# WOMEN'S WARTIME HOURS OF WORK

THE EFFECT ON THEIR FACTORY PERFORMANCE
AND HOME LIFE

WOMEN'S BUREAU BULLETIN NO. 208

UNITED STATES DEPARTMENT OF LABOR

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L. B. SCHWELLENBACH, Secretary

WOMEN'S BUREAU

FRIEDA S. MILLER, Director

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# LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
WOMEN'S BUREAU,
*Washington, June 7, 1946.*

SIR: I have the honor to transmit herewith the Women's Bureau study of the effect of different factory hours on the productive efficiency, attendance record, and home life of women workers. The investigation covered 13 selected plants.

The study was confined to war years. It therefore includes many housewives and other women workers who do not normally form a part of the labor force. Covering a period when the war stimulated all-out production, and factors more cogent than economic need alone were conducive to staying on the job, these findings nevertheless indicate, to an extent, the performance that can be expected of women factory workers under different hour-schedules under normal peacetime conditions. The findings also indicate the many off-the-job responsibilities that must be considered in setting a suitable and efficient work schedule for women employees.

The report was written by Margaret Kay Anderson, Field Supervisor, based on an analysis prepared by Bertha M. Nienburg, former Chief Economist of the Bureau, who also planned and directed the study. The field work was directed by Margaret Kay Anderson. Basic tabulations were prepared by Leo Robison of the Statistical Section.

FRIEDA S. MILLER, *Director.*

Hon. L. B. SCHWELLENBACH,
*Secretary of Labor.*

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# WOMEN'S WARTIME HOURS OF WORK

## SUMMARY OF 13 PLANT SURVEYS

### INTRODUCTION

In a war period with its greatly expanded production program, hours of work are lengthened, sometimes excessively, and many new workers are hired as a means of attaining the highest possible output of essential war materials. Women who are not normally in the labor market are drawn into factories, and as the war is prolonged, housewives increasingly form the backlog of war production forces. All pressures upon the wage earning woman are intensified. The draft of many men into the armed forces increases the urge for maximum production. At the same time it increases the demands made by responsibility for children, dependents, and the home.

As months of war work lengthened into years during World War II, reports of increasing fatigue among women employees became numerous; absenteeism occasioned much comment; and in the summer of 1943 the War Production Board reported a slowing down of production. The time was propitious to seek an answer to the question of what scheduled hours are best to maintain a stable, healthy staff of women workers able to carry on a sustained, high-quality production over an extended period.[1]

To determine the most healthful, as well as the most efficient, workday and workweek for women employees during a war period or any period, it is necessary to consider the demands on the woman worker not only on the job but in the home and in going to and from the place of employment. Not only must the industrial work she performs, the conditions under which she works, and the time of day in which the work is done be analyzed, but these must be correlated with her home demands and home environment. All these factors sum up her total effort during the day and week and determine whether her fatigue is such that it can be overcome by rest and recreation following the day's work, or whether she fails to recuperate and becomes more tired every day. Such cumulative fatigue may show itself in illness, irritation, and general inability to carry on her job and her home duties with reasonable ease. When such a condition results, not only are the individual woman and her family affected, but the social implications are widespread and her fitness to serve the wartime needs as well as the peacetime needs of the Nation is greatly lessened.

In this study the performance of women workers under different scheduled hours was reviewed in 13 plants. A great variety of scheduled hours was covered: daily hours ranged from 7½ to 10½, and weekly hours from 40 to 60. A total of 3,261 women were studied in selected occupations involving varying degrees of skill and of physical and mental demands.

The occupations studied, save a few minor ones, were man-paced. Machines operated included different types of punch presses, drill presses, lapping machines, coil winding machines, power sewing machines, looping and

[1] See p. 185 for a reference list of similar studies made in the United States and Great Britain.

transfer top knitting machines. Hand operations included riveting, soldering, welding, drilling, stator winding, armature winding, armature connecting, coil taping, hand packing, visual and gage inspecting, and various types of assembling. Neither the machine nor hand operations could be considered heavy muscular work. Rather the operations called for varying degrees of finger dexterity and wrist, arm, or shoulder motions.

In some occupations, such as looping, the fatiguing elements were close eye application, maintenance of the same posture, and performance of the same tasks at a high rate of speed. In others the complexity and variations of the tasks relieved the monotony and lessened the speed but increased the need for alert attention to specifications. In some occupations, such as punch-press operating, good eye, hand, and foot coordination was necessary, and knowing the accidents which might result from lack of such coordination constituted a strain. In a few occupations continuous standing was necessary. In still others, such as riveting and aircraft assembly, moving about was excessive, and noise and vibration were necessary concomitants of the jobs.

The occupational groups included and the products manufactured in each of the 13 plants studied were:

| *Plant* | *Occupationdl Group* | *Product* |
|---|---|---|
| A | Stator winders, armature winders, armature connectors, coil winders, coil tapers, etc. | Fractional horsepower and industrial motors |
| B | Punch-press operators | Cylinder head gaskets |
| C | Punch-press operators | Oil seals or grease retainers for ball bearings |
| D | Precision drillers and automatic-machine operators | Rotors for artillery ammunition |
| E | Machine lappers | Injector bushings for Diesel engines |
| F | Metal fabricators, solderers, welders, and sheet-metal assemblers | Aircraft radiators, oil coolers, and cabin heaters |
| G | Riveters and general aircraft assemblers | Aircraft |
| H | Light-machine operators, bench assemblers, and inspectors | Roller, silent, and conveyor chains |
| J | Light-machine operators, bench assemblers, and inspectors | Electrical connectors |
| K | Hand packers | Builders' hardware |
| L | Loopers and seamers | Full-fashioned hosiery |
| M | Loopers and transfer top knitters | Seamless hosiery |
| N | Power-sewing machine operators | Corsets and brassieres, and parachutes |

The 8-hour day 40-hour week, and varying schedules of 7½ to 7⅗ hours a day and 42½ to 45 hours a week, proved to be the best from the standpoint of regularity of attendance in the factory; lost time per 100 possible man-hours of work was the lowest under these hours. There was also a preponderance of opinion in favor of the 8-40-hour schedule among the women interviewed, 40 percent preferring this schedule. The women felt they were best able to meet their off-the-job-responsibilities and still have time for leisure and rest under these hours. Second in preference was the 8-hour day 48-hour week, which was favored by 19 percent of the women.

It was not possible to compare productive efficiency under widely different hours because the majority of women limited their hours of work to around

48 and 50 a week when on a schedule of 54 to 60 hours, which were the longest weekly hours studied. Regardless of the factory's scheduled hours, the women either would not or could not work longer weekly hours for any extended period. Individual productivity seemed little affected by hours worked when weekly hours attended were limited to around 48 and 50; the women could produce at about the same rate whether working 8, 9, or 10 hours a day during days they reported for work.

Thus it would seem that total production of a group of women workers cannot be increased by lengthening scheduled hours much beyond 48 a week, because women will not work longer hours than this for any extended period, even in war times.

This study was made under wartime conditions and included many housewives and other women who are normally not a part of the labor force. Under peacetime conditions when there is not the wartime stimulus for maximum production and good attendance on the job, it might very well be that productive efficiency could not be sustained under hours as long as 48 and 50 a week. More probably, optimum hours for women from a production standpoint under peacetime conditions would fall somewhere between 40 and 48 a week, while optimum hours, from the standpoint of good attendance on the job and from the standpoint of meeting the preference of women workers, would be near 8 hours a day and 40 hours a week.

## HOME DEMANDS IN RELATION TO HOURS WORKED

The woman war factory worker was, in the main, a woman with family and household responsibilities. She tried to maintain and increase her standard of performance in the factory and still maintain her standards for home and family. Faced with major difficulties in marketing for food and in securing any paid household help, she limited her hours of performance in the plant to permit her partially to fulfill her personal and household duties regardless of the factory's scheduled hours.

Forty percent of the women interviewed preferred the 8-hour day and 40-hour week, believing they could more easily meet their personal and household responsibilities and still have time for rest and leisure under this schedule. Also, the best attendance record was made under the 8-40-hour week and under the varying schedules of 7½ to 7⅗ hours a day and 42½ to 45 hours a week. Under these hours there was least lost time per 100 possible man-hours of work.

That fatigue was present under the longer schedules of hours was evidenced by the fact that some women went to bed at an earlier hour when working more than 8 hours a day, and many admitted they were absent because they were "tired" rather than ill. Under each hour schedule about ⅓ of the workers did not get more than 7 hours sleep regularly. The proportion with less than 6 hours sleep increased under the 9½- or 10-hour day.

The second-shift worker reached home soon after midnight under an 8-hour day; this permitted the woman worker to get to bed while the family was sleeping. Under the 10-hour schedule she arrived home as the rest of the family was getting started for the day and had to get her sleep during the day. While the second shift gave the women time at home to care for their families, under the longer schedule of daily hours, it cut into their hours of undisturbed rest.

When the workday was lengthened to 9 and 10 hours and ended between 5 and 6 o'clock, food stores were usually closed before the factory worker

could reach them. In a few instances the marketing was turned over to other members of the family. Usually, however, it had to be done on Saturdays, if that day was partially free, or the women shopped during the lunch period or took time off from work during the day to do marketing. The dinner hour was advanced under the longer hour schedules, and this later dinner hour left little time for other tasks after dishes were washed. Often Sunday became a day of laundering and cleaning, rather than a day of rest and recreation.

The home and family demands upon women workers varied with the woman's age and marital status, the family's circumstances, and inherited or environmental standards of living. Because the plants included were located in 11 communities ranging from rural towns to metropolitan centers, because they were in 7 States—Connecticut, Rhode Island, Pennsylvania, Tennessee, Ohio, Michigan, and Kansas—women studied had different nationality backgrounds and diverse living and social standards.

These were revealed in attitudes toward the evening meal and care of the home. A meal of fresh meat, vegetables, and homemade dessert was regarded as essential for their families by many women workers; to others delicatessen and canned foods sufficed when they were short of time. To some women workers, their home, purchased or being purchased and furnished through careful savings, was a very precious possession to be kept in good condition regardless of other demands upon them. To many others, the urge to keep the house or apartment nice was in continuous conflict with the "too tired" feeling at the end of a long day of factory work. To some few, rented quarters made little demand upon their sensibilities for regular and thorough cleaning.

Eighty-two percent of the women lived in family households, 11 percent had their own apartment or housekeeping room, and only 7 percent roomed and boarded.

Thirty-six in every 100 women interviewed in this study not only had the responsibility for the family but did the major part of the housework themselves. This included the ever-recurring marketing and cooking of two meals a day and the weekly tasks of washing, ironing, and housecleaning. Half the women shared the household duties with other members of the family. Only 9 in every 100 women reported that they lived at home but assumed no continuous household duties.

Sixty-five percent of the women were married, widowed, or divorced. Half of these women reported they had the general responsibility for the home and did the major part of the work. They accomplished the following services with varying degrees of thoroughness: getting breakfast, putting up lunches, making beds, marketing, preparing the evening meal, washing dishes, washing and ironing clothes and household linens, housecleaning, and mending clothes. When the workday ended around 3 or 4 p.m., under schedules of 8 hours a day or less, marketing could be done on the way home, an early dinner was served, and there was time for some other household or personal tasks or recreation at night. When Saturday was a day free from factory work, it became the day for mass buying of foods, for doing the laundry, and for major housecleaning. This left Sunday for extra tasks, rest, and recreation.

Such was the household burden of the half, in the group of married, widowed and divorced women, who carried the major part of their household responsibilities alone. The second largest group shared some of the household duties with other members of the family. What was done by the married woman, and what by her daughter or other relative living in the

household, depended somewhat on the woman's free time in relation to the demands on other members of the family. A few lived with relatives who relieved them of all household duties.

Over a third of all households in which married or widowed women lived had children under 14 years of age. Care when the mother was away at work was given these children most frequently by adult relatives living in the household. The husband on a different shift from the wife served as a second source for child care. Little use was made of child-care nurseries and only a few families used paid service to care for children. The school child able to take care of his own physical needs was the child sometimes left without anyone in the home to guide him when he came home from school. The presence of children in the home caused some women to work on the second or third shift. This permitted them to get the children ready for school and sometimes to see them when they returned home. Whereas older children usually helped the working mother with household tasks, unquestionably the woman with children under 14 years of age had more demands made upon her energies by her family than any other working woman.

One-eighth of all single women workers visited carried general responsibility for their households and had major household tasks. These were older women who frequently had the care of elderly fathers or mothers or disabled relatives. Their burden was often heavier than that of many married women workers, for the single woman was without the financial help or the household assistance of a man approximately her own age.

Sixty in every 100 single women helped with housework and usually did their own laundry and room-cleaning. Twenty in every 100 had mothers who did everything for them. The remaining small percent of single women roomed and boarded.

## HOURS PREFERRED BY WOMEN WORKERS

When the women visited in their homes were asked the hours they preferred to work, they were also asked to take into consideration the loss of overtime pay when working no more than 8 hours a day and 40 hours a week. Forty percent, as stated, preferred the 8-hour day 40-hour week; the better balance between factory and home demands believed possible under this schedule meant more to them than did the added overtime pay under longer hours. Nineteen percent preferred the 8-hour day 48-hour week. No other specific combination of daily and weekly hours was desired by more than 6 percent of women workers.

When daily hours alone were considered, 68 percent preferred the 8- or 8½-hour day. When weekly hours were considered, 40 percent preferred a 40-hour week; 16 percent preferred over 40 hours, to and including 45 hours; 22 percent, 47½ and 48 hours; and 11 percent, 50 hours a week. The 5-day week was preferred by 60 percent of the women.

These women were thinking in terms of the wage scale at the time they were interviewed in 1944 or 1945. When women expressed a preference for longer hours, it was primarily because of financial responsibilities requiring all possible earnings for present and future needs. Whereas an overwhelming number preferred the day shift, there were some women in each plant operating a night shift who preferred that shift when it began in the late afternoon and ended around midnight.

Below is a tabulation of the hour preferences of the 566 women inter-

viewed when they took into consideration the loss or decrease in overtime pay under the shorter hour schedules:

| | *Percent of women preferring specified days or hours* |
|---|---|
| *Number days per week:* | |
| 5-day week | 60 |
| 5 days and short Saturday | 16 |
| 6-day week | 24 |
| *Daily hours:* | |
| Less than 8 hours | 8 |
| 8 or 8½ hours | 68 |
| 9 or 9½ hours | 15 |
| 10 or 10½ hours | 9 |
| *Weekly hours:* | |
| Less than 40 hours | 5 |
| 40 hours | 40 |
| Over 40 and including 45 hours | 16 |
| 47½ and 48 hours | 22 |
| 50 hours | 11 |
| 53 or 54 hours | 2 |
| 55 hours | 3 |
| 57 or 60 hours | 1 |
| *Combination daily and weekly hours:* | |
| 8 hours 5 days a week | 40 |
| 8 hours 6 days a week | 19 |
| 7 hours and fractions of an hour, 5 days a week | 6 |
| 9 hours 5½ days a week | 6 |
| 10 hours 5 days a week | 6 |
| 8 hours 5½ days a week | 5 |
| 9 hours 5 days a week | 5 |
| No other combination preferred by more than | 2 |

## ATTENDANCE RECORD IN RELATION TO SCHEDULED HOURS[2]

The women workers studied had the best record of attendance under the 8-40-hour schedule and the different schedules of 7½ to 7⅗ hours a day and 42½ to 45 hours a week. Hours lost per 100 possible man-hours of work averaged only 8.7 in all plants having a 40-hour schedule and 8.8 in plants having schedules of less than 8 hours a day. The second best record of attendance was under the 8-48-hour schedule (8½-48 hours in one plant), with 9.6 hours lost per 100 possible man-hours of work.

There was a decided increase in lost time when hours were increased above 8 a day. Under the different schedules of 9 to 9⅘ hours a day and 45 to 54 hours a week the man-hours lost averaged 12.4. And, man-hours lost per 100 possible man-hours of work were the very highest under the 10-hour-day and 50- to 60-hour-week schedules, with hours lost averaging 14.6.

Examination of table I reveals the wide range in the proportion of time lost by women who were working the same scheduled hours in different plants, but, whatever the proportion of lost time in the shortest-hour period in each plant, the proportion of lost time increased in the longer-hour periods.

There was a self-adjustment of weekly hours by the women workers to bring about a balance between home and factory demands; and all the women included in each plant did not work much over 48 hours a week over an extended period, even under the longest hour schedules studied which were 54 to 60 hours a week. Some had personal and home demands that

[2] The 8-40-hour period in Plant B is excluded from this attendance summary because of the high proportion of older women responsible for many long-term absences, in this period as compared with other periods. The 51-54-hour period in Plant D is also excluded from the discussion because of the competitive production drive which distorted the attendance figures in this period.

