLY LABOR REVIEW, April 1945]

Hourly Earnings in the Ammunition-Loading Industry, 1944[1]

Summary

A BUREAU of Labor Statistics wage survey in ammunition-loading plants reveals that the straight-time average earnings of workers in representative key jobs amounted to 77 cents an hour in shell- and bomb-loading plants and to 71 cents an hour in bag-loading plants.

Among occupations studied in shell- and bomb-loading plants, average earnings ranged from 51 cents an hour for janitresses to $1.47 an hour for class A tool and die makers. Occupations with average earnings ranging between 65 and 75 cents an hour accounted for well over half of the workers, while slightly less than a third were in occupations averaging between 75 and 90 cents an hour.

In bag-loading plants, occupational earnings ranged from 48 cents for janitresses to $1.31 for class A pipe fitters. Nearly 87 percent of all the workers studied in this branch of the industry were employed in occupations in which the average hourly earnings ranged from 60 to 80 cents.

The ammunition-loading industry is outstanding for the large percentage of women it employs. These workers accounted for nearly three-fifths of the entire labor force of the plants covered by the survey. The employment of women is somewhat greater in bag-loading plants than in bomb- and shell-loading plants. Nearly two-thirds of the employees in bag loading were women. In contrast to the situation in many other manufacturing industries, the employment opportunities for women in ammunition loading are not limited to a few specialized jobs. Aside from certain indirect jobs which involve either very heavy work or long experience, women were found in nearly every occupation selected for study.

Wartime Development of the Industry

To supply the facilities needed for loading bombs and artillery ammunition on a scale commensurate with other wartime operations has required the building of an entire industry in a period of less than 5 years. In this branch of the ordnance industry, unlike many others, private production facilities could not be converted from other industries because of the highly specialized type of plant and equipment needed. During peacetime, the few existing Government owned and

[1] For comparison with earnings in the explosives manufacturing industries, see Monthly Labor Review, March 1945 (p. 603); reprinted as Bulletin No. 819.

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operated manufacturing arsenals were able to load ammunition in sufficient quantity to meet the relatively small requirements of the Army and Navy. Although some expansion of these arsenals was possible, their production has been completely overshadowed by the large new plants built by the Government since September 1939. All of these new loading plants, although owned by the Government, are operated by private companies. Although many of these companies had had no experience in either the explosives or the ammunition industries prior to the war, they did have the managerial experience needed for large-scale production of war materials.

The ammunition-loading industry is widely scattered geographically. Only five States—Illinois, Indiana, Texas, Massachusetts, and Pennsylvania—had more than two plants in operation at the time of the present survey. The few plants in the Northeastern States are relatively small. In line with the Government's general policy of decentralizing the war industries for strategic reasons, the loading plants built during this war are scattered throughout the interior States of the country. Other factors which entered into the selection of plant sites for the new loading plants were reasonable proximity to other plants in the munitions program, such as those manufacturing the high explosives, gunpowder, and metal components of ammunition; availability of natural resources, transportation and housing facilities, and labor supply; and safety of surrounding communities. Consequently, these plants are typically located at some distance from already crowded industrial centers, and have normally been built on large tracts of land in isolated rural areas.

Nature of the Industry

The information contained in this report is based on a Bureau of Labor Statistics survey of privately operated plants loading aircraft bombs and artillery ammunition. The study included the loading into bags of propellent charges for large-caliber weapons, as well as the loading of component shell and bomb parts, such as fuzes, "boosters," primers, and detonators. For the purposes of this study, artillery ammunition is defined as ammunition used in cannon of all calibers or, more specifically, in weapons of 20 mm. or more.

The two basic types of explosives used in military ammunition are propellants and high explosives. The distinction between the two is made largely on the basis of the speed with which explosion occurs after the charge has been set off. Propellants are relatively mild explosives whose rate of combustion is comparatively slow and which build up pressure gradually. The principal function of the propellent charge is to exert enough pressure on the projectile to propel it from the gun at the required rate of speed. Smokeless powder is at present used almost universally as a propellant.

High explosives burn with such extreme rapidity that they cause almost instantaneous reaction. There are numerous types of high explosives, and in military use they serve as bursting charges in shells and bombs and as initiators. The function of the bursting charge, which must have great shattering power and which is carried in the cavity or body of shells and bombs, is to shatter the metal case into fragments. Although several different kinds of high explosives are used, the most commonly used bursting charge is TNT or a mix-

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ture of TNT and ammonium nitrate, which is called amatol. Very sensitive high explosives, classified as initiators, are used in small amounts for setting off less-sensitive explosives and are usually loaded into the detonator, fuze, and booster. Since the bursting charge in shells and bombs is relatively insensitive to shock, these initiating explosives are loaded into a small detonator which is placed in the fuze, and into the booster which is generally assembled to the loaded fuze. Chief among the initiating explosives are mercury fulminate and lead azide, which are contained in the detonator, and tetryl, the typical booster explosive. The initial detonation, which is controlled by the fuze, explodes the tetryl charge in the booster, which in turn sets off the main or bursting charge of the shell or bomb.

Bombs are explosive missiles designed to be released over the target from aircraft. There are many different types and models of bombs, each serving a specific purpose. In general, however, they consist of a metal casing filled with the main high-explosive charge, a booster, one or more fuzes, a fin assembly for stabilizing the flight of the bomb through the air, and an arming-wire assembly to prevent the bomb from exploding prematurely.