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## Table 1. — Man-hours Lost per 100 Possible Man-hours by All Women Studied Under Different Scheduled Hours in Each Plant

| Scheduled hours in shortest-hour period studied in each plant | | | Man-hours lost per 100 possible man-hours in shortest-hour period studied in each plant | Man-hours lost per 100 possible man-hours in longer-hour periods studied when scheduled hours were[1]— | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Daily hours | Weekly hours | Plant [2] | | 8-48 hours (B), (N)<br>8½-48 hours (C) | 8½-51 and 9-54 hours (D) | 9¼-47½ hours (J)<br>9-45 and 9½-46 hours (L) | 9½-52¼ and 10-55 or 56½ hours (D) | 9-54 hours (D), (B), (G)<br>9 4/5-54 hours (E) | 10-50 hours (G)<br>10-54 or 55 hours (K)<br>10-55 hours (A), (H) | 10-60 hours (F), (G) |
| 7½ | 45 | D | 6.0 | ..... | [3] 5.4 | ..... | 7.1 | 8.3 | ..... | ..... |
| 7 2/3 | 44 2/3 | E | 9.1 | ..... | ..... | ..... | ..... | 13.3 | ..... | ..... |
| 7½ or 7 3/5 | 42½ or 43 | J | 11.3 | ..... | ..... | 13.0 | ..... | ..... | ..... | ..... |
| 8 | 40 | B | [4] 16.8 | 10.1 | ..... | ..... | ..... | 16.6 | ..... | ..... |
| 8 | 40 | C | 11.4 | 12.1 | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | 40 | L | 8.5 | ..... | ..... | 16.1 | ..... | ..... | ..... | ..... |
| 8 | 40 | N | 6.3 | 8.2 | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | 48 | A | 8.0 | ..... | ..... | ..... | ..... | ..... | 13.1 | ..... |
| 8 | 48 | F | 10.4 | ..... | ..... | ..... | ..... | ..... | ..... | 11.3 |
| 8 | 48 | G | 8.6 | ..... | ..... | ..... | ..... | 12.4 | 15.0 | 19.4 |
| 9 | 48 | H | 8.7 | ..... | ..... | ..... | ..... | ..... | 17.4 | ..... |
| 9 | 50 | K | 8.2 | ..... | ..... | ..... | ..... | ..... | 11.1 | ..... |

[1] Plant designation given in parentheses after each hour schedule.
[2] Plant M eliminated because attendance data not comparable to that in other plants. (See report on Plant M.)
[3] Less lost time than in shortest-hour period, owing to competitive production drive. (See report on Plant D.)
[4] Higher proportion of older women, who had long-term absences, in this period.

were as important to them as their job responsibilities, and others stated they were "too tired" to work excessively long hours. The women did, however, work the scheduled daily hours on the majority of days they reported for work.

When factory hours were 7½ to 7⅗ daily and 42½ to 45 weekly, the women actually averaged 38 to 43 hours per week during weeks they were in attendance (i.e., weeks in which they reported for work at all; absences of whole weeks were excluded from consideration). Under the 8-40-hour schedule they averaged 36 to 38 hours per week; under the 8- or 8½-hour day and 48-hour week, 44 and 45 hours; under the 9-54-hour schedule, 48 to 50 hours. When factory hours were 10 daily and 54 to 60 weekly, during the weeks the women reported for work they averaged 48 to 52 hours. Table II reveals further that in only two plants did women work more than an average of 50 hours in any period studied, and they averaged only 51 and 52 hours.

In each plant, a higher proportion of women lost time, and the average number of absences per woman increased with each increase in length of scheduled hours. This is shown in table III which gives the percent of women losing time and average number of absences per woman under each hour schedule studied in each plant.

Causes of lost time could not be compared under different scheduled hours because too few of the plants had adequate records on causes of absence. "Personal illness" was the principal reported cause of lost time. Many of the women workers interviewed admitted that they stayed home when they were "not really ill but just too tired to go to work." Also, while minor injuries to fingers, hands, and arms did occur in some occupations studied, the numbers were too few to bear any relation to hours worked.

In comparing attendance on the different shifts, it was found that there was less lost time on the second shift than on the first shift under the 10-hour-day schedule. Under the 8-hour-day schedule, lost time on the second shift was higher in some plants, lower in an equal number, and the same in one plant.

In an aircraft plant (Plant G) a special analysis was made of the attendance record of 1,237 women riveters and general aircraft assemblers to show the relation of lost time to marital status, age, number of dependents, and race. It was found that the proportion of married, widowed, or divorced women losing time was higher than the proportion of single women losing time. The single women 25 to 45 years of age were most regularly in attendance under each hour schedule. (This department did not employ a sufficient number of women 45 years of age and over to permit any statement concerning this age group's attendance.)

In Plant G, women workers with children under 14 years of age averaged one hour and 40 minutes more lost time per week under the 50-, 54-, and 60-hour schedules than did women without dependents. Under the 8-48-hour schedule, the women with children lost a half hour more per week than did women without dependents.

It was also found that there was little difference between the races as to the proportion staying away from work one week or more during any period studied. When at work, the proportion of white women who lost no time exceeded the proportion of Negro women who lost none because a larger proportion in the latter group lost a half day or less a week.

## Table II.—Average Weekly Hours Worked by All Women Studied Under Different Scheduled Hours in Each Plant

| Scheduled hours in shortest-hour period studied in each plant | | | Average hours worked per week in shortest-hour period studied in each plant | Average hours worked per week in longer-hour periods studied when scheduled hours were[1]— | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Daily hours | Weekly hours | Plant[2] | | 8-48 hours (B), (N) 8½-48 hours (C) | 8½-51 and 9-54 hours (D) | 9½-47½ hours (J) 9-45 and 9½-46 hours (L) | 9½-52¼ and 10-55 or 56½ hours (D) | 9-54 hours (D), (B), (G) 9 4/5-54 hours (E) | 10-50 hours (G) 10-54 or 55 hours (K) 10-55 hours (A), (H) | 10-60 hours (F), (G) |
| 7½ | 45 | D | 43.2 | ..... | [3] 50.6 | ..... | 51.1 | 50.1 | ..... | ..... |
| 7 2/3 | 44 2/3 | E | 41.7 | ..... | ..... | ..... | ..... | 50.0 | ..... | ..... |
| 7½ or 7 3/5 | 42½ or 43 | J | 38.4 | ..... | ..... | 42.9 | ..... | ..... | ..... | ..... |
| 8 | 40 | B | [4] 35.7 | 44.2 | ..... | ..... | ..... | 47.8 | ..... | ..... |
| 8 | 40 | C | 38.2 | 44.0 | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | 40 | L | 37.8 | ..... | ..... | 41.3 | ..... | ..... | ..... | ..... |
| 8 | 40 | N | [5] 36.7 | 44.6 | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | 48 | A | 44.8 | ..... | ..... | ..... | ..... | ..... | 48.2 | ..... |
| 8 | 48 | F | 43.9 | ..... | ..... | ..... | ..... | ..... | ..... | 52.3 |
| 8 | 48 | G | 45.0 | ..... | ..... | ..... | ..... | 48.7 | 45.5 | 50.5 |
| 9 | 48 | H | 44.9 | ..... | ..... | ..... | ..... | ..... | 48.0 | ..... |
| 9 | 50 | K | 45.7 | ..... | ..... | ..... | ..... | ..... | 49.4 | ..... |

[1] Plant designation given in parentheses after each hour schedule.
[2] Plant M not included because attendance data not comparable to that in other plants.
[3] Less lost time due to competitive production drive makes actual hours worked high.
[4] Higher proportion of older women, who had long-term absences, in this period made actual hours worked low.
[5] 1.4 of the 3.3 hours lost were due to lack of work.

Table III. — Percent of Women Losing Time and Average Number of Absences per

| Scheduled hours in shortest-hour period studied in each plant | | | Percent of women losing time and average number of absences in shortest-hour period studied in each plant | | 8-48 hours (B), (N) 8½-48 hours (C) | | 8½-51 and 9-54 hours (D) | |
|---|---|---|---|---|---|---|---|---|
| Daily hours | Weekly hours | Plant[2] | Percent of women losing time | Average number of absences | Percent of women losing time | Average number of absences | Percent of women losing time | Average number of absences |
| 7½ | 45 | D | 70.6 | 2.4 | ..... | ..... | [3] 60.3 | [3] 2.5 |
| 7 2/3 | 44 2/3 | E | 74.2 | 2.3 | ..... | ..... | ..... | ..... |
| 7½ or 7 3/5 | 42½ or 43 | J | 92.0 | 6.0 | ..... | ..... | ..... | ..... |
| 8 | 40 | B | [4] 82.3 | [4] 2.8 | 74.7 | 2.5 | ..... | ..... |
| 8 | 40 | C | 85.0 | 2.3 | 85.0 | 3.4 | ..... | ..... |
| 8 | 40 | L | 63.5 | 2.3 | ..... | ..... | ..... | ..... |
| 8 | 40 | N | 70.5 | 3.3 | 90.4 | 4.0 | ..... | ..... |
| 8 | 48 | A | 68.5 | 2.6 | ..... | ..... | ..... | ..... |
| 8 | 48 | F | 91.4 | 3.1 | ..... | ..... | ..... | ..... |
| 8 | 48 | G | 53.9 | ([5]) | ..... | ..... | ..... | ..... |
| 9 | 48 | H | 69.4 | 3.0 | ..... | ..... | ..... | ..... |
| 9 | 50 | K | 88.5 | 3.6 | ..... | ..... | ..... | ..... |

[1] Plant designation given in parentheses after each hour schedule.
[2] Plant M not included because attendance data not comparable to that in other plants.
[3] Percent of women losing time was less than in the shortest-hour period, owing to competitive production drive.
[4] Higher proportion of older women, who had long-term absences, in this period.
[5] Not reported.

## PRODUCTIVE EFFICIENCY IN RELATION TO HOURS WORKED

In factories manufacturing war goods that involved operations quite different from their normal peacetime manufacturing processes, there were constant changes in plant-wide and individual rates of output during the war period. The same held true for new factories that were built for the purpose of manufacturing some war item. In both types of plants there was a continual rise in productive efficiency as new technical and supervisory staffs were being developed, as retooling was being perfected, as mass production methods and production shortcuts were developed or improved, as better utilization was made of all employees, and as new workers gained experience. In factories where there were such continual changes, it was impossible to make valid comparisons of efficiency under different scheduled hours.

The best production comparisons could be made in plants where women had been employed for many years on the same general processes, whether

Woman Among All Women Studied in Each Plant Under Different Scheduled Hours

Percent of women losing time and average number of absences in longer-hour periods studied when scheduled hours were[1]—

| 9½-47½ hours (J) 9-45 and 9½-46 hours (L) | | 9½-52¼ and 10-55 or 56½ hours (D) | | 9-54 hours (D), (B), (G) 9 4/5-54 hours (E) | | 10-50 hours (G) 10-54 or 55 hours (K) 10-55 hours (A), (H) | | 10-60 hours (F), (G) | |
|---|---|---|---|---|---|---|---|---|---|
| Percent of women losing time | Average number of absences | Percent of women losing time | Average number of absences | Percent of women losing time | Average number of absences | Percent of women losing time | Average number of absences | Percent of women losing time | Average number of absences |
| ..... | ..... | 77.6 | 2.4 | 82.4 | 3.5 | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | 87.0 | 3.0 | ..... | ..... | ..... | ..... |
| 100.0 | 8.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | 86.3 | 4.4 | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 83.9 | 4.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | 82.5 | 3.2 | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 92.9 | 4.1 |
| ..... | ..... | ..... | ..... | 71.1 | (5) | 67.9 | (5) | 88.8 | (5) |
| ..... | ..... | ..... | ..... | ..... | ..... | 94.5 | 14.7 | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | 90.0 | 5.5 | ..... | ..... |

on wartime or peacetime products. On such operations length of experience on the job was generally the most potent factor in output. Consequently the best contrasts in productive efficiency could be made among women with the same length of experience, and among those who had attained proficiency on the job.

But other plant conditions caused variability in output and sometimes obscured the effect of changes in hours, even within the groups with the same length of experience. A noticeable factor in lowering efficiency was the amount of time spent on nonproductive tasks, such as getting materials and supplies, or on repair jobs, or on special jobs on an hourly rather than on an incentive basis. Mechanical difficulties and defective or poor quality materials also lowered output. Shifting workers from one task to another several times during the course of a day made it harder for them to build up speed on any one task. In some plants group spirit was against producing more than a "normal" amount per day or week. Finally, production was affected by the extent to which friendly relations among top management, supervisors, and workers served to spur workers on to meet plant production goals.

Table IV.—Productive Efficiency and Average Weekly Hours Worked by 17 Occupational Groups

| Occupational group and scheduled hours in the shortest-hour period studied | | | | Efficiency and average weekly hours worked by women workers with 1 year or more experience during the shortest-hour period studied in each plant | | 8-48 hours (B) All occupations (M) Transfer top knitters | |
|---|---|---|---|---|---|---|---|
| Daily hours | Weekly hours | Occupation | Plant | Efficiency (average hourly production) | Average weekly hours worked | Efficiency (average hourly production) | Average weekly hours worked |
| 7½ | 42½ | Machine operators, assemblers, and inspectors | J | [2] 84.5 | 38.4 | ..... | ..... |
| 8 | 40 | Punch-press operators (Depts. 1 & 2) ..... | B | 95.4 | 39.5 | 89.6 | 41.7 |
| 8 | 40 | Punch-press operators (Dept. 3) ..... | B | 89.9 | 36.1 | 96.2 | 44.8 |
| 8 | 40 | Small-press operators (Dept. 4) ..... | B | 91.7 | 34.1 | 85.3 | 45.4 |
| 8 | 40 | Seamers ..... | L | [2] 74.9 | 37.5 | ..... | ..... |
| 8 | 40 | Loopers ..... | L | [2] 69.9 | 38.1 | ..... | ..... |
| 8 | 40 | Loopers[3] ..... | M | 105.2 | 39.6 | ..... | ..... |
| 8 | 40 | Transfer top knitters ..... | M | 122.8 | 38.4 | 122.8 | 46.6 |
| 8 | 48 | Stator winders ..... | A | 149.1 | 45.9 | ..... | ..... |
| 8 | 48 | Coil winders ..... | A | 103.1 | 45.1 | ..... | ..... |
| 8 | 48 | Armature winders "A" ..... | A | 149.2 | 45.7 | ..... | ..... |
| 8 | 48 | Armature winders "B" ..... | A | 145.2 | 45.8 | ..... | ..... |
| 8 | 48 | Armature connectors ..... | A | 152.7 | 47.6 | ..... | ..... |
| 8 | 48 | Coil tapers and miscellaneous workers.... | A | 97.0 | 44.2 | ..... | ..... |
| 9 | 48 | Machine operators ..... | H | [2] 76.8 | 45.7 | ..... | ..... |
| 9 | 50 | Light packing ..... | K | 69.0 | 46.6 | ..... | ..... |
| 9 | 50 | Bulk packing and screw wrapping ..... | K | 61.7 | 47.2 | ..... | ..... |

[1] Plant designation, in parentheses, and occupation covered given after each hour schedule.
[2] Efficiency is based on average weekly piecework earnings.
[3] Women in the third and fourth periods were identical with those in the first.

## With a Year or More Experience, Under Different Scheduled Hours, by Plant

Efficiency and average weekly hours worked by women workers with 1 year or more experience in the longer-hour periods studied when scheduled hours were[1]—

| 9½-47½ hours (J) All occupations<br>9-45 hours (L) Loopers<br>9½-46 hours (L) Seamers | | 8 and 9-50 hours (M) Loopers | | 9-54 hours (B) All occupations | | 10-50 hours (A) Coil tapers and miscellaneous<br>52-57 hours (M) Loopers | | 10-54 hours (K) Light packing<br>10-55 hours (A) All occupations other than coil tapers and miscellaneous (H) Machine operators (K) Bulk packing and screw wrapping | |
|---|---|---|---|---|---|---|---|---|---|
| Efficiency (average hourly production) | Average weekly hours worked | Efficiency (average hourly production) | Average weekly hours worked | Efficiency (average hourly production) | Average weekly hours worked | Efficiency (average hourly production) | Average weekly hours worked | Efficiency (average hourly production) | Average weekly hours worked |
| [2] **80.1** | 42.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | **90.8** | 43.9 | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | **94.7** | 46.6 | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | **81.5** | 51.2 | ..... | ..... | ..... | ..... |
| [2] **77.5** | 40.5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| [2] **70.6** | 41.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | **112.1** | 48.5 | ..... | ..... | **109.6** | 52.9 | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **147.6** | 49.9 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **107.1** | 50.0 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **149.3** | 49.6 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **152.3** | 48.7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **151.8** | 51.0 |
| ..... | ..... | ..... | ..... | ..... | ..... | **105.7** | 44.9 | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | [2] **77.3** | 49.0 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **69.6** | 50.0 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **66.2** | 52.5 |

Such variables in plant conditions are normal in both peacetime and wartime, and will always be an obstacle in getting a very accurate measure of the effect of hours worked on output. These variables have been pointed out in each plant study, in the interpretation of production data. Final conclusions on the best hours from a production standpoint must be based on plant studies in which these variables were at a minimum.[3]

The best contrast in relative efficiency under different hours can be made among women workers with a year or more experience, because in almost all the jobs studied they would have attained a norm of production with this length of experience. Seventeen occupational groups had a sufficiently large number of women with at least a year's experience to afford comparisons in efficiency. Some of the groups were studied under more than two different hour schedules, so that there was a total of 21 comparisons of efficiency among the 17 occupational groups. As hours were increased, productive efficiency remained the same or practically the same in 10 instances, efficiency decreased in 4 instances, and increased in 7.

In no occupation did the efficiency of these women vary widely under the different scheduled hours studied, as can be seen in table IV. The degree of "increase" or "decrease" in efficiency was often so slight that it had little relation to hours worked. Where the changes in efficiency were more marked, various groups often reacted quite differently to the same or similar changes in hours, and, there was no great difference in the strains or physical effort in the jobs involved to account for these variations. Sometimes there was an "increase" or "decrease" in efficiency even though there was little difference in hours actually worked which indicates that the hours had little to do with this change in productivity.

In no instance was productive efficiency being compared under widely different hours, as the women either would not or could not work excessively long hours per week. Even though scheduled weekly hours of as long as 54 to 60 were studied, the majority of women never worked more than 48 to 50 hours under these longer schedules. Individual productivity seemed little affected by hours worked, when weekly hours were limited to around 48 and 50, regardless of the factory's work schedule. Many of the experienced workers had personally set production goals which they tried to meet and generally could attain, on days they reported for work, regardless of whether daily hours were 8, 9, or 10, as long as they limited weekly hours to around 48. It was found that even though the women did not work the full scheduled weekly hours, they did work scheduled daily hours on the majority of days they reported for work.

There were 4 occupational groups with at least a year's experience in Plants B and M that changed from an 8-hour day 40-hour week to an 8-hour day 48-hour week. Two had a lower efficiency rate under the longer hour schedule, one had a higher efficiency rate, and in one group efficiency remained about the same in each period.

Seamers in a full-fashioned hosiery mill went from an 8-40-hour schedule to a 9½-46-hour schedule, and their production increased by 2½ points, while loopers in the same plant went from an 8-40-hour schedule to a 9-45-hour schedule, and their efficiency remained practically the same. Loopers in a seamless hosiery mill changed from an 8-40-hour schedule to a 50-hour schedule of 8 and 9 hours a day, with a resulting increase in efficiency in the latter period. The overtime pay under longer hours was believed to be a

[3] Findings in Plants C, D, E, F, and N are excluded from this summary of productive efficiency because the production data were distorted for efficiency comparisons.

stimulus to production in this particular plant. When these same loopers went from a 50-hour to a 52- and 57-hour week, their efficiency decreased slightly.

It should be noted that valid production comparisons under an 8-40-hour schedule were possible in only 3 of the 13 plants studied. In other plants where scheduled hours of more than 40 hours a week were studied, the performance of these same groups under an 8-40-hour schedule is, of course, not known. Therefore, conclusions on efficiency under an 8-40-hour schedule as compared with longer work schedules are relatively limited.

Plant J went from a 7½-42½-hour schedule to a 9½-47½-hour schedule, and there was a lower efficiency rate under the longer hour schedule.

Three groups in Plant B went from an 8-48-hour schedule to a 9-54-hour schedule. In two of the groups efficiency remained about the same under the 9-54-hour schedule, and in the other group efficiency dropped. The two groups that had about the same efficiency in each period actually worked only 2 hours more per week under the longer work schedule. The group that had a drop in efficiency worked longer hours under the 9-54-hour schedule than did the other two groups, averaging 6 hours more a week under the 54-hour week than under the 48-hour week.

There were 5 occupational groups in Plant A that changed from an 8-hour day 48-hour week to 10 hours a day and 50 or 55 hours a week. Three of these groups maintained the same general level of efficiency in both periods, and two had a higher efficiency rate in the longer hour period. However, average weekly hours worked were not appreciably different under each schedule, the hours worked averaging only 3 or 4 more per week under the 54-55-hour schedules as compared with the 48-hour schedule. One group in Plant H changed from a 9-48-hour schedule to a 10-55-hour schedule, and the efficiency rate remained practically the same.

Coil tapers and some miscellaneous workers in Plant A went from an 8-48-hour schedule to a 10-50-hour schedule, and they showed an increase in efficiency although the hours worked remained practically the same, averaging 44.2 and 44.9 in the 48- and 50-hour periods, respectively. Two groups studied in Plant K went from a 9-50-hour schedule to a 10-54- or 55-hour schedule, and in one group efficiency remained the same, and in the other it was higher in the longer hour period.

# PLAN OF STUDY

## CHARACTERISTICS OF PLANTS SUITABLE FOR STUDY

The first consideration in determining whether a plant was suitable for study of women's performance under various scheduled hours was that at least two different schedules must have been in operation in a woman-employing department for extended periods during the war. The stimulation of effort brought about by the urgencies of war naturally increased production, so that conclusions derived from a comparison of a short-hour prewar period with a long-hour war period would be without validity. Scheduled hours fluctuated with the awarding of new contracts, the cancellation of others, the pressure for increased production of certain items, the flow of work, the labor supply available for different occupations, the extent of relaxation of hours regulations by State labor departments, and mandatory directives of the War Manpower Commission. It is generally recognized that workers can speed up their production for a short time, and their initial response to a change in hours may be different from their response after the schedule has been in effect over an extended period. Therefore, no hour schedule was deemed suitable for study until it had been in operation for at least two months. Nor could very hot summer months nor very cold winter months be taken for study, as absenteeism usually ran abnormally high at such times.

The second essential was to preclude as many variables as possible, other than hours, from the comparison. The performance to be compared under different hour schedules had to be on essentially the same product, manufactured with the same tools and equipment, under the same working conditions. This consideration eliminated almost all shipbuilding and aircraft assembly from any production comparisons, for in these vital industries the war production pattern was one of continuous improvement in equipment and development of mass-production methods with much reengineering when new models were introduced. Also, practically no individual production records were kept in such plants. Comparison of performance in an entire plant was therefore impossible unless only a few processes were involved and the product manufactured was relatively simple. Conference with management personnel, check-ups of records, follow-up talks with foremen were necessary before a department or an occupation could be found that operated without substantial change in product or equipment during the periods in which different hour schedules had been worked. Sometimes even after all initial precautions had been taken in selecting a group for study and the plant survey was under way, records revealed that material changes affecting rate of output had taken place. Or forgotten happenings and conditions that had influenced production were recalled by women workers and verified by supervisors.

Only jobs in which pace was determined in large part by the worker were deemed suitable for this comparative study. Therefore, the third consideration was that women must be on jobs other than machine-paced operations requiring only watching on the part of the worker.

The fourth consideration was that *individual* records must be available on work history in the plant, quits and transfers, attendance and production. Although many plants had over-all figures of man-hours worked, of over-all efficiency and production, without available data to break these totals down

into their component parts no sound causal relation could be established between such totals and scheduled hours. Many plants, that in peacetime had incentive work systems or piecework which necessitated keeping individual production records, no longer kept such records when, with the conversion to war production, workers were placed on straight hourly rates. Pressure for production and turn-over of personnel also served to prevent adequate individual-record keeping even in some plants that customarily kept such records.

## SEARCH FOR PLANTS SUITABLE FOR STUDY

States with basic hour laws permitting women to work more than 8 hours, and States in which wartime amendments permitted such employment, naturally were the most suitable areas in which to search for plants whose conditions warranted the study under consideration. Michigan, Missouri, Kansas, Tennessee, and Rhode Island were chosen as States representing the group first mentioned; Ohio, Connecticut, and Pennsylvania, as States permitting wartime extension of hours. Through the courtesy of the War Production Board and the War Manpower Commission, files were searched to determine what war-contract firms in these States had reported changes in hour schedules for women during the war period. Reports of State labor commissioners were also checked. With lists thus obtained, visits to specific plants began.

A total of 150 plants was covered in 11 States, and only 13 of these plants in 7 States were found suitable for study.

*Michigan.*—Michigan has a 54-hour law permitting an average 9-hour day but a 10-hour-maximum day for women in factories. Personal visits were paid to 18 Michigan plants making guns, tanks, spark plugs, engines, and parachutes; calls were also made to 20 foundries in search of women employed on heavy work. While many foundries were employing or had employed women in the core-making department, hours did not exceed 48 a week except in a few plants where some women were employed among the men coremakers, and the number of women was too small to study. In the munitions plants, one-third of those visited had not employed women more than 48 hours a week. Some of these plants had operated woman-employing departments on a 9-hour day, but there had been too many changes in manufacturing methods and too frequent shifting of women from job to job to meet the prerequisites of the hours study. Other plants had no individual production records. Of 38 Michigan plants visited, 4 were chosen for study, 2 that had changed schedules from 40 or 44⅔ to 54 hours, and 2 that had changed from 40 to 48 hours.

*Kansas and Missouri.*—Missouri has a 9-54-hour law for women of 16 years and over in manufacturing establishments, while Kansas has a 9-hour day and 49½-hour week. Seven firms were visited in these States. Two of the plants in Kansas proved suitable for study. The others had no schedules beyond 48 hours that could be studied, or production methods had been changed too frequently to warrant consideration as study material, or the plants were operating on a straight time basis of pay without keeping individual production records.

*Rhode Island.*—The Rhode Island labor law sets a limit of a 9-hour day and a 48-hour week, except that when 48 hours are worked in 5 days the daily hours may equal but not exceed 9⅗. In 1943, following investigation of need, the director of labor under a wartime grant of authority issued 111

permits to exceed legal hours of work, covering 3,681 women. Some provided for a 10-hour day and 5-day week, others for 6 days of 9 hours, and a few gave permission for Sunday work, but these permits were issued for emergencies only, not to exceed 30 days, though renewal was possible. The Bureau visited 24 Rhode Island firms that employed large proportions of women, but found no plant that had a schedule exceeding 48 hours a week over a 2-month period. Rather, much ingenuity had been shown in adjusting the daily hours to suit the family demands of women workers. One firm that permitted women in the same department to choose different hours of work was chosen for study to see how this arrangement affected attendance.

*Ohio.*—Ohio's labor law calling for a maximum 8-hour day and 45-hour week for manufacturing establishments was amended to permit, during the war emergency, the employment of women for 10 hours a day and 50 hours a week. However, employers with war contracts could employ women in excess of these hours and on the seventh day also if this was necessary to meet production schedules vital to the war effort. Any such overtime had to be reported to the director of industrial relations within 48 hours.

Twenty plants were visited in the Columbus and Dayton area. While scheduled hours for women had increased in these plants, the majority had increased hours from 40 to 45, 48, 49, or 50 a week. Six plants had employed women on schedules of 55 to 60 hours. Two of these were chosen for study; two others had such material changes in contracts that the work done under different scheduled hours was not comparable, and two had gone on the longer schedule only just before the Bureau representative's visit.

*Connecticut.*—The Connecticut hours-of-work law for women in manufacturing establishments provides for a maximum 9-hour day and 48-hour week. In cases of emergency, the commissioner of labor could allow 10 hours a day and 55 hours a week for not more than 8 weeks in any 12 months. Employment between 10 p. m. and 6 a. m. was prohibited. By the War Powers Act the governor was authorized to extend the overtime period beyond 8 weeks and to suspend the limitations on night work.

Seventeen firms that had been granted permits for a 10-hour day were visited, but only two were found suitable for study. The other plants had either not used their permits at all or used them for short emergency periods only, or there was no continuous short-hour period to contrast with the long-hour period, or there had been so many changes in production techniques and shifting of women from one job to another that production data would have been invalidated.

*Pennsylvania.*—The Pennsylvania hour law for women in manufacturing provides a maximum 44-hour week and 8-hour day; if only 5 days are worked, 10 hours are allowed in one day as long as total hours do not exceed 44. As a wartime measure, permits could be granted for the duration to work 48 hours a week. Under an emergency provision, further relaxations were allowed plants on war work, but an attempt was made to limit such special permits to 54 and 56 hours.

Twenty-three plants in which the product manufactured called for heavy machine tool operations were covered in the Philadelphia labor market area, including one plant in Camden, N. J. None of these plants proved to be suitable for study; 10 firms either had no women on heavy machine tool operations or the group on such work was too small for study; 5 had no individual production data; 6 had no change in hours; and 2 had a change in hours too recent for purposes of this study.

Two additional plants, both hosiery mills, were visited in Philadelphia. While hours did not exceed 48 per week, the plant with an 8-hour-day and a 9-hour-day comparison was selected for study. One department studied in this plant operated under an 8-40-hour and under a 9-45-hour schedule; another department was studied under an 8-40-hour and under 9½-46-hour schedule.

*Massachusetts.*—An optical plant was visited in Massachusetts, where the law sets a 9-48-hour schedule with provision for emergency extension of hours. A group of about 400 women had worked 44, 48, and 50 hours as regular schedules for extended periods. They would have been suitable for study had not so many lived in rural areas, and home visits been almost impossible during the period of heavy snows—the time of survey.

*Tennessee.*—Tennessee's law sets a maximum of 10½ hours a day and 57 hours a week for women 16 years of age and over in manufacturing establishments. Its wartime legal provisions permit the governor and the commissioner of labor to suspend the hours law in manufacturing plants on the written request of a representative of the War or the Navy Department.

Visits were made to 17 firms producing hosiery, shoes, knitwear, or cotton uniforms. Ten had continuously been on a schedule of 40 or 45 hours so that no contrast in widely different hours was possible. While some departments in a few plants worked overtime occasionally to keep a steady flow of production, such overtime was too infrequent or of too short duration to be of value in this study. Two others had changed from a 40- to a 48-hour schedule, but records were inadequate. Three had worked 50 or 54 hours without change throughout the entire war period. Only two were found that had worked the legal maximum of 57 hours at any time during the war period. One of these had been unionized and returned to a 48-hour week. The initial emotional stir resulting from unionization was believed to have interfered with smooth operation under the 48-hour schedule and have made production data of questionable value. The last firm, in which one department had shifted from 40 to a maximum of 57 hours, finally was taken for study.

*Georgia.*—A hosiery mill was visited in Georgia, where the law provides for a 10-hour day, 60-hour week. The loopers had worked the longest hours because of the shortage of such workers, but they had been allowed to work almost any hours they wished. This policy of allowing the women workers to work hours to suit their convenience resulted in such irregularity in daily and weekly hours that no study was possible.

## SCOPE AND METHOD OF STUDY

The factory performance of 3,261 women was reviewed under different scheduled hours. These women were employed in selected occupations in 13 plants. Approximately 15 to 40 percent of the women studied in each plant were visited in their homes to determine not only their home demands and the effects of different hour schedules on their home and personal life, but also to get information that aided in the interpretation of production data secured in the plant. A total of 566 women were interviewed.

### SELECTION OF OCCUPATIONAL GROUPS FOR STUDY

The variations in occupations and working conditions in the different departments of the plants made it necessary to confine the study to specific operations in one or more departments except in one small plant (Plant F), all of whose women production workers were included. Jobs were selected

that involved varying skills, strains, physical and mental demands.

Each job was analyzed in detail in order that any influences of varying physical and mental demands would be ascertainable. The job descriptions included:

Purpose of job.
Tools and machines used.
Materials used.
Reiterated tasks, occasional tasks, and other tasks performed.
Posture.
Physical and mental demands of the job, continuity of attention.
Relation of individual task and pace to group task and pace.
Training or experience required.

For each job described, any exceptional conditions of temperature, humidity, dust, ventilation, light, noise, vibration, crowded aisles, and so forth, were noted.

Sometimes all the women employed in the specified occupation during the weeks selected for study were included in the survey. Other times only those employed a specified period of time, such as 30 days or more in each of two periods studied, were included. Women who had worked only a short time in the periods studied were usually eliminated from the study of plants with very high turn-over; their inclusion would have made such a change from one period to another in the composition of the group studied that findings would have been distorted. The basis for selecting the groups studied is described in each plant report.

## SELECTION OF PERIODS FOR STUDY

Effort was made to get as many varieties of scheduled hours to study as possible, in order that performance under these varying schedules could be contrasted. However, the selection of periods had to be confined to the war period beginning January 1942, so that the same urgency for maximum production and the same strains and wartime conditions would be present in all periods studied.