Artillery projectiles are in many respects similar to bombs. The obvious differences are in size and in the method of projection from the point of release to the target. Bombs, which are released from aircraft, need no propellent charge to send them to their target. Projectiles fired from guns, on the other hand, require a propellent charge of slow-burning gunpowder to force them from the bore of the gun. A complete round of artillery ammunition, which includes all of the component parts necessary to fire the cannon once, includes, ordinarily, the main bursting charge (which is enclosed in the body of the projectile), a fuze and booster assembly, a propellent charge, and a primer loaded with black powder which performs the function of setting off or firing the propellent powder.

Depending upon the method of loading the propellent charge, artillery ammunition is classified as fixed, semifixed, or separate-loading ammunition. In fixed ammunition the propellent charge is carried as loose powder in the cartridge case, which is rigidly crimped to the projectile. In semifixed ammunition, the propellent powder is assembled in the cartridge case in bags or increments of varying sizes, and the projectile is easily separated from the cartridge case to allow removal of increments which may not be needed under certain firing conditions. In both fixed and semifixed ammunition the primer is rigidly pressed into the base of the cartridge case. Both types of ammunition are also loaded into the cannon with the primed cartridge case attached to the projectile. In separate-loading ammunition, which is used for large-caliber cannon, the projectile and the propellent charge are loaded into the gun separately rather than as a unit. The propellent charge for such ammunition is usually contained in one or more cylindrical bags. Similarly, the primer, or igniter charge (which consists of a small amount of black powder), is contained in cloth bags and loaded into the gun separately.

PROCESS OF MANUFACTURE

Both shell- and bag-loading plants require very extensive plant facilities. A typical loading plant built during the present war covers many acres of ground, and the various operations are carried

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on in widely separated buildings in order to minimize the hazard. The processes involved in the loading of bombs and large-caliber artillery shells are very similar and require the same general type of plant equipment. Bombs are, therefore, generally loaded in plants which also perform shell-loading operations.

Shell and bomb loading.—The manufacturing process carried on in a shell- or bomb-loading plant consists largely of the final assembly of component materials into complete ammunition. The explosives, shell or bomb casings, cartridge cases, fuzes, primers, boosters, and detonators are received from outside manufacturers. They are then inspected and stored, until required, in the loading departments. The loading and assembling of these materials is carried on as an assembly-line process. Various departments or so-called "load lines" are maintained for the processing of each particular type of ammunition. Thus, a plant may have, in addition to one or more shell- or bomb-load lines, separate lines for loading such component parts as detonators, fuzes, primers, and boosters. In some cases, however, these smaller components are received from other plants, already loaded with the explosive charge and ready for final assembly into the completed projectile.

The main loading operation for shells and bombs is generally performed by either the melt-load or the press-load process. On the load line, the shell or bomb casings are cleaned, inspected, and painted. Large-caliber shells and bombs are usually filled by the melt-load process, the major operations of which consist in screening, melting, and pouring the main explosive or bursting charge into the shell or bomb cavity. The most commonly used bursting charge is TNT, which is readily melted either alone or with ammonium nitrate. After the TNT has hardened, the booster and fuze are inserted. Some large-caliber shells are shipped to combat zones unfuzed, and the fuze is assembled in the field prior to firing the shell. In the case of fixed and semifixed rounds of ammunition, the projectile is assembled to the cartridge case, which contains the propellent charge and artillery primer. The final operations involve labeling and packing or crating for storage or shipment. Inspection is carried on continuously at each stage of the operation.

The operations performed on the lines loading shells by the press-load process differ somewhat from those where the melt-loading process is used. The main explosive charge is loaded into the projectile in a dry, rather than molten state, and consolidated into the shell by means of a hydraulic press. Press loading is most generally applied to smaller-caliber shells, such as those used in 20-mm. and 40-mm. cannon.

The process of loading such component parts as fuzes, boosters, detonators, and primers is largely confined to very simple assembly work. Artillery primers, the bodies of which are metal tubes filled with a specified amount of black powder, are generally loaded on a volumetric loading machine. The heads, containing a small percussion element which ignites upon friction from the firing pin, are staked to the loaded bodies. Most of the operations on the primer-load lines are mechanized.

The method of loading detonators, fuzes, and boosters varies somewhat from plant to plant, but in general the operations involve a large amount of bench assembly work. On the booster-loading line,

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for instance, each minute task is performed at long tables having numerous stations. Although most of the operations are performed by hand, small crimping and staking machines are used at the tables to assemble the various parts.

Bag loading.—The loading of propellent charges into ammunition bags for semifixed and separate-loading ammunition is a far more simple operation and requires equipment quite different from that found in bomb- and shell-loading plants. The major operations involved in the bag-loading plants are the cutting and sewing of cloth bags of various sizes and the loading of these bags with specific amounts of smokeless powder for propellent charges or black powder for igniter charges.

In the bag-making department the cloth is spread and cut into specified sizes and shapes, depending upon the type of charge which is to be loaded. After identification of the charge has been printed on these pieces of cloth, they are sent to the sewing room to be made into bags by seaming on power sewing machines. An opening is left in the bag for pouring in the powder charge.

The bag-loading lines are made up of the buildings for the actual loading of the gunpowder and a number of widely separated and barricaded storage magazines. The bag-loading buildings are divided into small rooms with thick concrete walls between them for safety of the operators. In these small rooms, each having only a limited number of operators, the explosive powder is carefully weighed and poured into the bags which have been transferred from the bag-making department. The bag is then closed on a sewing machine and is ready for final inspection and packing. For certain types of ammunition, several bags are tied together before packing, to form a charge made up of several increments.

Scope and Method of Survey

This report is based on a survey of the earnings of workers in plants loading bombs and artillery ammunition and includes virtually all of the establishments which were engaged in the loading of these products during the summer of 1944. Data were obtained for 38 plants; 35 of these were loading bombs and shells or their component parts and employed a total of approximately 133,000 workers, and the 3 others were loading propellent powder bags for semifixed and separate-loading ammunition and employed about 13,000 workers.

Because of the many different types of shells, bombs, and component parts processed in these ammunition-loading plants, wide variations existed from plant to plant in the scope of operations. Eight plants, for instance, were loading only such components as detonators, fuzes, boosters, or primers. A number of the plants were loading large shells and bombs by the melt-loading process, while others loaded smaller shells by pressing or consolidating the explosive charge into the shell cavity. Some component parts were also loaded in most of the shell- and bomb-loading plants. Operations in the three bag-loading plants, however, were in each instance confined to the making and filling of ammunition bags.

The wage data were collected from plant pay-roll records by trained field representatives of the Bureau, who used written job descriptions in classifying workers in each plant studied. The duties performed by

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workers included within the individual occupational groups are, therefore, closely comparable despite any interplant differences in operations which may have existed at the time of the survey. Unusual difficulty was encountered in ascertaining the exact numbers of workers within each occupational group because of the frequent shifting of workers from one job to another as a result of changes in production schedules. The distribution of workers by occupation shown in this report, therefore, represents an averaging of different types of operations in these plants rather than an exact occupational distribution as of a particular time. The influence of this factor on the hourly earnings presented in the report is negligible, as the change from one job to another generally consists merely of a change of station within the same department or to some other job for which the same wage rate obtains.

Detailed wage data were obtained for 98,022 workers employed in the occupations selected for study. Somewhat more than two-thirds of all the workers employed by the 38 plants covered were classified in these selected occupations, which are believed to be representative of the various levels of skill and earnings in the industry. In each plant visited, the field representative also obtained such other items of information as scope of operations, number of shifts worked, extent of unionization, entrance rates paid to male common labor, methods of wage payment, and the plant policy with regard to premium payments for overtime and late-shift work. This general information was found helpful for interpreting the earnings data which constitute the chief objective of the study. The occupational wage data represent straight-time average hourly earnings, excluding premium payments for overtime work and for work on late shifts. In the main, the data relate to typical pay-roll periods in June 1944.

The Labor Force

The recruitment and training of workers was one of the most serious problems confronting the ammunition-loading industry in the early months of the war. As the industry has no real counterpart in peacetime, literally the entire labor force had to be trained by the few people already familiar with the operations. For a large percentage of the workers recruited by the loading plants, this employment involved moving from rural areas and represented their first experience in a manufacturing plant. Moreover, many of the workers, particularly the women, were entering the labor force for the first time.

The ammunition-loading industry is outstanding for the large percentage of women it employs. These workers accounted for nearly three-fifths of the entire labor force of the plants covered by the survey. The employment of women is somewhat greater in bag-loading plants than in bomb- and shell-loading plants. Nearly two-thirds of the employees in bag loading were women. In ammunition loading, unlike many other manufacturing industries, the employment opportunities for women are not limited to a few specialized jobs. Aside from some of the indirect jobs which involve either very heavy work or long experience, women were found in nearly every occupation selected for study.

Total plant employment varied widely in the plants studied. The actual range was from fewer than 200 workers in the smallest plant

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to more than 10,000 in the largest. All but 13 of the plants employed over 2,000 workers.

Nearly all of the operations in the loading and assembling of ammunition involve unskilled or semiskilled work, and the training period is relatively short. In fact, most of the jobs require as little as one week of training. Undoubtedly, the most important feature in the training of new workers is that of impressing them with the importance of observing safety precautions and rules in the handling of explosives. Many other steps are also taken to reduce the accident hazard. The loading plants are so constructed as to provide every possible protection for the workers. The plants are spread over large tracts of land, and the individual buildings in which explosives are handled are widely separated so as to confine any accidents to only a small part of the plant and thus reduce to a minimum the possibility of endangering large numbers of workers. Safety regulations are of the strictest and apply to all persons entering the processing areas of the plants. Typical safety regulations are the prohibition against carrying matches or wearing shoes with exposed nails in the production areas. Only a specified number of persons and a limited quantity of explosives are allowed in any one building at a given time. Particularly hazardous operations are performed behind shields or barricades. The result of these and many other precautions is reflected in the low accident-frequency record of the industry during the present war.

For the most part, the operations involved in the loading and assembling of ammunition have been divided into many small and simple tasks, each of which is assigned to a different operator. In most plants there is considerable shifting of workers from one job to another, caused principally by (1) an attempt to offset the monotony of routine and repetitive work and (2) the continual changes made in production schedules and in the size and type of ammunition being processed.

Some steps in the loading process require that large numbers of workers be assigned to certain operations. Very considerable proportions of the workers on the lines loading bombs, shells, and component parts, for instance, are assigned to assembly work. Numerous operators are also required for the packing and crating departments on all load lines. On the melt-load line, the operators pouring the molten TNT into shell and bomb cavities comprise sizable groups. Relatively few workers, on the other hand, are employed as kettlemen and draw-off operators, whose duties are to tend the large units where the TNT is melted and to draw the molten TNT from these units into large tubs. Only a small crew of kettlemen and draw-off operators is needed to supply a large group of workers employed in the pouring room.

Fifteen of the 38 plants studied, employing 34 percent of the workers, had union agreements covering a large percentage of their employees. Nine additional plants, with 32 percent of the workers, had union contracts which covered only certain groups of employees, such as maintenance or other indirect workers, while the remaining 14 plants, which employed 34 percent of the wage earners, were not unionized. Nearly all union contracts were with the unions affiliated with the American Federation of Labor and with the United Mine Workers of America.