No period was considered unless the scheduled hours had been in operation over two months, thus permitting an adjustment to the new schedule. The periods of different hour schedules studied were 4 to 8 weeks in length. In choosing the 4- to 8-week periods for comparative study, abnormal weeks in which the department did not operate fully or worked overtime, holiday time, weeks of hurricanes, floods, and influenza epidemics, as well as the very hot summer months and very cold winter months, were eliminated.

## DATA SECURED FROM PLANT RECORDS

### Personnel Data

Having decided on the occupations and the periods of study, the next step involved determining the women who were employed in such occupations during the weeks selected for study. This was usually ascertained by checking the pay-roll register or clock cards of the department or group under consideration. Names were traced in the personnel files to get the address, telephone number, clock number and Social Security number (when needed to trace worker on pay roll), together with date of birth, last grade of school completed, marital status, and the data on number of children and other dependents that some personnel records contained. All changes in status of the worker from the first period under study through the last period and up to the date of plant visit were entered on the Bureau schedule. Shifts from one job to another or between departments, wage changes, shift

changes, clock-number changes, quits and reasons therefor, leaves of absence and reasons, and rehires were noted.

### Attendance Data

The hours worked, for every day of every week in the periods covered, were recorded for each woman included in the study. If she had worked in another department during the period, her total time included such work as well as that done in the department being studied. Where lateness was noted, this was recorded. The attendance record of every woman included was complete for the periods under study.

When records of causes of absence were available, these were copied.

### Production Data

Getting individual production data necessitated determining the actual hours each woman worked on the task under consideration as apart from total hours worked. Not only were some workers shifted from one department to another, but they were sometimes assigned to a new or to a repair work job on a straight hourly basis, or to other work not a part of the production process. Then, too, there were machine break-downs, delays in getting materials, and other causes that decreased the time on productive tasks. In determining individual efficiency, all losses of time from the productive job under consideration were deducted and the actual time on the job studied was computed.

Whenever over-all production data for the entire group studied were available, these were secured in addition to the individual production data.

In most of the individual plant studies there are two basic production tables. One shows individual efficiency by length of experience in the occupation studied, and all the information is based on individual averages. The other production table is composed of index numbers based on totals for the entire group studied, i.e., aggregate figures on possible man-hours, total man-hours worked, average hourly production, total production, and so forth.

### Illness and Accident Statistics

Reasons for calls to the medical department made by the women during the periods studied were recorded when such data were available. In a few plants nurses visited workers who were reported as out ill, and reports on such visits were also checked. All such data were compiled for comparison under different scheduled hours.

### Miscellaneous Statistics

Gross earnings of the women studied under different scheduled hours were obtained for background use. Dates of changes in wage rates and other facts necessary for making valid comparisons between periods studied were secured.

Turn-over reports for the department studied were also secured when available.

## DATA SECURED THROUGH HOME VISITS

A 15- to 40-percent sample of the women studied in each plant were interviewed in their homes. A total of 566 women were interviewed. The sample was based on occupation, extent of employment in the periods studied, age, marital status, and distance between home and plant. The size of the sample varied with the number of women studied and the degree of variation in composition of the group.

As only the woman worker herself could answer certain of the questions, visits to all day-shift workers had to be made in the evenings and on Sun-

days. The method of conducting such interviews was to gain the interest of the woman in the study and to bring out her reactions by directing the conversation rather than by asking specific questions.

### Demands of Home Life on the Woman Worker

The personal and work-history data secured from the plant were checked with the women. The membership of the family household during each period under study, and the relation to persons in the armed services, were secured. The home duties of the woman worker, and whether carried fully or with assistance from other members of the household; the hour of rising and of leaving home, transit time, and hour of reaching home and of retiring; method of transportation in each period—all these were discussed. Personal adjustments to meet demands with changes in hours were ascertained. In the interview attempts were also made to ascertain the usual reasons for long-term absences, or Saturday absences, or numerous short absences and latenesses.

### Worker's Attitude and Reaction to Her Job

The Women's Bureau agent in charge of field work framed a special set of questions to be asked concerning the actual work done and its effect on the worker under different scheduled hours. The individual's record of efficiency was known to the interviewer. The woman was asked to describe what she did from the time she reached the factory, what differences there had been in her work, in material and equipment, or in conditions of work in the various periods of study.

In obtaining this detailed description of their duties, much information was secured concerning non-productive work that reduced the hours on productive work. Sometimes additional information on other factors affecting production, that plant records did not show or management failed to mention, was also secured through these interviews. The worker's conception of how long it took her to learn her job, comments on her own production pace and the hours under which she thought she worked to best advantage; her degree of fatigue on different days of the week or hours of the day; her relationship with fellow workers, her attitude toward her supervisors, her liking for her job as compared to other jobs she had had—all gave insight to the worker's attitude and reactions toward her work and their influence on attendance and production.

Finally, she was asked the length of the workday and week that, taking into consideration the extra rate paid for overtime, would be most suitable for her.

At times individual-worker interviews brought up matters that required further checking in the plant. This follow-up work was done to verify or qualify statements made by workers. The women were found to have good memories on changes that had occurred but to be uncertain of the exact dates on which such changes had taken place.

## DEFINITIONS OF TERMS USED IN THE STUDY

In order to treat data from all firms uniformly, firm customs concerning termination of employment and their definitions of absence had to be disregarded in favor of an interpretation that would lead to the same measurement of women's performance from firm to firm. When should a woman be considered as on the pay roll for attendance-record purposes? When should she be considered as a "quit"? Firms had very different policies with regard to termination of employment during absence. One stated that workers'

names were taken off the pay roll after an absence of 5 days; another, only after 5 weeks. It was found, however, that regardless of what they stated, such policies were not carried out by the firm with any regularity during the periods under study.

With the plant history of each individual available, all women whose personnel pay roll or clock card records showed them assigned to the department and the job under consideration prior to the period of study, and who worked on the job during part of the periods under study, were considered "at work" and their "possible man-hours of work" were for the entire period charged to the department. If beginners left soon after their employment, whether or not the personnel record had listed them as "quits" or "lay-offs," they were so regarded and omitted from the detailed study. If experienced persons had absences without any notice of "quit" in the office and were continued on the pay roll, they were counted as "absent" until the final date of termination.

Because some women were hired and others were terminated within weeks studied, "possible man-hours" for each woman naturally could not equal the number of weeks studied times the scheduled weekly hours. Rather, possible man-hours for each woman is the total of all hours she could have worked during the weeks or days that the records show that she could be considered employed on the job studied.

In many absenteeism studies only absences of a whole day are counted as "lost time" and absences of a half day, several hours, or less than an hour are disregarded. For purposes of this study, "lost time" consists of all absences from work of more than 15 minutes duration. Sometimes workers came late in the morning or were late in coming back from lunch; sometimes they left early, usually with permission; frequently they worked less than half a day. These, in addition to absences of a day or many days, were included as "lost time" in this study.

When a worker was less than an hour late in reporting for work at the beginning or middle of a shift, this was tabulated as "lateness." When a worker was more than an hour late this was counted as an absence. In the attendance tables, latenesses of less than 15 minutes were not included in lost time, but latenesses in excess of 15 minutes were included in lost time.

"Average weekly hours worked" are actual hours worked during the weeks a woman reported for work in the period studied. Only absences within the weeks of reporting for work enter into this average, and whole weeks missed are not used in computing the average. However, time lost per 100 possible man-hours of work includes long-term absences of whole weeks missed as well as absences within weeks attended.

"Average number of absences," as shown on the attendance tables analyzing man-hours lost per 100 possible man-hours of work, is based on the average number of absences among the women having absences rather than absences among the total women studied.

"Length of time in occupation" was from the time hired on the occupation in the plant studied to the first week in each period studied.

In most of the plants studied there were incentive wage systems with individual efficiency ratings that indicated comparative production. These plants had a standard unit time set on all productive operations. "Standard hours produced" divided by actual hours worked on an incentive basis gave a quotient called "efficiency." These efficiency rates were used as a measurement of relative efficiency under different scheduled hours in these plants.

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In other plants average hourly piecework earnings were used as a measure of efficiency. Instead of a standard time being set on each operation, a unit piece rate was set on each task.

When identical pieces were produced and the operation on that piece remained the same, the number of units produced could be used as a measure of output. However, more often there was such a variation in the sizes and types of parts produced and in operations performed, that total units could not be used to indicate volume or rate of output.

# STATOR WINDERS, ARMATURE WINDERS, COIL WINDERS, AND ALLIED WORKERS — PLANT A

## INTRODUCTION

Plant A had been engaged in the production of fractional horsepower motors and industrial motors for many years. Its peacetime product had been used in industrial or household equipment, and its wartime product was being used in aircraft or other war equipment, but the essential processes involved in making the motors were the same. The plant had always employed many women. Of a total of 7,200 employees in April 1944, approximately 2,000 were women. Women had always been employed in the occupations in which performance under differing hour schedules is compared in this study. These occupations are armature winding and connecting, stator winding, coil winding, and a group of miscellaneous jobs.

The turn-over rate in the departments studied was low, a large number of the women having been with the firm for many years. In the more skilled occupations under study women had been working at their respective occupations in this plant for 6 years or longer.

War demands called for a greater volume of production from this factory. As the area in which the plant was located had many war industries and vastly expanded units of the Air Service Command, women's employment there had increased by nearly 50 percent since 1940. Additional workers were difficult to secure; therefore, management resorted to increasing the hours of work. However, even as late as January 15, 1943, some departments had employed women on an 8-40-hour basis, with no work on Saturday. This was advanced to an 8-45-hour schedule, then to one of 8-48, and finally a 10-hour day with 5 hours on Saturday was adopted.

The periods chosen for study were periods when specific hour schedules had been in effect for some months and there were no abnormal conditions to affect attendance or production. The 8-48-hour period covered 6 weeks in September and November 1943. The 10-55-hour period covered 6 weeks in January and February 1944 except for armature winders and connectors who were studied over a 5-week period. In the second period the coil tapers and some of the workers on the miscellaneous group jobs worked the 10-hour days but did not work on Saturdays because there was not enough work to keep these occupational groups busy Saturdays. A small group of 60 armature winders and connectors were also studied under an 8-40-hour schedule covering 4 weeks in January 1943.

Below is a résumé of the periods and groups studied:

| *Period* | *Schedule* |
|---|---|
| *Stator Winders and Miscellaneous Workers (Coil winders, coil tapers, etc.)* | |
| *1st period:* | |
| September–November 1943 (6 weeks)<br>8-hour day, 6-day 48-hour week | Day shift: 6:30 a.m.–3 or 3:30 p.m.<br>(30-minute or 1-hour lunch period)<br>Night shift: 3 p.m.–11:30 p.m.<br>(30-minute lunch period) |
| *2d period:* | |
| January–February 1944 (6 weeks)<br>10-hour day, 5-hour Saturday,<br>5½-day 55-hour week<br>10-hour day, 5-day 50-hour week<br>(Coil tapers and some other miscellaneous workers did not work Saturday) | Day shift: 6:30 a.m.–5:30 p.m.<br>(1-hour lunch period)<br>Saturday—6:30 a.m.–11:30 a.m.<br>Night shift: 6:30 p.m.–5:30 a.m.<br>(1-hour lunch period)<br>Saturday—3 p.m.–8 p.m. |

*Armature Winders and Connectors*

| | |
|---|---|
| *1st period:* | |
| September–November 1943 (6 weeks)<br>8-hour day, 6-day 48-hour week | Day shift: 6:30 a.m.–3 or 3:30 p.m.<br>(30-minute or 1-hour lunch period)<br>Night shift: 3 p.m.–11:30 p.m.<br>(30-minute lunch period) |
| *2d period:* | |
| January–February 1944 (5 weeks)<br>10-hour day, 5-hour Saturday,<br>5½-day 55-hour week | Day shift: 6:30 a.m.–5:30 p.m.<br>(1-hour lunch period)<br>Saturday—6:30 a.m.–11:30 a.m.<br>Night shift: 6:30 p.m.–5:30 a.m.<br>(1-hour lunch period)<br>Saturday—3 p.m.–8 p.m. |
| *Special 40-hour period:* | |
| January 1943 (4 weeks)<br>8-hour day, 5-day 40-hour week | 6:30 a.m.–3 or 3:30 p.m.<br>(30-minute or 1-hour lunch period) |

Personnel data were secured for the entire group of 455 production workers in the four occupations under study. Occupational changes were noted, as well as length of experience in the plant and in the occupation. Actual hours worked each day by each worker during the weeks under study were copied. Causes of absences were noted, and calls at the medical department and the causes of such calls were recorded. The hours worked on efficiency-rated jobs, the amount produced as measured by standard production hours, and the resultant efficiency ratings were secured for each individual for each week. Gross earnings also were secured.

In order that the casual worker who did not stay long enough to acquire skill might not warp the picture of plant performance, women who were employed less than 4 weeks of the 12 weeks studied were excluded from the study. Also, those who had been transferred to other departments in either period were not considered in the detailed analysis of attendance and production, as records concerning their performance were incomplete. Thus the total of 455 women employed in the periods studied was reduced to 406 in the detailed analysis of attendance and productive efficiency. However, information on causes of calls to the medical department included the entire 455 women employed.

Personal visits were made to women workers in their homes. Women called upon represented a cross-section of those employed in the four occupations, with the sample weighted according to experience, marital status, and distance between home and plant. These women were questioned concerning personal and family adjustments necessary under the differing hour schedules, their household responsibilities, forms of recreation, and means of travel from home to plant. Their attitude toward their work and their fellow workers, their ideas concerning production in relation to hours worked and earnings, and their reactions concerning resulting changes in their own physical condition were ascertained.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD

Over four-fifths of the women workers visited lived in family households. This was true in spite of the fact that over half the women employed were single. It was not unusual to find daughters living with father or mother, or sisters living together in the old family household. Households ranged in size from 2 persons to 12 persons; however, those of 2, 3, 4, or 5 persons predominated. One-third of the households had children under 14 years

of age. Obviously, the hours of work, the physical condition, and mental attitude of these women workers have repercussions on the family life.

The women visited were in several age brackets, but the majority were 20 and under 35. Over a third were married, and an eighth were widowed.

## HOME RESPONSIBILITIES

When home was reached, half the women who were or had been married had all or the major responsibility for household duties. Even with the longer hours it was not possible for this group to shift the responsibility to others. Some lived with parents or other relatives who did some of the chores. Marketing and cooking were the two tasks that some married women were able to transfer to others—sometimes to children—after the 10-hour day went into effect.

One married woman, who was busy washing windows while her husband cooked the dinner on the Sunday she was visited, stated her case thus:

> Now we have a late dinner, 7:30 or 8 o'clock, and it does not agree with us. Regular markets are closed and we are forced to buy in the delicatessen except for Sundays. I do keep up my housework.

Another explained:

> I cannot cook roasts or cakes when I get home at 6:30, so we must eat fried foods and canned vegetables.

This "late" dinner hour and "keeping up" the house by doing a little each evening seemed to be the practice of many married women whose attitude was expressed by:

> You can't let things go when you own a nice house and want to keep it nice.

Others said that with a 10-hour day, all they could manage was to wash the daily dishes, make beds, and prepare meals; all else had to be done Saturdays and Sundays, or let go entirely.

Working on the night shift gave married women an opportunity to prepare breakfast and see the children off to school, but they did not get to bed until 9 a. m. or later. Saturday was a particularly difficult time for them: arriving home after 6, and with children around the house on Saturday mornings, there usually was little opportunity for them to sleep; some time had to be spent on week-end food shopping. As a result many women went back to work at 3 o'clock Saturday without any sleep.

The single women interviewed usually did not have major responsibility for households, but two-thirds carried some responsibility, the larger number doing laundry and cleaning. However, a fourth did the cooking for the family, and a fifth did marketing. Women workers who roomed and boarded out were very few in number.

## TIME OF RISING AND OF REACHING HOME

Day workers rose from 4:30 to 6 o'clock during both periods, as the factory work began at 6:30 in the morning. How it was possible to rise at 6 and punch the factory time clock at 6:30 was explained by one woman:

> Six of us regularly report to work without breakfast. We have a system. Each day one of us goes to the plant store, buys coffee and doughnuts, and brings them upstairs where each of us eats at her bench.

While there were some changes in residence and from the use of busses to the use of private cars in the second period, in both periods the largest group had an over-all transit time of from over a half hour to an hour. About 10 percent in the 8-hour period and 8 percent in the 10-hour period

spent from 1 1/2 hours to 2 hours or more in travel to and from the plant. About a fourth spent not over 30 minutes in transit. About half used public vehicles in the first period and a somewhat smaller proportion did so in the second. Less than 10 percent walked to work.