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Wage-Payment Practices

Because of the hazardous nature of the industry, workers employed in ammunition-loading plants are typically paid straight hourly rates. Only 3 of the 38 plants studied employed any workers under incentive methods of wage payment, and most of these workers were in assembly occupations. Incentive workers constituted only about 3 percent of all the workers covered in the survey.

Multiple-shift operations were reported by 35 of the 38 plants. Twenty-two of the plants were on a 3-shift schedule, while 12 were operating two shifts. Of the total number of workers employed by the establishments surveyed, approximately 54 percent were employed on the first shift, 31 percent on the second, and 15 percent on the third. Twenty-three plants reported periodic shift rotation of production workers.

The payment of differentials for work of second and third shifts was reported by 12 plants. Four of these plants were operating only two shifts; and a differential of 5 cents an hour above the first-shift rate was paid to second-shift workers in all 4 plants. Of the 8 plants operating three shifts and paying shift differentials, 4 paid the same premium to both late shifts; in 2 of these 4 plants the differential amounted to 10 percent above the day-shift rate, in 1 plant to 5 percent, and in another to 5 cents an hour. Two plants paid shift differentials amounting to 5 percent more than the first-shift rate to second-shift workers, and 10 percent more to third-shift workers. One plant paid a premium of 5 cents an hour to second-shift workers and of 10 cents an hour to third-shift workers; the eighth plant paid no second-shift differential, but gave a premium of 5 percent for work on the third shift.

Nearly all the plants studied were operating on a scheduled 48-hour workweek. All paid time and a half for work in excess of 40 hours a week or 8 hours a day. Work on the 6 holidays recognized by Executive order was paid for at the rate of time and a half in all but 3 plants. Special provisions were reported for work on the seventh consecutive day by all but 1 of the 38 plants; 36 plants paid double time, and one paid time and a half.

Established entrance rates for male common labor were reported by 30 of the 38 plants. Starting rates for these workers ranged from 40 cents to 85 cents an hour, with 9 plants paying from 70 to 75 cents an hour and 12 plants paying less than 60 cents an hour.

Occupational Earnings

The basic wage data collected during the Bureau's survey are shown for shell- and bomb-loading plants in table 1 and for the bag-loading plants in table 2. Straight-time average hourly earnings are shown, by plant department, for a comprehensive group of occupations in each of these two branches of the ammunition-loading industry.

SHELL AND BOMB LOADING

The wage data obtained for the 35 plants loading bombs, artillery shells, and the related component parts cover 89,850 workers, classified into 106 selected occupational groups. About 58 percent of these

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workers were women. In June 1944, straight-time average earnings amounted to about 77 cents an hour for all the workers for whom data on earnings by occupation were obtained. The general average for male workers employed in these plants was 88 cents an hour, and the corresponding average for women amounted to 70 cents an hour. This wide difference in average earnings for men and women workers is accounted for mainly by the fact that women were generally employed in large numbers in the lower-paid occupations. In the maintenance departments, where the wage rates are relatively high, women were found in only two occupations—journeymen's helpers and class B maintenance mechanics.

TABLE 1.—*Straight-Time Average Hourly Earnings of Workers in Selected Occupations, in Shell- and Bomb-Loading Plants, June 1944*

Occupation	United States		Northeast		Central		South	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Maintenance								
Blacksmiths	35	$1.20	6	$1.14	16	$1.23	13	$1.19
Carpenters, class A	686	1.19	49	1.20	384	1.22	253	1.15
Carpenters, class B	439	1.06	20	1.04	57	1.02	362	1.07
Electricians, class A	489	1.31	14	1.32	334	1.31	141	1.29
Electricians, class B	115	1.11	15	1.13	18	1.10	82	1.11
Helpers, journeymen	702	.83	37	.87	197	.93	468	.78
Helpers, journeymen, female	22	.78	1	(1)	3	.90	18	.76
Instrument repairmen	34	1.24	------	------	15	1.24	19	1.23
Machinists, class A	330	1.26	26	1.18	169	1.30	135	1.22
Machinists, class B	216	1.13	45	1.16	52	1.13	119	1.12
Mechanics, automotive	406	1.15	28	1.16	191	1.14	187	1.15
Mechanics, maintenance, class A	404	1.17	43	1.11	192	1.22	169	1.14
Mechanics, maintenance, class B	535	1.02	79	1.06	187	1.02	269	1.01
Mechanics, maintenance, class B, female	14	.83	2	(1)	------	------	12	(1)
Millwrights, class A	345	1.24	41	1.33	206	1.26	98	1.17
Millwrights, class B	76	1.14	7	1.05	24	1.06	45	1.19
Oilers	84	.89	9	.91	33	1.01	42	.79
Painters	216	1.15	15	1.04	111	1.16	90	1.15
Pipe fitters, class A	409	1.30	33	1.23	233	1.34	143	1.24
Pipe fitters, class B	88	1.15	10	1.16	29	1.11	49	1.17
Scale repairmen	79	1.10	1	(1)	31	1.17	47	1.06
Sheet-metal workers, class A	118	1.29	17	1.31	61	1.31	40	1.25
Sheet-metal workers, class B	18	1.15	------	------	8	1.10	10	1.18
Tool and die makers, class A	136	1.47	25	1.46	79	1.51	32	1.37
Tool and die makers, class B	11	1.26	2	(1)	9	(1)	------	------
Welders, hand	130	1.25	1	(1)	58	1.29	71	1.23
Supervision								
Working foremen	2,427	.96	31	1.04	1,453	1.00	943	.91
Working forcladies	1,490	.83	124	.84	458	.89	908	.80
Processing								
Shell and bomb load lines:								
Melt load:								
Assemblers	1,034	.78	------	------	482	.86	552	.71
Assemblers, female	4,042	.75	------	------	2,719	.78	1,323	.68
Booster-cavity drillers	245	.86	------	------	173	.89	72	.77
Booster-cavity drillers, female	78	.92	------	------	56	.98	22	.76
Cartridge-case fillers	20	.88	------	------	------	------	20	.88
Cartridge-case fillers, female	779	.71	------	------	576	.70	203	.71
Cleaners, funnel and splash pan	263	.88	------	------	154	.91	109	.83
Cleaners, funnel and splash pan, female	291	.77	------	------	251	.78	40	.69
Cleaners, loaded bombs	75	.82	------	------	18	(1)	57	.77
Cleaners, loaded bombs, female	156	.78	------	------	30	(1)	126	.77
Cooling-tub operators	203	.87	------	------	120	.89	83	.83
Cooling-tub operators, female	187	.77	------	------	77	.84	110	.72
Craters	1,094	.79	------	------	517	.86	577	.73
Craters, female	1,796	.70	------	------	826	.79	970	.62
Draw-off operators	252	.92	------	------	176	.96	76	.84
Draw-off operators, female	51	.90	------	------	32	.93	19	.84
Inspectors	801	.96	------	------	603	.98	198	.89

[1] Number of workers and/or plants too small to justify computation of an average.

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TABLE 1.—*Straight-Time Average Hourly Earnings of Workers in Selected Occupations, in Shell- and Bomb-Loading Plants, June 1944*—Continued

Occupation	United States		Northeast		Central		South	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Processing—Continued								
Shell and bomb load lines—Continued.								
Melt load—Continued.								
Inspectors, female	1,089	$0.75	------	------	293	$0.79	796	$0.73
Kettlemen	435	.91	------	------	297	.94	138	.84
Kettlemen, female	130	.87	------	------	100	.89	30	.78
Packers	289	.78	------	------	114	.89	175	.71
Packers, female	987	.72	------	------	731	.76	256	.64
Pourers and puddlers	973	.88	------	------	556	.91	417	.83
Pourers and puddlers, female	2,066	.82	------	------	1,386	.87	680	.73
Primer-press operators	20	.80	------	------	11	.89	9	.70
Primer-press operators, female	125	.74	------	------	81	.76	44	.70
Salvagers	165	.81	------	------	88	.86	77	.75
Salvagers, female	93	.71	------	------	51	.70	42	.72
Screeners, powder	718	.86	------	------	402	.90	256	.79
Screeners, powder, female	336	.82	------	------	267	.81	69	.83
Set-up operators	249	.74	------	------	68	.91	181	.68
Set-up operators, female	193	.83	------	------	134	.89	59	.70
Split operators	73	.86	------	------	54	.86	19	.85
Split operators, female	10	.77	------	------	5	(1)	5	(1)
Spray painters	79	.76	------	------	34	.77	45	.76
Spray painters, female	100	.79	------	------	76	.80	24	.77
Unpackers and cleaners	435	.77	------	------	314	.78	121	.73
Unpackers and cleaners, female	1,269	.74	------	------	969	.76	300	.68
X-ray operators	14	.84	------	------	13	.86	1	(1)
X-ray operators, female	56	.77	------	------	33	.88	23	(1)
Press load:								
Assemblers	404	.84	69	$1.03	71	.83	264	.79
Assemblers, female	4,108	.71	1,594	.77	651	.69	1,863	.66
Cartridge-case fillers	45	.81	35	.82	------	------	10	.78
Cartridge-case fillers, female	947	.67	129	.75	185	.60	633	.67
Consolidating-press operators	107	.91	9	(1)	50	(1)	48	.89
Consolidating-press operators, female	376	.82	247	.85	106	.77	23	(1)
Craters	237	.77	8	(1)	101	.85	128	.68
Craters, female	219	.62	9	(1)	36	.72	174	.59
Crimping-machine operators	126	.87	64	(1)	57	(1)	5	(1)
Crimping-machine operators, female	93	.83	------	------	93	.83	------	------
Facers and buffers	111	.88	65	.90	------	------	46	.85
Facers and buffers, female	289	.65	36	.75	168	(1)	85	.62
Inspectors	269	.85	121	.88	2	(1)	137	.82
Inspectors, female	1,060	.68	305	.74	265	.65	490	.67
Loaders, projectile	349	.89	180	.90	------	------	169	.88
Loaders, projectile, female	741	.70	54	.81	180	(1)	507	.71
Packers	197	.79	84	.85	------	------	113	.74
Packers, female	643	.69	171	.79	175	.68	297	.65
Paint machine operators	34	.86	17	.91	2	(1)	15	.81
Paint-machine tenders, female	248	.64	27	.78	64	.61	157	.63
Pellet-press operators	27	.84	14	(1)	------	------	13	.81
Pellet-press operators, female	213	.73	6	(1)	93	.76	114	.69
Primer-press operators	52	.76	16	.80	20	(1)	16	.79
Primer-press operators, female	732	.65	75	.78	236	.59	421	.66
Salvagers	214	.86	96	.97	29	.82	89	.76
Salvagers, female	426	.72	173	.74	6	(1)	247	.70
Screeners and blenders	185	.88	76	.92	46	.93	63	.81
Screeners and blenders, female	31	.71	------	------	------	------	31	.71
Unpackers and cleaners	159	.87	79	.93	36	.87	44	.75
Unpackers and cleaners, female	278	.67	8	.84	66	.66	204	.67
Component parts:								
Primer line:								
Craters	47	.70	2	(1)	2	(1)	43	.69
Dipping-room attendants	8	.87	------	------	7	(1)	1	(1)
Head-assembly machine operators	8	.85	------	------	5	.96	3	(1)
Head-assembly machine operators, female	57	.66	------	------	------	------	57	.66
Head-assembly machine tenders, female	221	.66	9	(1)	15	.74	197	.65
Inspectors, female	687	.68	111	.64	115	.75	461	.67
Lacquering-machine operators	8	.81	------	------	5	.92	3	(1)
Lacquering-machine operators, female	80	.66	14	(1)	------	------	66	.65
Lacquering-machine tenders	13	.61	------	------	------	------	13	.61
Lacquering-machine tenders, female	235	.68	38	(1)	19	.78	178	.67
Liner inserters, hand, female	170	.67	41	(1)	63	.71	66	.64
Liner inserters, machine, female	102	.70	------	------	29	.82	73	.66
Loaders, hand	7	.84	3	(1)	------	------	4	(1)