The real difference occasioned by longer daily hours for day workers was in the time of reaching home. Instead of arriving a little after 4 o'clock as under the 8-hour schedule, many women under the 10-hour schedule did not get home until after 6 o'clock. More time was lost also in getting on public vehicles that were already crowded when they reached the plant at the 5:30 closing hour. The night shift, which under the 8-hour schedule had reached home sometime after midnight and could get to bed while other members of the family were sleeping, under the 10-hour schedule did not reach home until after 6 a. m.

Under the 8-hour schedule the time away from home was from 9 to 10 hours for 56 out of every 100 women workers and from 10 to 11 hours for another third. Under the 10-hour schedule the time away from home was 11 to 12 hours for a third, 12 to 13 hours for over half, and 13 hours and over for 13 of every 100 women.

## WORKERS' OVER-ALL DAY

The longer work schedule increased the number of women who had an over-all day of 18 to 19 hours, and it also caused a slightly earlier retirement for others who "just were too tired." Under both hour schedules 43 in every 100 women were active from 17 to 19 hours, leaving but 5 to 7 hours for sleep. Another group, slightly smaller, were up 16 to 17 hours. Under the 10-hour work schedule only one-fifth of the women reported that they secured 8 hours' rest in bed each day.

For married women this long day was almost a continuous round of chores. "I seldom go out and it is growing very boring to live like a machine from Monday through Saturday. It's very tiring." "No leisure time whatsoever." "You meet yourself coming and going." "I used to enjoy caring for my grandson; now I find he annoys me." "I liked the job until the darn 10-hour day started. Now I'm crabby and irritable all the time." (The family concurred.)

It was customary for single women to seek recreation after work or in the evenings under the 8-hour schedule. Many attended the movies regularly once a week when work ended at 3 or 3:30. Others went to dances, went bowling, or visited in the evening. Under the 10-hour schedule recreation was limited chiefly to Sundays. Some women reported they were "too tired at night to dress and go anywhere." "I never feel like doing anything and have no time to have any fun."

The night-shift workers had other difficulties. The single girls wished the society of other people on Sundays, and so slept Sunday night and got up with the family Monday morning. This upset them on Monday night when they worked from 6:30 p.m. to 5:30 a.m.

Women who had work to do in the home quite generally reported that "10 hours was too long because of greater fatigue." The usual comment was "no particular ailment but more tired." Others complained of specific illnesses such as sinus headaches, eyestrain, legs swelling, shoulder pains, and so forth, that might or might not have been the result of being "too tired." The younger women with fewer responsibilities found that the 10-hour workday made life rather boring.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

Fewer than 5 in every 100 women expressed preference for the 10-hour day (these wanted a 5-day week), and this small group did so because the time-and-one-half rate added an extra day's pay. Eighty-eight in every 100 preferred the 8-hour day. There was a difference of opinion concerning Saturday work; while over half of all those interviewed preferred a 5-day week, others divided between a half day and a full day on Saturday.

One-fifth of the women reporting preferred the night shift; this preference was due to the better opportunity afforded, in their opinion, to care for their children.

### GROSS EARNINGS IN RELATION TO HOURS

That the preference of 95 percent of the interviewed women for the shorter day is probably representative of all the women studied is borne out by the fact that under the 10-hour-day schedule they did not work the full schedule (see Attendance Record, below), in spite of the opportunity to increase earnings by time-and-a-half rates for overtime. Average gross earnings—$40.20 under the 48-hour schedule and $45.83 under the 55-hour schedule—differed by only $5.63.

Gaining experience and working on the more difficult jobs also were means of increasing earnings. Class A armature winders and armature connectors earned $1 or more an hour in both periods studied; stator winders averaged 98½ cents in the 48-hour-week period and $1 in the 55-hour-week period. The less experienced (Class B) armature winders and the coil winders and tapers averaged 85 to 87 cents an hour in the first period and 90 to 93 cents an hour in the second. Armature connectors had the highest gross earnings in both periods, averages of $48.72 and $54.03, in the first and second periods, respectively. Coil tapers' average gross earnings were $38.24 in the first period, $40.85 in the second.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

#### Attendance, All Women Studied

As already stated, in the first period the departments under study operated a schedule of 6 days at 8 hours, or 48 hours a week. In the second period the schedule was 10 hours a day, 5 hours Saturday, 55 hours a week, i. e., for all but coil tapers and some women on miscellaneous jobs who did not work Saturdays and were on a 10-50-hour schedule. Workers on miscellaneous jobs (some of whom worked a 55- and some a 50-hour schedule) and coil tapers have been combined in the attendance tables; their scheduled hours averaged 51.1 in the 6 weeks studied in the second period.

There was also no Saturday work for armature winders and connectors in the last 2 weeks of the 5 weeks they were studied in the second period. Consequently, scheduled hours averaged 52.5 for the "B" armature winders and 53 for the "A" armature winders and connectors over the 5-week period studied.

In analyzing attendance under different hour schedules, forced lay-offs, vacations, and extended sick leave periods—when a person was not con-

tinued on the company pay roll but was subject to reinstatement—were excluded from lost time.

The proportion of women workers losing time, the average number of absences, and the actual hours absent, each increased under the 55-hour schedule, as is shown on table I. The total man-hours lost per 100 man-hours of work was 8 under the 48-hour schedule and 13.7 under the 55-hour schedule among day-shift workers. This higher rate of absenteeism in the second period occurred in each occupation and on both day and night shifts.

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Shift and Occupation — Plant A

| Period studied, scheduled hours, shift, and occupation | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period (8-48 hours) | 352 | 241 | 68.5 | 2.6 | 11.9 | 8.0 |
| 2d period (10-55 hours)[1] | 343 | 283 | 82.5 | 3.2 | 14.2 | 13.1 |
| *By shift* | | | | | | |
| Day shift: | | | | | | |
| 1st period (8-48 hours) | 249 | 159 | 63.9 | 1.7 | 12.7 | 8.0 |
| 2d period (10-55 hours) | 246 | 210 | 85.4 | 2.9 | 13.6 | 13.7 |
| Night shift: | | | | | | |
| 1st period (8-48 hours) | 103 | 82 | 79.6 | 2.1 | 10.2 | 8.0 |
| 2d period (10-55 hours) | 97 | 73 | 75.3 | 1.9 | 16.7 | 11.4 |
| *By occupation* | | | | | | |
| Stator winders: | | | | | | |
| 1st period (8-48 hours) | 46 | 29 | 63.0 | 2.4 | 11.5 | 6.1 |
| 2d period (10-55 hours) | 58 | 51 | 87.9 | 3.4 | 17.0 | 15.7 |
| Coil winders: | | | | | | |
| 1st period (8-48 hours) | 50 | 39 | 78.0 | 3.4 | 11.0 | 10.5 |
| 2d period (10-55 hours) | 51 | 43 | 84.3 | 4.1 | 13.8 | 15.0 |
| Coil tapers and miscellaneous workers: | | | | | | |
| 1st period (8-48 hours) | 78 | 58 | 74.4 | 3.4 | 10.0 | 9.1 |
| 2d period (10-50 or 55 hours) | 72 | 68 | 94.4 | 3.7 | 12.8 | 15.1 |
| Armature winders, Class B: | | | | | | |
| 1st period (8-48 hours) | 134 | 90 | 67.2 | 2.1 | 13.6 | 7.9 |
| 2d period (10-55 hours) | 119 | 95 | 79.8 | 2.6 | 14.3 | 11.6 |
| Armature winders, Class A, and armature connectors: | | | | | | |
| 1st period (8-48 hours) | 44 | 25 | 56.8 | 1.8 | 8.8 | 5.9 |
| 2d period (10-55 hours) | 43 | 26 | 60.5 | 2.3 | 12.7 | 6.7 |

[1] Coil tapers and some miscellaneous workers were on a 10-50-hour schedule with no Saturday work in the second period.

How was this time lost? The proportion of women who stayed out a full week or more in the 48-hour period was doubled in the 55-hour period. In the first period 95 in every 100, and in the second period only 90 in every 100 worked at least part of each week of employment.

During weeks in which women worked at least part of the week, 32 percent of the women lost no time in the 48-hour period; this proportion was reduced to 19 percent under the 55-hour week. The result was that the schedules of 48 and 55 hours were reduced by absenteeism to 44.8 and 48.2 hours, respectively.

**Table II. — Analysis of Time Lost by Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Shift — Plant A**

| Period studied, scheduled hours, and shift | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | 5 weeks | 6 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| 1st period (8-48 hours): | | | | | | | | | | | | | | | |
| Number | 352 | 335 | 17 | 6 | 4 | 4 | ..... | 3 | ..... | 352 | 114 | 140 | 62 | 36 | 44.8 |
| Percent | 100.0 | 95.2 | 4.8 | 1.7 | 1.1 | 1.1 | ..... | 0.9 | ..... | 100.0 | 32.4 | 39.8 | 17.6 | 10.2 | ..... |
| Day shift: | | | | | | | | | | | | | | | |
| Number | 249 | 234 | 15 | 5 | 4 | 4 | ..... | 2 | ..... | 249 | 93 | 94 | 39 | 23 | 45.0 |
| Percent | 100.0 | 94.0 | 6.0 | 2.0 | 1.6 | 1.6 | ..... | 0.8 | ..... | 100.0 | 37.3 | 37.8 | 15.7 | 9.2 | ..... |
| Night shift: | | | | | | | | | | | | | | | |
| Number | 103 | 101 | 2 | 1 | ..... | ..... | ..... | 1 | ..... | 103 | 21 | 46 | 23 | 13 | 44.2 |
| Percent | 100.0 | 98.1 | 1.9 | 1.0 | ..... | ..... | ..... | 1.0 | ..... | 100.0 | 20.4 | 44.7 | 22.3 | 12.6 | ..... |
| 2d period (10-55 hours):[1] | | | | | | | | | | | | | | | |
| Number | 343 | 308 | 35 | 10 | 12 | 2 | 5 | 4 | 2 | [2] 338 | 64 | 164 | 55 | 55 | 48.2 |
| Percent | 100.0 | 89.8 | 10.2 | 2.9 | 3.5 | 0.6 | 1.5 | 1.2 | 0.6 | 100.0 | 18.9 | 48.5 | 16.3 | 16.3 | ..... |
| Day shift: | | | | | | | | | | | | | | | |
| Number | 246 | 220 | 26 | 6 | 9 | 2 | 3 | 4 | 2 | [2] 241 | 40 | 119 | 43 | 39 | 48.1 |
| Percent | 100.0 | 89.4 | 10.6 | 2.4 | 3.7 | 0.8 | 1.2 | 1.6 | 0.8 | 100.0 | 16.6 | 49.4 | 17.8 | 16.2 | ..... |
| Night shift: | | | | | | | | | | | | | | | |
| Number | 97 | 88 | 9 | 4 | 3 | ..... | 2 | ..... | ..... | 97 | 24 | 45 | 12 | 16 | 48.4 |
| Percent | 100.0 | 90.7 | 9.3 | 4.1 | 3.1 | ..... | 2.1 | ..... | ..... | 100.0 | 24.7 | 46.4 | 12.4 | 16.5 | ..... |

[1] Coil tapers and some miscellaneous workers were on a 10-50-hour schedule with no Saturday work in the second period.
[2] Total is less than total number of women studied because some were absent the total number of weeks they were on the pay roll in the period studied.

The difference between day- and night-shift attendance was slight. Under the 48-hour schedule the day shift averaged 45 hours, the night shift 44.2 hours; under the 55-hour schedule the day shift averaged 48.1 hours, the night shift 48.4.

That the inconsistency between hours scheduled and hours worked is not attributable to a relatively few persons irregular in attendance is shown by a comparison of women who worked in every week during each period studied. This group, representing over one-half the employees studied, averaged 45.4 hours under the 48-hour schedule and 49.1 under the 55-hour schedule. The practice of staying away up to half a day during the week spread to a larger number of workers as the hours were increased.

### Attendance, Stable Group of Workers

An additional study was made of 60 armature winders and connectors employed not only in the periods when the 8-48- and 10-55-hour schedules were in effect, but in an earlier period, under an 8-hour 5-day week, which fell in January 1943. These women were experienced workers who averaged less lost time than did the entire group of women studied.

The proportion of women who lost time under the 40-hour schedule was doubled under the 8-48-hour schedule and continued to increase under the 10-55-hour week. The average number of absences of women trebled under the 48-hour week and continued to increase under the 55-hour schedule. The average length of absence was 11.9 hours under the 40-hour, 13 hours, under the 48-hour, and 11.5 hours under the 55-hour schedule. To sum up this record—the hours lost per 100 man-hours of work were 4 under 8-40 hours, 5.4 under 8-48 hours, and 7.3 under 10-55 hours.

Under the 40-hour week, 70 percent of the women lost no time whatsoever. The proportion dropped to less than 40 percent under the 48-hour week, and to 34 percent under the 55-hour week. The average hours worked per woman were as follows:

| *Hours scheduled* | *Average hours worked* |
|---|---|
| 8-40 | 39.3 |
| 8-48 | 46.2 |
| 10-55 | 49.5 |

### Causes of Lost Time and Calls to Medical Department

As already stated, women employed less than 4 weeks of the 12 weeks studied and those who had transferred to other departments were excluded from the study. However, records of calls to the medical department were checked for all 455 women employed.

Detailed reports on causes of lost time were not available for the 48-hour period and comparison between causes in this and in the 55-hour period are therefore not possible. Under the 55-hour schedule 63 of every 100 women reporting time lost gave personal illness as the cause; personal illness was given as the cause in one-third of the absences and for almost three-fifths of the hours lost. Causes such as, "Sometimes I'm not really ill, but I'm just too tired to go to work," would be reported under personal illness. Absences for personal reasons other than illness, such as shopping, business, or recreation, accounted for 18 percent of the absences and over 8 percent of the time lost. Causes attributable to the family, such as illness in the family, return of relative from service, or home duties, were given as the cause of absence by 22 of every 100 women; these reasons accounted for 10 percent of the absences and 13 percent of the hours lost. Causes attributable to the

company, such as shortage of materials, excused for patriotic meetings, and so forth, added to the numbers of absences but accounted for less than 3 percent of the time lost.

No records of the nature of the illnesses that kept women away from work were available, but there were records of causes of calls to the plant medical department for both periods studied. Both the number of women receiving medical attention and the number of calls increased slightly during the 55-hour week, owing chiefly to the contacts with scarlet fever reported in this period. In both the first and second periods about a third of the women went to the medical office with colds. The next largest group went to have finger or hand cuts or bruises attended to or redressed. Foreign bodies in the eye and headaches and dysmenorrhea rated next among conditions requiring medical assistance.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

The jobs studied—armature winding and connecting, stator winding, coil winding, and the miscellaneous jobs—were entirely man-paced. Each

Table III. — Causes of Calls to Medical Department and of Visiting-nurse Calls Under Different Scheduled Hours — Plant A

| Causes of calls for medical aid and of visiting-nurse calls | 1st period (8-48 hours) | | | | 2d period (10-55 hours) | | | |
|---|---|---|---|---|---|---|---|---|
| | Women | | Visits | | Women | | Visits | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Total women employed | 336 | 100 | ..... | ..... | 359 | 100 | ..... | ..... |
| Women making no medical calls | 235 | 64 | ..... | ..... | 211 | 59 | ..... | ..... |
| Women making medical calls or having visiting-nurse calls | 121 | 36 | 292 | ..... | 148 | 41 | 366 | ..... |
| Women reporting reasons for making medical calls or having visiting-nurse calls | [1]131 | ..... | 292 | 100 | [1]148 | ..... | 366 | 100 |
| Medical calls (in plant) | 128 | ..... | 269 | 92 | 140 | ..... | 339 | 93 |
| Finger-hand injuries—cut, bruise, abrasion, and redress | 35 | .... | 56 | 19 | 32 | ..... | 52 | 14 |
| Cold, flu, sore throat, etc. | 44 | ..... | 55 | 19 | 48 | ..... | 67 | 18 |
| Eye—foreign body in—irritation; photophobia | 17 | ..... | 26 | 9 | 16 | ..... | 17 | 5 |
| Headache | 15 | ..... | 17 | 6 | 19 | ..... | 29 | 8 |
| Other abrasions, cuts, bruises, etc., and redress | 8 | ..... | 16 | 5 | 3 | ..... | 5 | 1 |
| Dysmenorrhea | 13 | .... | 14 | 5 | 20 | ..... | 25 | 7 |
| Backache, shoulder, arm, leg pains, etc. | 10 | ..... | 14 | 5 | 8 | ..... | 11 | 3 |
| Skin irritations, blisters; redress | 8 | ..... | 13 | 4 | 10 | ..... | 13 | 4 |
| Indigestion, gastro-intestinal, etc. | 12 | ..... | 12 | 4 | 11 | ..... | 11 | 3 |
| Wrist injuries—sprain, cuts; redress | 5 | ..... | 10 | 3 | 6 | ..... | 7 | 2 |
| Teeth—extraction; toothache | 8 | .... | 9 | 3 | 4 | ..... | 4 | 1 |
| Medical consultation; examination after illness | 8 | ..... | 8 | 3 | 4 | ..... | 4 | 1 |
| Home injuries—burns, bruises, redress | 4 | ..... | 5 | 2 | 8 | ..... | 11 | 3 |
| Vaccinations | 3 | ..... | 5 | 2 | ..... | ..... | ..... | ..... |
| Nervous condition | 3 | .... | 4 | 1 | 2 | ..... | 2 | 1 |
| Other ailments [2] | 3 | ..... | 3 | 1 | 4 | ..... | 5 | 1 |
| Pregnancy | 2 | ..... | 2 | 1 | ..... | ..... | ..... | ..... |
| Scarlet-fever contact | ..... | ..... | ..... | ..... | 29 | ..... | 70 | 19 |
| General malaisé | ..... | ..... | ..... | ..... | 6 | ..... | 6 | 2 |
| Visiting-nurse calls | 14 | ..... | 23 | 8 | 13 | ..... | 27 | 7 |
| Colds, flu, sore throat, etc. | 4 | ..... | 7 | 3 | 6 | ..... | 16 | 5 |
| Indigestion, gastro-intestinal, etc. | 1 | .... | 2 | 1 | 1 | ..... | 1 | [3] |
| Teeth—extraction; toothache | ..... | ..... | ..... | ..... | 1 | ..... | 1 | [3] |
| Operations | 1 | .... | 4 | 1 | 1 | ..... | 5 | 1 |
| Nervous condition; nerves, etc. | 3 | ..... | 5 | 2 | ..... | ..... | ..... | ..... |
| Scarlet fever | ..... | ..... | ..... | ..... | 1 | ..... | 1 | [3] |
| Other ailments [2] | 1 | .... | 1 | [3] | ..... | ..... | ..... | ..... |
| No response when nurse called | 4 | ..... | 4 | 1 | 3 | ..... | 3 | 1 |