(1) Number of workers and/or plants too small to justify computation of an average.

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TABLE 1.—*Straight-Time Average Hourly Earning of Workers in Selected Occupations, in Shell- and Bomb-Loading Plants, June 1944*—Continued

Occupation	United States		Northeast		Central		South	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Processing—Continued								
Component parts—Continued.								
Primer line—Continued.								
Oilers, female	5	$0.81	1	(1)	4	(1)	------	------
Packers	45	.76	------	------	15	$0.76	30	$0.77
Packers, female	131	.70	------	------	25	.75	106	.69
Salvagers	41	.70	26	(1)	2	(1)	13	.77
Salvagers, female	105	.70	36	(1)	9	.89	60	.71
Screeners	18	.93	3	(1)	7	.99	8	.94
Screeners, female	27	.82	------	------	15	(1)	12	(1)
Tube-assembly machine operators, female	223	.69	------	------	23	.82	200	.67
Volumetric-loading machine operators, female	61	.73	18	(1)	29	.83	14	(1)
Fuze, booster, and detonator lines:								
Assemblers	1,529	.69	73	$0.80	280	.81	1,176	.66
Assemblers, female	15,918	.66	3,145	.70	2,843	.70	9,930	.64
Craters	253	.70	24	.81	44	.81	185	.66
Craters, female	52	.74	------	------	35	(1)	17	.62
Inspectors	199	.81	162	.81	4	(1)	33	.75
Inspectors, female	2,233	.69	769	.74	113	.77	1,351	.65
Inspectors, powder pellet	19	.82	15	.80	2	(1)	2	(1)
Inspectors, powder pellet, female	171	.74	36	.79	6	.81	129	.72
Packers	199	.66	------	------	29	.81	170	.64
Packers, female	483	.65	70	.63	80	.72	333	.63
Pellet-press operators	167	.91	18	.93	34	.95	115	.90
Pellet-press operators, female	410	.82	106	.89	114	.88	190	.74
Salvagers	159	.80	24	(1)	29	.87	106	.77
Salvagers, female	310	.69	147	(1)	15	.81	148	.61
Screeners and blenders	403	.86	27	.89	201	.82	175	.89
Screeners and blenders, female	101	.87	------	------	7	.84	94	.87
Powerhouse								
Ashmen	25	.63	5	(1)	3	(1)	17	.54
Coal handlers	39	.72	18	(1)	5	.77	16	.59
Engineer, stationary	178	1.24	5	1.17	113	1.29	60	1.14
Firemen, stationary boiler	409	.95	63	.96	194	.96	152	.92
Recording and control								
Magazine keepers	163	.90	16	(1)	34	.90	113	.92
Stock clerks	415	.90	8	.83	172	.84	235	.77
Stock clerks, female	23	.75	3	(1)	4	.76	16	.77
Stockmen	443	.82	110	.87	127	.89	206	.76
Timekeepers	333	.91	16	(1)	200	.95	117	.83
Timekeepers, female	328	.75	101	.78	116	.75	111	.74
Tool clerks	127	.89	4	.83	94	.89	29	.92
Tool clerks, female	43	.75	------	------	22	.78	21	.71
Material movement								
Brakemen	319	1.09	40	.94	165	1.14	114	1.05
Conductors, yard	159	1.20	------	------	99	1.22	60	1.15
Conveyor tenders	201	.80	40	.83	95	.89	66	.65
Conveyor tenders, female	100	.71	------	------	50	.85	50	.58
Engineers, locomotive	206	1.26	2	(1)	136	1.31	68	1.17
Firemen, locomotive	58	1.10	------	------	45	1.13	13	.99
Loaders and unloaders	4,538	.72	255	.80	2,650	.79	1,633	.59
Loaders and unloaders, female	413	.62	------	------	141	.77	272	.55
Truck drivers	2,013	.89	234	.94	939	.91	840	.85
Truck drivers, female	134	.75	------	------	41	.93	93	.66
Truckers, hand	1,743	.74	164	.93	416	.89	1,163	.65
Truckers, hand, female	772	.75	17	.79	271	.86	484	.69
Truckers, power	146	.83	2	(1)	121	.85	23	.72
Truckers, power, female	254	.79	------	------	215	.78	39	.82
Custodial								
Change-house attendants	165	.71	5	.80	126	.73	34	.62
Change-house attendants, female	244	.68	17	.65	119	.66	108	.70
Firemen, plant protection	669	.81	24	.86	376	.82	269	.79
Guards	2,986	.83	389	.84	1,601	.84	996	.81
Guards, female	181	.73	13	.78	168	.73	------	------
Janitors	1,111	.69	166	.75	662	.73	283	.57
Janitresses	1,771	.51	55	.75	397	.72	1,319	.44

[1] Number of workers and/or plants too small to justify computation of an average.