[1] Details add to more than total because some women made medical calls for more than one illness or injury, or had both medical and visiting-nurse calls.
[2] Other ailments include: Excess temperature, kidney trouble, diarrhea, epistaxis, cancer sores, and hemorrhoids.
[3] Less than one-half percent.

involved a number of hand operations requiring the manipulation of small hand tools with or without the use of automatic or semiautomatic winding machines. The fingers, the wrists, and the muscles of arms and shoulders were involved in continuous activity. Lifting was but a slight factor. The degree of attention required and the frequency of repeated operations varied in the four major operations under study. The more skilled operations of stator winding and Class A armature winding and connecting involved working on all types of stators or armatures. The more variation in types, the more difficult the winding, the greater the attention required; the larger the size of the part, the longer time required to complete the job. Only when the same winding was done repeatedly and when the parts were small, as for B armature winding, could a rhythm be developed that relieved eye concentration. These workers were seated at their fixtures all day and had little opportunity to change position.

The miscellaneous group of jobs included such operations as coil taping, coil connecting, assembling coils, forming coils, scratch-brushing leads, and drilling. These miscellaneous jobs and coil winding had fewer operations and were more repetitive in nature. The girls were shifted from one task to another, partly to relieve the monotony of the job. A few physical strains were involved in some of these jobs. The operator of the semiautomatic coil-winding machine held and guided wire into slots while the spindle operated automatically. Though she wore finger stalls to protect her fingers and wire guides to protect her arm and wrist from the pull of the rewound wire, there was a tension on hand and arm. Coil connectors and electric-drill operators stood at their work, but the strain of standing was occasionally relieved by shifting to jobs in the department at which they could sit.

Plant morale was excellent. In the departments studied the women were congenial. They liked the forewoman and held the department supervisor in high regard. Women workers considered the firm a good employer. As one aging worker put it, "If I had to quit work I would die, I'd miss it so." Indicative of the friendly atmosphere that prevailed was the custom of recognizing unusual events in the lives of fellow workers on the floor by singing special songs in their honor and doing a bit of decorating for the occasion. Holidays, too, were observed in similar fashion. The monotony of everyday life was thereby broken, and interest and good will promoted among the workers.

During the periods covered by the study, the departments included were located in a section of a large unpartitioned factory floor where other manufacturing processes were performed. Lighting was excellent, a new fluorescent lighting system having been installed. Noises were those usually heard in a factory, the noise of the job itself, the hum of machines in adjoining departments, the clanging of elevators, hand and motor trucks, the ringing of signal bells, and the talking of some hundreds of workers. Music records, played about 3 hours of each shift, were heard over a loud-speaker system throughout the floor.

Despite the use of exhaust fans, the air at times seemed stuffy and the temperature high to visiting representatives. As windows were the chief source of ventilation, the usual ventilation problem occurred, workers nearest the windows complaining of drafts when windows were open and those in the center of the room complaining when windows were closed. However, one of the departments under study was moved to an air-conditioned room during the period workers were being interviewed, and com-

plaints about ventilation in the air-conditioned room far exceeded complaints about the stuffiness in the large workroom. A major objection to the air-conditioned room was that, being unable to see what was taking place in the main work area, the workers' sense of sociability was restricted.

Aisles were wide and there were no underfoot obstructions. Floors were clean and dry. There was no crowding. All women workers who could be seated while at work were provided with comfortably backed chairs and with footrests at correct height for the worker.

Coil winding and miscellaneous jobs required about 6 weeks to learn and about 6 months in which to become skilled in all the types of work. Stator winding and armature winding required 6 weeks to 2 months in which to learn the simpler operations. To attain speed and achieve maximum efficiency on these simple types of jobs took 6 months. To become proficient enough to wind any type of stator or armature assigned to this department required at least a year.

The differences in skill required accounted for differences in the experience and age of workers in the several occupations covered. At the time of the first week included in the study, almost all the stator winders and the Class A armature winders and connectors had been employed in the plant 6 years or more, many of them over 10 years. Most of these women had been on the particular job they were doing for almost as long. They were fully experienced, trusted employees. Only a few of the Class B armature winders, winding small armatures of not over 1 3/4 pounds, had been on their jobs for as long as 6 years. Only a tenth had a year or more of experience, a third had over 6 months but less than a year's experience, and the remainder had 6 months' or less experience. Among coil winders and workers on miscellaneous jobs a little more than a third had a year's experience, and about an equal proportion had less than 6 months' experience.

### Payment on the Job

Stator winders, armature winders, and armature connectors were paid on an incentive basis. Coil winders, coil tapers, and the workers on miscellaneous jobs were paid on a time basis, but individual efficiency records were kept.

Low-speed, medium-speed, and high-speed workers had been timed on all operations. Their average output was considered 100-percent efficiency. Individual efficiency rates were computed by dividing the number of "standard production hours" the operator achieved by the number of hours she actually worked on time-studied jobs. Workers were paid on the basis of their average efficiency for the week.

The scale of hourly rates based on average efficiency for the week is shown below.

| Efficiency rate (percent) | Corresponding hourly rate (cents) | Efficiency rate (percent) | Corresponding hourly rate (cents) | Efficiency rate (percent) | Corresponding hourly rate (cents) |
|---|---|---|---|---|---|
| *Class A* | | *Class A—cont.* | | *Class B* | |
| Starting rate | 66 | 128–130 | 86 | Starting rate | 65 |
| Rate after 1 month | 71 | 131–133 | 87 | Rate after 1 month | 70 |
| 100 (after 3 months)–101 | 76 | 134–136 | 88 | 100 (after 3 months)–105 | 75 |
| 102–103 | 77 | 137–139 | 89 | 106–111 | 76 |
| 104–106 | 78 | 140–142 | 90 | 112–117 | 77 |
| 107–109 | 79 | 143–145 | 91 | 118–123 | 78 |
| 110–112 | 80 | 146–148 | 92 | 124–129 | 79 |
| 113–115 | 81 | 149–151 | 93 | 130–135 | 80 |
| 116–118 | 82 | 152 | 94 | 136–141 | 81 |
| 119–121 | 83 | | | 142–147 | 82 |
| 122–124 | 84 | | | 148–153 | 83 |
| 125–127 | 85 | | | 154 | 84 |

The pace required for the standard 100-percent efficiency was reached by the majority of the workers by the end of the first 3 months of employment. A limit was placed on earnings—efficiencies beyond 152 percent or 154 percent were not reimbursed—but this limit was set close to the point of maximum sustained production. Experienced women reported that they could exceed this limit during some weeks but could not do so continuously on all types of work. There was no belief on the part of the women that they would turn out more production continuously if the wage ceilings were removed.

An incentive worker was paid for hours on repair work or on a new job that had not been timed at the same rate she had maintained on incentive work during the week. Experienced workers knew how long any given operation should take. If their production was retarded by stiff wire, not enough or too much wax on the wire, ragged edges on insulation paper, or other poor material, they were permitted to charge this slowed-down production to hourly-rated work, which tended to keep their record of efficiency at an even level. The winder entered her own hourly rated time on her card, giving the reason for the entry.

As soon as a worker could maintain 100-percent efficiency for 2 consecutive weeks, she was guaranteed the 100-percent-efficiency rate. Others were guaranteed the 100-percent-efficiency rate after 3 months' employment. No worker in Class A was paid a straight time rate of more than 94 cents an hour, which was the rate for 152 percent efficiency, and no worker in Class B was paid more than 84 cents an hour, the rate for 154 percent efficiency.

The nonincentive workers, including coil winders and workers on miscellaneous jobs, were paid 71 cents as beginners, 76 cents after 1 month, and 81 cents after 3 months.

Night-shift workers received a premium of 5 percent on gross earnings.

The methods and rates of pay were not changed during the periods studied, but in the later period studied the change from an 8-hour day to 10 hours brought payments of time and a half for the last 2 hours worked each day.

### Performance on the Job

Whereas this study compares productive efficiency under an 8-48-hour schedule and under a 10-55-hour schedule, the actual hours worked by the women were such that the comparison becomes one of 45 with 48.1 hours on the day shift, and 44.2 with 48.4 hours on the night shift. Because of the differences in experience and tasks involved in the several occupations, it appeared desirable to consider efficiency in relation to occupation and length of experience, as shown in table IV.

### Performance on the Job — Stator Winders

In both the first and second periods stator winders worked only a day shift. During the 48-hour week, when averaging 45.8 hours, they actually worked 39 hours on operations computed in their efficiency rating and the remainder were counted as hourly-rated time. Their efficiency rating was 148. During the 55-hour week, when the stator winders averaged 49 hours, 41.9 of which were on incentive work, their efficiency dropped by only one point to 147.[1] The change in hours did not appreciably affect the efficiency

[1] These figures do not include a group of women who worked in this department a few weeks in the second period and then were transferred to other departments. Their efficiency was low, owing to lack of experience.

of this stable group of workers, the majority of whom had a year or more experience.

Of the 35 stator winders who worked each week during both periods, 27 made at least top efficiency in all or all but one week during each period. Sixteen of these women occasionally exceeded top efficiency. One never made top efficiency during either period; two maintained it in the first period but never reached it in the second; two maintained it in the second but did not reach it in the first, when they had less experience; and three were erratic in production during both periods. A number of records of those who lost a week or more of time showed a slowing down before leaving and a slow pace when first returning. In fact, a change in pace was shown for some workers even when they were out only a few days.

Reports of the girls' comments on their production under different hour schedules are significant:

*A* did best work in the morning. Quit work about 4:30 p.m. and "just fussed around." Got tired about 2:30 or 3. Whole department did the same and only pretended to be busy. Did not produce enough additional work on a 10-hour day to pay.

*B* had been tired since second month of 10-hour day.

*C* did not think she got out as much in 10 hours as in 8 hours. (Record showed that she always had an efficiency rating of 152 or more.)

*D* always produced more on an 8-hour day than on a 10-hour day. Fatigued about 3 p.m. and from Wednesday on. (Record showed an efficiency rating of 152 each period.)

*E's* production was much lower on a 10-hour day.

*F* used to do better than do today. (Record showed increase in second period.)

*G*, on an 8-hour day always kept a day's ticket ahead. On a 10-hour day did well to keep ahead for 4 or 5 hours.

*H* did best work in morning and had to make enough to take care of afternoon slack.

*J* let down about 4 p.m. and "just messed around."

As has been stated, the 12-week record of production of stator winders showed approximately the same degree of efficiency in both periods. This is not surprising, in view of the fact that the average weekly hours on incentive work differed by only 3 hours a week and did not exceed 42 hours in either period. The statement of many stator winders that they did not produce much after 3 or 3:30 p.m. when the quitting time was 5:30 on the 10-hour day could not be verified because the day's production was entered without regard to the time of day on which it was completed, and the women reported they sometimes held tickets back to submit on days when their production fell below normal.

### Performance on the Job — Armature Winders and Connectors

Class A winders were armature winders sufficiently experienced to perform all types of winding. All had 1 or more and the majority had 7 or more years' experience in the plant. In the 8-48-hour period the day-shift workers averaged 46.9 hours a week, 44.7 of which were on incentive work. In the 10-55-hour period these women averaged 50.2 hours a week, 47.9 of which were on incentive work. Their efficiency was 151 in both periods. In the first period the night shift averaged 43.7 hours, 42.4 of which were on incentive work, and achieved an efficiency of 146. In the second period the night shift worked 48.9 hours, 47.5 of which were on incentive work, and achieved 147-percent efficiency.

Armature connectors also were a group with years of experience. Their efficiency was at maximum in both the first and second periods with 153

Table IV. — Individual Efficiency by Length of Experience in Occupation

| Occupation, shift, period studied, and scheduled hours | Total | | | | 1 year or more | | |
|---|---|---|---|---|---|---|---|
| | Number of women studied | Average weekly hours worked | Average weekly hours on efficiency-rated work | Average efficiency rating | Number of women studied | Average weekly hours worked | Average weekly hours on efficiency-rated work |
| **Stator winders:** | | | | | | | |
| Day shift: | | | | | | | |
| 1st period (8-48 hours) | 46 | 45.8 | 39.0 | 148 | 44 | 45.9 | 38.8 |
| 2d period (10-55 hours) | 57 | 49.0 | 41.9 | 147 | 43 | 49.9 | 41.2 |
| **Coil winders:** | | | | | | | |
| Day shift: | | | | | | | |
| 1st period (8-48 hours) | 27 | 43.3 | 36.4 | 100 | 10 | 45.0 | 38.2 |
| 2d period (10-55 hours) | 26 | 49.2 | 42.3 | 96 | 13 | 50.0 | 45.4 |
| Night shift: | | | | | | | |
| 1st period (8-48 hours) | 23 | 43.8 | 39.0 | 109 | 1 | 46.3 | 42.1 |
| 2d period (10-55 hours) | 25 | 49.3 | 46.3 | 110 | 5 | 49.9 | 44.4 |
| **Coil tapers and miscellaneous workers:** [1] | | | | | | | |
| Day shift: | | | | | | | |
| 1st period (8-48 hours) | 60 | 44.2 | 37.4 | 96 | 28 | 44.2 | 37.5 |
| 2d period (10-50 or 55 hours) | 55 | 45.5 | 37.9 | 104 | 27 | 44.9 | 39.4 |
| Night shift: | | | | | | | |
| 1st period (8-48 hours) | 18 | 43.7 | 39.2 | 94 | 3 | 44.4 | 40.7 |
| 2d period (10-50 or 55 hours) | 15 | 45.8 | 42.5 | 103 | 2 | 45.3 | 43.0 |
| **Armature winders, Class A:** | | | | | | | |
| Day shift: | | | | | | | |
| 1st period (8-48 hours) | 21 | 46.9 | 44.7 | 151 | 21 | 46.9 | 44.7 |
| 2d period (10-55 hours) | 20 | 50.2 | 47.9 | 151 | 20 | 50.0 | 47.9 |
| Night shift: | | | | | | | |
| 1st period (8-48 hours) | 12 | 43.7 | 42.4 | 146 | 12 | 43.7 | 42.4 |
| 2d period (10-55 hours) | 12 | 48.9 | 47.5 | 147 | 12 | 48.9 | 47.5 |
| **Armature winders, Class B:** | | | | | | | |
| Day shift: | | | | | | | |
| 1st period (8-48 hours) | 86 | 45.0 | 44.0 | 131 | 9 | 46.2 | 44.8 |
| 2d period (10-55 hours) | 74 | 47.9 | 47.1 | 147 | 9 | 48.0 | 46.8 |
| Night shift: | | | | | | | |
| 1st period (8-48 hours) | 48 | 44.7 | 41.7 | 131 | 4 | 45.0 | 43.8 |
| 2d period (10-55 hours) | 43 | 48.4 | 47.6 | 146 | 3 | 51.0 | 50.6 |
| **Armature connectors:** | | | | | | | |
| Day shift: | | | | | | | |
| 1st period (8-48 hours) | 9 | 47.7 | 40.1 | 153 | 9 | 47.7 | 40.1 |
| 2d period (10-55 hours) | 9 | 50.8 | 48.4 | 152 | 9 | 50.8 | 48.4 |
| Night shift: | | | | | | | |
| 1st period (8-48 hours) | 2 | 47.5 | 25.6 | 154 | 2 | 47.5 | 25.6 |
| 2d period (10-55 hours) | 2 | 51.5 | 21.5 | 153 | 2 | 51.5 | 21.5 |

[1] Coil tapers and some miscellaneous workers were on a 10-50-hour schedule with no Saturday work in the second period.

## Under Different Scheduled Hours, by Occupation and Shift — Plant A

| Average efficiency rating | Length of time in occupation: 6 months, less than 1 year — Number of women studied | Average weekly hours worked | Average weekly hours on efficiency-rated work | Average efficiency rating | 6 weeks, less than 6 months — Number of women studied | Average weekly hours worked | Average weekly hours on efficiency-rated work | Average efficiency rating | Less than 6 weeks — Number of women studied | Average weekly hours worked | Average weekly hours on efficiency-rated work | Average efficiency rating |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 149 | | | | | | | | | 2 | 44.0 | 43.0 | 125 |
| 148 | | | | | 2 | 50.5 | 47.1 | 154 | 12 | 45.8 | 43.6 | 143 |
| 101 | 9 | 41.7 | 37.4 | 109 | 3 | 43.1 | 28.0 | 73 | 5 | 42.6 | 36.1 | 103 |
| 105 | 6 | 50.0 | 45.7 | 98 | 7 | 47.2 | 33.8 | 78 | | | | |
| 128 | 10 | 43.4 | 39.5 | 118 | 4 | 42.5 | 36.1 | 97 | 8 | 44.6 | 39.6 | 99 |
| 112 | 8 | 48.8 | 45.1 | 114 | 8 | 49.7 | 48.3 | 107 | 4 | 49.2 | 47.0 | 103 |
| 98 | 9 | 43.6 | 37.5 | 97 | 20 | 44.3 | 37.5 | 92 | 3 | 45.2 | 34.3 | 90 |
| 106 | 18 | 45.9 | 35.8 | 100 | 8 | 45.4 | 37.7 | 106 | 2 | 47.6 | 35.5 | 97 |
| 86 | 8 | 43.3 | 38.0 | 102 | 6 | 44.4 | 40.6 | 89 | 1 | 40.0 | 35.5 | 80 |
| 105 | 11 | 45.4 | 42.4 | 103 | 2 | 48.3 | 43.8 | 101 | | | | |
| 151 | | | | | | | | | | | | |
| 151 | | | | | | | | | | | | |
| 146 | | | | | | | | | | | | |
| 147 | | | | | | | | | | | | |
| 147 | 17 | 44.5 | 43.9 | 150 | 33 | 44.8 | 43.6 | 140 | 27 | 45.2 | 44.1 | 103 |
| 152 | 26 | 49.2 | 48.5 | 146 | 31 | 47.6 | 47.0 | 146 | 8 | 44.9 | 43.7 | 143 |
| 141 | 10 | 44.9 | 41.4 | 147 | 17 | 46.1 | 43.9 | 141 | 17 | 43.1 | 39.3 | 108 |
| 154 | 16 | 48.4 | 47.5 | 153 | 18 | 47.7 | 46.5 | 148 | 6 | 49.6 | 49.3 | 118 |
| 153 | | | | | | | | | | | | |
| 152 | | | | | | | | | | | | |
| 154 | | | | | | | | | | | | |
| 153 | | | | | | | | | | | | |

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and 152 for the day shift, 154 and 153 for the night shift, respectively. The day shift averaged 50.8 hours of work in the second period as compared to 47.7 hours in the first, and the night shift averaged 51.5 in the second period as compared to 47.5 in the first.

The "B" group of armature winders were winding small armatures only. Very few in either period had as much as a year's experience. As shown on table IV, experience was the important factor in efficiency in this occupation. Girls on the day shift who had less than 6 weeks' experience at the beginning of the first period studied (the 48-hour schedule) averaged 45.2 hours of work and a 103 rating; those in the occupation for 6 weeks to 6 months achieved a 140 rating. Efficiency reached 150 for those with experience of 6 months to a year, and for those with a year or more of experience the average was 147. In the second (55-hour) period all those who remained in the occupation from the first period had 14 weeks more experience, so that the group in general had that advantage. But a few new workers who were taken on on the day shift in the second period rated, surprisingly, 143 while working an average of 44.9 hours a week. During this period both the 6-months-to-1-year group and 6-weeks-to-6-months group had an efficiency of 146, which for the latter group represented a slight rise in efficiency over the first period, and for the former group, a drop in efficiency.

The record of "B" armature winders on the night shift also showed the influence of experience. On this shift too there were more inexperienced girls in the first period than in the second. Rather surprisingly the night-shift workers at times achieved a somewhat higher efficiency than did the day armature winders. During the 48-hour period beginners averaged 43.1 hours of work and achieved a rating of 108; in the 55-hour period the few beginners averaged 49.6 hours and rated 118. Those with experience of 6 weeks to 6 months rated 141 and 148 in the two periods, when their hours worked were respectively 46.1 and 47.7.

Productive efficiency under an 8-40-hour schedule was checked on 60 armature winders and connectors who had worked that schedule as well as 48 and 55 hours. Their performance is summarized below.

| *Hour schedule* | *Average weekly hours worked* | *Average weekly hours on incentive work* | *Average efficiency rating* |
|---|---|---|---|
| 8–40 hours | 39.3 | 37.4 | 146 |
| 8–48 hours | 46.2 | 43.0 | 147 |
| 10–55 hours | 49.5 | 47.0 | 150 |

If the memory of some of these winders is correct, their slightly lower efficiency during the 40-hour period was due to heavier armatures and heavier wire. War work was said to be easier.

Reviewing the statements of women visited, there would seem to be two types of workers, women who maintained a regular speed throughout the day whether the day was 8 or 10 hours, and women who worked in spurts during the day and also during the week.

Reports of the comments of experienced workers follow:

*A* tries to reach top efficiency and to stay there by making more on the days she feels good to carry her over the poor days. She holds back tickets.

*B* says the girls went up to 154 efficiency because war work was easier and the armatures much smaller. (In the 40-hour period when her efficiency was 146, was on machines winding heavier armatures, working with heavier wire.)

*C* did her best work before lunch. She got tired just before lunch and then again around 2:30 or 3 o'clock. On an 8-hour shift it was only 4 hours to lunch time. On a 10-hour shift it was 5 hours and you got more tired waiting the extra hour to eat and relax.

*D* thinks work on commercial armatures was much harder than war work. Her efficiency was not affected to any degree by the lengthening of daily or weekly hours, as the longer hours were on easier work.

*E* kept her efficiency right around 152 percent. She knew how many pieces it would take, because she had done it for so many years. Her efficiency remained the same during the lengthening of working hours, but it took much more effort to keep it so.

*F* kept her efficiency up to 152 percent. She did not want a higher top rate because she could not turn out that amount of work every day. If her top rate were higher, she would have no opportunity to get tickets ahead. She felt very tired after 4 o'clock in the afternoon.

*G* tried to keep at top efficiency. By working hard at the beginning of the week when she felt energetic, she usually could compensate for the days when she could not keep up.

*H* stated that having a goal to meet every day made the work more interesting.

*J* was tired about 4 p.m. and walked around a bit. In the earlier (40-hour) period she did not reach top efficiency because the work was commercial, and commercial armatures were larger and the wire heavier than wartime armatures.

*K* usually worked pretty hard the early part of the week and then not much on Saturday, if she had enough tickets to average nearly top efficiency.

*L* said feeling tired was about the only thing that made for less efficient work.

*M* thought one had to work twice as hard now to meet the ceiling. Some thought it was the wire. Lately the wire was a little better. She believed it was the 10-hour day more than anything else. She did not produce so well under the 10-hour day; she was sure of that.

*N* said there was not much difference in her efficiency but she was more tired under the 10-hour schedule.

*O* did not always make top efficiency, could not see any point in wearing oneself out the way some girls did.

### Performance on the Job — Nonincentive Operators

The coil winders and the miscellaneous workers, as stated, were paid on an hourly basis but a record was kept of individual daily production and efficiency rate. These records were kept in order that a spot check could be made of the output of new workers and of workers whose production was believed below standard.

Hours on work on which efficiency could be computed generally represented only a part of total hours worked because workers were often transferred to hourly-rated tasks which had no standard time, or were given allowed time for machine breakdowns, bad stock, and so forth. Also, records were sometimes incomplete for computing efficiency ratings because of the worker's failure to record the number of units produced, the operation number, or the hours worked on each task. The efficiency ratings, therefore, are not based on all work done but on the part that was recorded, and on hours worked on operations for which standard times were set.

The average over-all hours of coil winders working on the day shift were 43.3 under the 48-hour schedule and 49.2 under the 55-hour schedule. Hours on efficiency-rated work were 36.4 and 42.3, respectively, during which they achieved efficiencies of 100 and 96, respectively. On relating this record to experience, it is found that at times some of the less experienced workers had higher efficiencies than the more experienced workers, regardless of the hours worked. Also, when the hours on efficiency-rated work were low in number, there was a tendency for the efficiency rate to be low.

The night-shift coil winders spent more of their time on efficiency-rated work than did the day-shift workers, and their efficiency record corresponded more closely to the curve of experience than that of the day-shift workers, as can be seen from table IV. For all night-shift coil winders, regardless

of experience there was little difference in efficiency as between the two periods studied, the rate being 109 in the first period and 110 in the second.

Coil tapers and workers on miscellaneous jobs were shifted from task to task more frequently than any other group studied. From an examination of individual records it appears that efficiencies were higher when the proportion of hours worked on timed operations was greater. Here, too, experience seems to have had less noticeable effect on the production record than among workers paid on an incentive basis. In each of the experience groups shown on table IV there was a slight increase in efficiency in the second period. However, there was very little difference in hours worked in the two periods. The day shift worked 44.2 hours in the first period and 45.5 hours in the second period, with resulting efficiencies of 96 and 104, respectively. The night shift worked 43.7 hours in the first period and 45.8 hours in the second period, with efficiencies of 94 and 103, respectively.

Many of the nonincentive workers interviewed were younger than the incentive workers and had fewer ideas about their work or its effect on them. Their remarks, nevertheless, have value.

*Day-Shift Coil Winders*

*A* said, take away that 10-hour day and bring back the 8-hour day! Everyone would shout so with joy the roof would be blown off.

*B* left because the 10-hour day was too hard. She could not do anything about the house.

*Night-Shift Coil Winders*

*A* As other members of family are on the first shift, she does not get anything but a cold lunch. She is so tired and thinks it awful to work the present night shift. Ten hours are terrible at night.

*B* says on the 10-hour shift you meet yourself coming and going. It took her one month to learn everything about coil winding. Machine trouble and broken wire slow down production. One can do much more when feeling better and not so tired.

*C* Sleeping Saturday and Sunday at night throws her off the rest of week. She's more tired on Monday because of the changing hours of work over week end.

*D* Ten hours at night is just too much.

*Day-Shift Coil Tapers, etc.*

*A* Since working 10-hour day feels run down and has no pep. There are more rejects in this department since they have been working longer days.

*B* does her best work in the morning and feels that the whole department slacks up in the afternoon. She notices fatigue from 2 p.m. on.

*C* does her best work before noon, so can figure out how many she must do before noon.

*D* slows down for the last 2 hours of the 10-hour day; on an 8-hour day, for the last half hour. She has more frequent headaches on the longer day.

*Night-Shift Coil Tapers*

*A* The whole department slacks up about 3 a. m. when working 10 hours.

*B* felt much more time is wasted on the 10-hour schedule; girls stayed on the job better under 8 hours. Now, after 3 a. m. they begin to fool around.

### Performance on the Job — Summary

The principal reason for increasing hours from 48 to 55 a week was to secure a much needed increase in output in a tight labor market. Women workers were fully aware of the war need for their production, but most of them had family demands that were as vital to them as work demands.

Still others were fatigued from the longer hours or found that the 55-hour schedule allowed them far from sufficient time for relaxation and recreation. For these reasons the women averaged only 48 hours a week under the 55-hour schedule. From the point of view of the individual, this self-determined 48-hour week instead of the nominal 55 hours permitted some family demands and personal needs to be met. What was the over-all result for the plant?

The plant picture as shown in table V is based on records for the 406 women included in other phases of the study; it excludes women employed less than 4 weeks in the 12 weeks studied and those who had transferred to other departments in the periods studied. The data are given occupationally, because, as has been shown, the occupational groups were differently constituted with respect to skills they had developed, experience attained, and reactions to longer hours. Stator winders and "A" armature winders and connectors were the two skilled groups of workers, the majority of whom had years of experience prior to the periods studied.

Management was able to increase the number of stator winders between the 48-hour and the 55-hour period, thereby achieving, instead of the prescribed 14.6 percent increase, a total increase of 41 percent in possible man-hours among this occupational group. However, under the pressure of longer hours the stator winders themselves reduced actual hours worked to a point where the increase in such hours equaled only the increase in number of workers; they maintained the same level of production in the second period as in the first period. The result was an increase in total production equivalent to the increase in staff.

In the case of "A" armature winders and connectors there was a slight decrease in number of workers in the second period, and a reduction in nominal hours to 50 instead of 55 in the last 2 weeks under study, which resulted in an increase in possible man-hours of only 10 percent. A corresponding 10-percent increase in actual hours worked resulted. Production was carried on at about the same rate in both periods, so that the increase in the total production equaled the increase in hours worked.

"B" armature winders decreased in number in the second period, so that possible man-hours were increased by only 12 percent instead of 14.6 percent. Actual hours worked were increased by 8 percent, hourly production by 9 percent, and the end result was a total production increase of 18 percent. The increase in efficiency, as shown on table IV, is due to the longer experience of the women "B" winders in the second period.

The nonincentive workers—coil winders, tapers, and so forth—decreased in number by 4 percent in the second period. The coil tapers were on a 50-hour schedule and the coil winders were on a 55-hour schedule in the second period, which made the possible man-hour increase only 6 percent. Actually there was no gain in hours worked in the second period. However, the smaller number of beginners in the second period brought about a 4-percent increase in efficiency, causing a 3-percent gain in total production.

From these over-all results it would seem, therefore, that a campaign to cut down the 3.2 hours lost under the 48-hour-week schedule would have achieved the same end results as were achieved by a nominal 55-hour schedule which women workers by their own response brought down to the 48-hour level. By keeping the 8-hour day, the feeling of constant tiredness would have been eliminated, and time to meet personal and household demands would have been available.

Table V. — Summary of Possible Man-hours, Total Man-hours Worked, Total Man-hours Worked on Incentive Jobs, Efficiency, and Total Production, Based on Totals for All Women Studied, Under Different Scheduled Hours, by Occupation — Plant A[1]

| Occupation, period studied, and scheduled hours | Index numbers of— | | | | | |
|---|---|---|---|---|---|---|
| | Number of women | Possible man-hours | Total man-hours worked | Total man-hours worked on incentive jobs | Efficiency (average hourly production) | Total production |
| Stator winders: | | | | | | |
| 1st period (8-48 hours).. | 100 | 100 | 100 | 100 | 100 | 100 |
| 2d period (10-55 hours).. | 126 | 141 | 126 | 127 | 100 | 126 |
| Coil winders, coil tapers, and miscellaneous workers: | | | | | | |
| 1st period (8-48 hours).. | 100 | 100 | 100 | 100 | 100 | 100 |
| 2d period (10-50 or 55 hours) ..... | 96 | 106 | 100 | 99 | 104 | 103 |
| Armature winders, Class A, and armature connectors: | | | | | | |
| 1st period (8-48 hours).. | 100 | 100 | 100 | 100 | 100 | 100 |
| 2d period (10-55 hours).. | 98 | 110 | 110 | 111 | 101 | 111 |
| Armature winders, Class B: | | | | | | |
| 1st period (8-48 hours).. | 100 | 100 | 100 | 100 | 100 | 100 |
| 2d period (10-55 hours).. | 89 | 112 | 108 | 110 | 109 | 118 |

[1] Indexes for scheduled hours not shown because some workers were on both a 55- and 50-hour schedule in the 2d period.

# PUNCH-PRESS OPERATORS — PLANTS B AND C

## INTRODUCTION

The punch press used in stamping and forming pieces of metal calls for perfect eye, hand, and foot coordination when operated manually or semi-manually. This type of operation is one on which fatigue may bring about imperfect coordination that, in the absence of adequate guards, will result in accidents. The hour schedule which will bring the best response from women press operators is of vital importance to all plants employing women on this type of machine. Such response is conditioned not only on fatigue developed on the job but on fatigue resulting from too little time for meeting home demands or for recreation.