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For all occupations studied, the average earnings ranged from 51 cents an hour for janitresses to $1.47 an hour for class A tool and die makers. The average earnings of the majority of the workers, however, fell within a much more limited range. Occupations with average earnings ranging from 65 cents to $1.00 an hour accounted for 90 percent of the workers. Average earnings in the 10-cent interval between 65 and 75 cents an hour accounted for well over half of the workers, while slightly less than a third were in occupations averaging between 75 and 90 cents an hour. The greatest concentration of workers within any 5-cent interval occurred in the 21 occupational groups with earnings between 65 and 70 cents, where fully three-tenths of the workers were employed. Average earnings amounting to less than 65 cents an hour were paid to only six occupational groups and accounted for 3 percent of the workers studied. At the other extreme, about 7 percent of the workers were classified in the 27 occupational groups whose earnings amounted to an average of $1.00 or more an hour. These occupational groups were composed of male workers in indirect rather than processsing jobs.

Workers employed in maintenance occupations were, in general, receiving the highest average rates of pay. With only two exceptions (oilers, earning 89 cents an hour, and journeymen's helpers, earning 83 cents an hour), male workers in these occupations were paid well over $1.00 an hour. Women workers, employed in two maintenance occupations (journeymen's helpers and class B maintenance mechanics) earned respective average rates of 78 cents and 83 cents an hour. Other numerically important groups of workers not employed in processing occupations were male loaders and unloaders, truck drivers, and hand truckers. The respective averages for these occupations were 72 cents, 89 cents, and 74 cents an hour. The large group of male guards averaged 83 cents an hour.

Approximately two-thirds of the workers whose occupational earnings were studied were employed in processing jobs on the various load lines. Average earnings for these workers on all the load lines combined amounted to 73 cents an hour. The average for male load-line operatives was 82 cents an hour and for women 70 cents an hour. The highest average rate earned by male workers was paid to inspectors on the melt-load line, who earned 96 cents an hour; the lowest rate for male workers (61 cents an hour) was paid to the small group of lacquering-machine tenders on the primer-loading line. Average hourly earnings for women on the load lines ranged from 62 cents an hour for shell craters on the press-load lines to 92 cents an hour for booster-cavity drillers on the melt-load lines.

Somewhat more than nine-tenths of the women employed on the load lines were classified in the 42 occupational groups having average rates between 65 and 80 cents an hour. The largest concentration of male workers occurred in the 18 occupational groups whose average earnings ranged from 85 to 90 cents an hour. These occupations accounted for one-third of the male workers.

On each line except the primer-loading lines, where most of the operations are mechanized, assemblers constituted the largest occupational group for women workers. This concentration is particularly great on the lines loading fuzes, boosters, and detonators, most of the operations of which involve the relatively simple assembly of small parts, and on which women constitute about 85 percent of all workers em-

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ployed. About 8 of every 10 women employed on these component-loading lines were classified as assemblers and received an average hourly rate of 66 cents an hour. The average earnings of women assemblers on the melt-load line amounted to 75 cents an hour and on the press-load line, to 71 cents an hour. Male assemblers on the melt-load, press-load, and component lines earned average rates of 78 cents, 84 cents, and 69 cents an hour, respectively. Two other numerically important groups of male workers were shell and bomb craters on the melt-load lines, who earned an average rate of 79 cents an hour, and pourers and puddlers, whose earnings averaged 88 cents an hour.

In most of the occupations in which both men and women were employed, the averages shown appear to indicate a wage difference in favor of the male workers. In many cases, however, this difference actually reflects minor variations in duties. The male workers are generally required to do any heavy lifting which may be connected with the performance of a particular operation. The packing and crating occupations on the shell- and bomb-loading lines furnish good examples of this difference in duties. Women are employed in these jobs, but the lifting of heavy shells and crates is usually assigned to male operators. Other differences in duties within the same general occupational groups may occur if male operators are responsible for the operation of equipment also used by women workers at the same station on the line. On the primer-loading line, for instance, the machine used for lacquering the primer bodies is usually started and maintained by a male operator who may also be responsible for keeping the machine in good working order and supplied with the lacquer solution.

In a few of the processing occupations the average hourly rate shown for female operators is higher than the average earned by male operators. This is generally a result of interplant differences in plants that did not employ both men and women in these particular jobs. Within individual plants, where both men and women were employed in these occupations, the rates paid to male workers were consistently as high as the rates earned by the women.

Regional comparisons.—The 38 plants included in this study are in widely separated wage areas. Consequently there was a considerable range between the highest and the lowest rate paid to workers in many of the occupations. In order to reduce somewhat the effect of extreme locality differences on average hourly earnings reflected in the general averages discussed above, separate figures are shown for three broad regional groups of plants. Because of the relatively small number of plants studied in the survey, however, even these three regions represent plants in widely separated wage areas. Thus, figures shown for the Northeastern region represent plants located in Massachusetts, Delaware, Maryland, Pennsylvania, and New Jersey; the Central region includes plants in Illinois, Ohio, Kentucky, Indiana, Iowa, Kansas, and Nebraska; the Southern region includes plants scattered from Virginia to Texas, including Tennessee, Mississippi, North Carolina, Georgia, Louisiana, and Arkansas.

Because of variations in products manufactured from plant to plant, not all occupational groups are represented in all three regions. For instance, in the Northeastern region none of the plants for which figures are shown were loading large shells and bombs by the melt-

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load process. However, a comparison of the averages appearing in all 3 regions reveals that plants in the Northeastern region paid, in general, slightly higher average rates for most occupations than those in either of the other two regions, and that plants in the Central and Southern States ranked second and third respectively. For the occupations for which averages are shown in all three regions, the averages for the South are lowest in 33 occupational groups, and highest in only 5 occupational groups. The Northeastern region had the highest averages in 25 occupations, and the lowest in 11, while the Central region ranked first in 22 occupational groups and third in 9. On the melt-load lines, where only the Central and Southern regions are represented, the plant averages for the South are lowest in all but 3 of the occupational groups for which averages are shown.

A further attempt was made to measure and compare the *general level* of wages in the industry existing in each broad region at the time of the survey. The average hourly earnings of 73 occupations, all of which occurred in each region, were weighted for each region by the number of workers employed in the occupations for all regions combined, thus giving each occupation the same relative importance in all regions. A general average for these occupations was then computed for each region. The resulting average for the Northeast was 83 cents an hour; for the Central region, 81 cents; and for the South, 73 cents. The corresponding average for all regions combined (that is, for the same 73 occupations) amounted to 77 cents an hour, or the same as that for all the 106 occupations selected for study and mentioned earlier in the report.

Constant employment weights were also used to compute a general average for the 102 occupational groups found in both the Central and Southern regions. This average was computed in order to compare the two regions having plants loading large shells and bombs and also having representation in most of the occupations studied. The resulting average for the Central and Southern regions were 82 cents and 73 cents, respectively. Again, the corresponding average for all regions combined was 77 cents an hour.

BAG LOADING

The wage data collected for the 3 bag-loading plants cover 8,172 workers, classified into 40 occupational groups. Slightly more than two-thirds of all the workers studied were women. Straight-time average earnings for all workers amounted to 71 cents an hour. The average for all male workers studied was 81 cents an hour and that for women workers 66 cents an hour.

No women were employed in the maintenance occupations studied. With the exception of journeymen's helpers, who earned 66 cents an hour, the averages for male workers in these occupations ranged from 90 cents an hour for oilers and scale repairmen to $1.31 for class A pipe fitters.

Occupational earnings for women employees ranged from 48 cents an hour for janitresses to 78 cents for inspectors. Aside from maintenance occupations, the range in average rates for male workers was from 59 cents an hour for change-house attendants to $1.28 an hour for locomotive engineers. The highest average for processing workers was earned by the small number of male dyeing-machine tenders. Nearly 87 percent of all the workers were employed in occupations

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whose average hourly earnings ranged from 60 to 80 cents. Roughly a third were concentrated in the four occupations with earnings from 60 to 65 cents an hour, and nearly a third were in five occupations whose average earnings fell within the range of 65 to 70 cents.

The women sewing-machine operators making powder bags accounted for the largest occupational group, and were paid 63 cents an hour. The women performing the operation of closing the loaded bags on sewing machines earned 68 cents an hour. Three other numerically important groups of women operators were the powder-bag loaders, the shadowgraph-scale operators, and the volumetric weighers. The respective averages for these occupations amounted to 65 cents, 69 cents, and 68 cents.

Among male workers, the two largest groups were hand truckers and loaders and unloaders, with average rates amounting to 79 cents and 77 cents, respectively. The guards, constituting another important group of male workers, earned 85 cents an hour. In the processing occupations, men were found in smaller numbers than women. The male powder-bag loaders earned 64 cents an hour, on the average, or 1 cent less than women in the same occupation. Within individual plants, however, these workers were paid rates amounting to as much as those paid women in the same occupation.

TABLE 2.—*Straight-Time Average Hourly Earnings of Workers in Selected Occupations in Ammunition Bag-Loading Plants, June 1944*

Occupation	Number of workers	Average hourly earnings
Maintenance		
Carpenters, class A	41	$1.16
Carpenters, class B	22	1.12
Electricians, class A	22	1.26
Electricians, class B	21	.98
Helpers, journeymen	166	.66
Machinists, class A	11	1.13
Machinists, class B	23	1.06
Mechanics, automotive	35	1.12
Mechanics, maintenance, class A	20	1.13
Mechanics, maintenance, class B	51	.98
Oilers	4	.90
Painters	14	1.06
Pipe fitters, class A	12	1.31
Scale repairmen	37	.90
Welders, hand	5	1.15
Processing		
Cloth spreaders	5	.77
Cutters, machine	31	.89
Dyeing-machine tenders	6	1.06
Inspectors	63	.85
Inspectors, female	321	.78
Loaders, powder bag	217	.74
Loaders, powder bag, female	791	.65
Packers	141	.82
Packers, female	283	.75
Printers	8	.92
Printing-press feeders, female	199	.63
Sewing-machine operators (bag closers)	75	.72
Sewing-machine operators (bag closers), female	574	.68
Sewing-machine operators (bag makers), female	2,170	.63
Processing—Continued		
Shadowgraph-scale operators	15	$0.79
Shadowgraph-scale operators, female	470	.69
Volumetric weighers	40	.70
Volumetric weighers, female	547	.68
Powerhouse		
Firemen, stationary boiler	16	1.00
Recording and control		
Stock clerks	32	.94
Stockmen	108	.79
Material movement		
Brakemen	8	.92
Conductors, yard	5	1.12
Engineers, locomotive	6	1.28
Loaders and unloaders	400	.77
Truck drivers	81	.76
Truck drivers, female	25	.73
Truckers, hand	546	.79
Custodial		
Change-house attendants	15	.59
Change-house attendants, female	9	.58
Firemen, plant protection	77	.81
Guards	254	.85
Janitors	67	.62
Janitresses	83	.48

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