The factories whose operators were studied produced cylinder head gaskets and oil seals (grease retainers) for bearings used on war equipment. The same products had been manufactured for peacetime use, so that no change in production methods was necessary when war contracts were received. Blanking, piercing, stamping, flanging, and closing gaskets and oil seals was done on different sizes and types of punch presses.

### DATA SECURED

Periods were chosen for study when specific hour schedules had been in effect for some months; weeks with holidays or other abnormal conditions affecting attendance or production were eliminated. Three periods were studied in Plant B—the first when the plant was operating on a 40-hour week, the second when it was on a 48-hour week, and the third when on a 54-hour week; two were studied in Plant C—the first a 40-hour-week period and the second a 48-hour-week period. In Plant B the first period fell in August-October 1942, the second in February-May 1943, and the third in October-November 1943; in Plant C the first period occurred in May and June 1942 and the second in September-November 1943. Each period studied in Plant B covered 6 weeks; in Plant C, 8 weeks.

Turn-over in both plants was extremely high. Because of the small number employed in Plant C, all 56 women listed as punch operators in the two periods were included in the study of that plant. In Plant B only those were included who were punch operators for at least 3 weeks in each of two of the three periods studied, which eliminated many who were employed for one period only and could not furnish any comparative attendance or production experience.

Personnel data were secured for the women included. Length of experience in the plant and in the occupation was taken from the records, as were actual hours worked each day by each worker. Causes of absence, when reported, were noted, and calls at the medical department and reasons for calls. Average hourly earnings, mainly piecework earnings but including some "day work" earnings, were secured in Plant C as a measure of efficiency. In Plant B the hours worked on efficiency-rated jobs, the amounts produced as measured by standard production hours, and the resultant efficiency ratings were obtained for each individual for each week. Gross earnings also were secured.

Personal visits were paid to women workers in their homes. Women called upon were a cross section of those employed in each department; the sample represented normal distribution with respect to experience, marital status, and distance between home and plant. These women were questioned concerning the personal and family adjustments necessary under the different hour schedules and their own household responsibilities, means of travel from home to plant, and forms of leisure-time activities. Their ideas concerning plant conditions and production in relation to hours worked and earnings and their reactions concerning resulting changes in their own physical and mental condition were ascertained.

## SIMILAR CONDITIONS IN THE TWO PLANTS

### Characteristics of Personnel

The two plants studied had employed women as punch-press operators for many years. Employees who had long service records, chiefly Polish-born women, were a stable dependable group who had adjusted completely to punch-press operations and factory environment. In the war years each firm had increased the number of workers by drawing on a younger group of women, many of whom came from southern States and were without factory experience. The two groups of women did not understand each other. The older women with long experience regarded the younger women as flighty; the criticism was that they worked too fast, spent too much time in the dressing room, and were not steady workers. The younger women objected to the "bossiness" of the older women and believed these older employees were favored in the assignment of jobs. Both plants were unionized, and the more experienced workers had seniority rights and the choice of shifts on which to work. Knowing their own likes and dislikes concerning different punch-press jobs, these experienced workers were better able to get what they wanted by pressure on the assignment clerks or forewomen. On a particularly undesired type of work, the situation was met by ruling that each operator must do this disliked work once a week.

### Turn-over

Whether because of this conflict between groups of workers or for other reasons, the turn-over rate was high in both plants. Of the 336 women punch-press operators in Plant B, only one-third were employed 3 weeks or more in each of 2 of the 3 periods studied. In Plant C only 22 of 56 operators worked in the 2 periods studied.

### Hours of Work

Both plants in 1942 were operating the punch-press departments on an 8-hour-day and 5-day-week schedule with both a day and night shift. A rest period of 10 minutes was given in the first half and of 15 minutes in the second half of each shift. Lunch periods were a half hour except on the night shift in Plant B, which had a 15-minute lunch period.

As the pressure for war output increased, both plants adopted the 48-hour week for punch-press operators. Plant B did so by adding an 8-hour day on Saturday; Plant C, by requiring the shifts to work 8½ hours on 5 days of the week and adding 5½ hours on Saturday. One department in Plant B also attempted a third, midnight shift, which began at 11 p. m. and ended at 7 a. m. and had an informal paid lunch period.

Plant B shifted to the 9-hour day 54-hour week late in 1943. A summary of hour schedules, time of beginning and ending shifts, and the periods studied in each plant is given below.

| *Period* | *Schedule* |
|---|---|
| **PLANT B** | |
| *1st period:* | |
| August–October 1942 (6 weeks)<br>8-hour day, 5-day 40-hour week | 1st shift: 7:30 a.m.–4 p.m.<br>(30-minute lunch period)<br>2d shift: 4:10 p.m.–12:25 a.m.<br>(15-minute lunch period) |
| *2d period:* | |
| February–May 1943 (6 weeks)<br>8-hour day, 6-day 48-hour week | 1st shift: 7:30 a.m.–4 p.m.<br>(30-minute lunch period)<br>One department—7 a.m.–3 p.m.<br>(informal paid lunch period)<br>2d shift: 4:10 p.m.–12:25 a.m.<br>(15-minute lunch period)<br>One department—3 p.m.–11 p.m.<br>(informal paid lunch period)<br>3d shift: one department only—<br>11 p.m.–7 a.m.<br>(informal paid lunch period) |
| *3d period:* | |
| October–November 1943 (6 weeks)<br>9-hour day, 6-day 54-hour week | 1st shift: 7 a.m.–4:30 p.m.<br>(30-minute lunch period)<br>2d shift: 4:35 p.m.–1:50 a.m.<br>(15-minute lunch period) |
| **PLANT C** | |
| *1st period:* | |
| May–June 1942 (8 weeks)<br>8-hour day, 5-day 40-hour week | 1st shift: 7:30 a.m.–4 p.m.<br>(30-minute lunch period)<br>2d shift: 4 p.m.–12:30 a.m.<br>(30-minute lunch period) |
| *2d period:* | |
| September–November 1943 (8 weeks)<br>8½-hour day, 5½-hour Saturday,<br>5½-day 48-hour week | 1st shift: 7 a.m.–4 p.m.<br>(30-minute lunch period)<br>Saturday—7 a.m.–12:30 p.m.<br>2d shift: 4 p.m.–1 a.m.<br>(30-minute lunch period)<br>Saturday—4 p.m.–9:30 p.m. |

## UNLIKE CONDITIONS IN THE TWO PLANTS

### Wage Payment Methods

In 1937 Plant B studied its punch-press jobs thoroughly prior to developing an incentive system of wage payment. However, during the periods studied punch-press operators were paid on a time basis, but the plant continued keeping individual production records. Punch-press operators who had been employed over an extended period were very conscious of the production expected of them. Consequently, these women complained when a specific job seemed to them to have too high a standard time and would bring about a restudy of the timing under current conditions. These women also were careful to mark on the back of the task cards the amount of time spent on incidental work, in waiting for work, dies, and so forth, so that such time would be deducted from the hours charged against their production hours. Management discussed individual workers' efficiency with them only when individuals seemed to be falling down on the job.

In Plant C, punch-press operators had been paid on an hourly basis with bonus. But prior to the first period studied a piece-rate system with a guaranteed hourly minimum was installed.

During the periods studied, therefore, one plant (B) operated on an hourly basis, keeping individual production records; the other (C) operated on a piece-rate system.

### Working Conditions

Both plants were operating on war contracts and were under pressure to get out production. Plant B was operating above capacity and had crowded presses into every available space. Presses in one department were so close together that the operators had to watch that they did not strike each other when working on long gaskets. Further, mass production of gaskets of all types entails continuous handling of great bulks of material, and a shortage of stockmen to move this material resulted in piles of stock, cans of scrap and parts, and reels of metal congesting aisles and work areas. So few stock handlers were available that they were assigned only to the heaviest tasks. Machine operators were expected to service themselves, securing necessary stock, parts, trays, and bins, and carrying away finished pieces and scrap. The general confusion and disorder resulted in time-wasting search for necessary stock and parts.

In Plant C presses were adequately spaced so that workers did not interfere with one another and there was ample room in the aisles. Stock was brought to the operators, while bins of finished pieces and waste material were carried away as fast as they accumulated, even though there was not such a volume of bulky material as in Plant B. Operators, on finishing one job, moved to another machine already set up to take on the next job. There was little idle time or confusion. There was, however, an atmosphere of tension and high speed throughout this second workroom, and it was much noisier than the Plant B workroom.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD

Approximately seven-eighths of the punch-press operators under study in both plants were or had been married. Over eight-tenths in one plant and nine-tenths in the other were at least 25 years of age. It is not surprising, therefore, that almost all these women were members of family households. The households ranged in size from 2 persons to 10, 3-person households being most common.

Over two-fifths of these homes had children under 16 years of age, but only about a fourth of the women workers had children of their own below 16. Usually the woman worker had but one child, though there were several wage-earning women with three or more children.

### HOME RESPONSIBILITIES

Under all 3 hour schedules, more than half of the women had entire responsibility for their households; this meant actually doing the marketing, cooking, cleaning, and laundry—not simply taking general responsibility for seeing that these necessary functions were performed. Most of the others did the marketing and the cooking while various members of the family helped with cleaning or laundry.

In Plant C, which shifted from a 40- to a 48-hour week by adding a half hour to each of the 5 workdays and by working 5½ hours on Saturday, it was the consensus among women interviewed that the extra half hour did not make much difference in their ability to meet home demands. The Saturday morning work forced a shift in marketing from morning to afternoon;

in a few families daughters were called on to do more of the household tasks.

In Plant B, which added 8 hours weekly by making Saturday a full day of work and later changed to six 9-hour days, almost all women reported difficulty in getting their housework done. The following comments are typical.

> I had so much more time to go to the store and get my groceries on the 40-hour week. I could come home and have a breathing spell. The 40-hour week is best for any married woman who keeps house, unless she can afford to have someone come in and do the washing and ironing . . . On the 48-hour week I had to do my washing and ironing either in the evening or in the afternoon before I went to work, when I was on the afternoon shift, instead of on my free day as I did on the 40-hour week . . . That extra free day means so much. I could get up early and do my shopping while fruits and vegetables were still fresh, but you can't do that when you work 6 days a week.

Another woman said—

> The 54-hour week was really hard. I didn't go out much, for that was an awful grind. On the 48-hour period I felt more like getting up early and could get a little more housework done, and I wasn't so tired all the time. I got to bed quite a bit earlier on the 48-hour week, was more rested, and felt better. I had more time to spend with my husband and children, and I got more rest. I was more rushed on the 54-hour week, because I tried to do the same things at home that I did on the 48-hour week.

Another comment was—

> The 54-hour shift was awfully bad. The money was nice but 9 hours was a long day. I got so tired in the afternoon; then I would come home and do my housework. I would have to let things go I was too tired to do. When I wanted to go some place, I would be too tired to go and just have to stay home.

A young matron of 25 years said—

> I reach home to get supper ready. It was much easier on the 40-hour week because I could clean on Saturday. Now, under 54 hours, I must clean in the evenings. As I have to get some sleep, we don't go out as often. On 40 hours we would go to Detroit for a show. I hate 9 hours a day.

A service man's young wife, who was living with her mother and father, gave this report of her leisure time under different hour schedules:

> When I worked from 3 p. m. to 11, I could go to the midnight show after work and still get enough sleep. Most of the girls I chum with go to shows or parties. Then I was changed to the midnight shift, which I prefer. I get up for supper, go to the first show, and am still in time to go to work without rushing too much. I have all Saturday off until Sunday night, so I see my friends and read. During the 54-hour period I worked the afternoon shift. On this shift I just ate, slept, and worked—I didn't even have time to write letters. Any place I went I had to go on Sunday.

Women workers were put on different shifts from time to time. This necessitated change in their household routines. Some women liked the second shift because it gave them mornings to do marketing and more time to care for the home. This meant that they had already done a day's work when they reported to the factory.

### TIME OF RISING, OF REACHING HOME, AND OF RETIRING

For the day shift, changing hours from 40 to 48 a week involved starting work 30 minutes earlier (as well as working on Saturdays) in Plant C and in the largest department of Plant B. This necessitated getting up a half hour earlier on the part of the women affected. The rising hour varied from 5:30 to 7 o'clock in the first period, but from 5 to 6 o'clock in the second period. Changing to the 9-hour day in Plant B affected three of the departments, whose workers had to arrive at 7 instead of 7:30. As already stated,

the fourth department had changed to a 7 a. m. starting hour in the second period and this remained the same under the 9-hour day.

The second shift, under the 40-hour schedule, worked from 4:10 p. m. to 12.25 a. m. in Plant B and 4 p. m. to 12:30 a. m. in Plant C. Under the 48-hour schedule the second shift in Plant C ended at 1 a. m.; in Plant B, 3 departments experienced no change, for a full workday was added on Saturday, but the fourth department worked from 3 to 11 p. m. (when a third shift came on that worked until 7 a. m.). When Plant B initiated the 9-hour day, all departments worked from 4:35 p. m. to 1:50 a. m.—These second-shift workers usually went to bed as soon as they reached home and got up from 10:30 a. m. on.

The distance from home to plant permitted almost as many to walk to work as went by private automobile or as traveled by public vehicle. Round trip transit time was 30 minutes or less for some workers and between 30 minutes and an hour for an equal number. Those who spent more than an hour in going and returning were few.

When the day shift ended at 3, or 4, or 4:30 p. m., many women workers were home before 5 o'clock. When the second shift ended variously from 11 p. m. to 1:50 a. m., the workers reached home in the quiet hours of early morning. The day away from home exceeded 11 hours for relatively few women; until the work hours were lengthened to 9 a day, the majority were away from home less than 10 hours. Obviously the 9-hour day increased such time by at least 1 hour for many women.

### WORKERS' OVER-ALL DAY

Under the 40-hour schedule, more than half the women interviewed from both factories had 8 or more hours of sleep. Only a few had less than 6 hours' rest. The proportion able to sleep 8 hours or more increased under the 48-hour schedule, as did the proportion with fewer than 6 hours of rest. But the 54-hour schedule increased the over-all day for many, as over half the press operators were active for more than 17 hours of each working day.

There seems no question that these press operators, who for the most part were housewives, believed the 54-hour schedule left insufficient strength and energy to carry on the household tasks efficiently. Accumulated housework, in turn, became an irritation.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

It is not surprising from the foregoing that only a very small percentage of these women wished to work the 9-54-hour week. About two-thirds wanted the 8-40-hour week, even though this eliminated overtime pay. About a fourth wanted the 8-48-hour week, usually because "I need the extra money."

While there were women who preferred the second shift, from late afternoon to early morning, the majority preferred the day shift.

### GROSS EARNINGS IN RELATION TO HOURS

In Plant B, a pay raise and overtime pay for all hours over 8 a day or over 40 a week resulted in increased earnings in the longer-hour periods for the group studied even though scheduled hours were not worked regularly and efficiency was not increased. Gross earnings rose from $28.19 under the 40-hour schedule to $37.84 under 48 hours and to $45.86 under 54 hours.

In Plant C, gross earnings increased from $37.12 under the 40-hour schedule to $47.04 under 48 hours. This increase was due to the increases in piece rates and guaranteed minimum rates, overtime pay, and higher efficiency of the group studied.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

As stated in the introduction, during the first period the departments under study operated a schedule of 8 hours a day, 40 hours a week. During the second period Plant B operated an 8-48-hour schedule, Plant C operated a 48-hour week of five 8½-hour days and 5½ hours on Saturday. In a third period Plant B had a 9-54-hour schedule. All punch-press operators employed in Plant C during the periods studied were included. In Plant B, only women employed 3 weeks in at least 2 of the 3 periods were included in the study, and this eliminated 29 in the first period, 93 in the second period, and 117 in the third period; in the first and third periods, about a third of those omitted did not work beyond 3 weeks even in one period. In the second period, a half did not work more than 3 weeks in the period.

#### Attendance, All Women Studied

During the 8-40-hour period more than 80 percent of the women in both plants lost time. The average number of absences during that period exceeded two, and the average length of absence was over 17 hours. In the 8-48-hour period, Plant B cut down the proportion of women losing time, the average number of absences, and the average length of absence. In Plant C, however, only the length of absence was shortened. When Plant B went on the 9-54-hour schedule, the number of absences increased, though their length decreased.

Table II shows that a large proportion of workers lost a week or more in the periods studied. In the first period, about 30 percent in each plant lost from 1 to 5 weeks. In the second period, Plant B was able to cut the proportion to 12 percent. In Plant C's second period and Plant B's third period, both of which fell in the fall of 1943, the proportion who lost a week or more was 22½ percent.

Plant B age records showed a higher proportion of older women working in the 40-hour period than in the second and third periods, when additional younger workers were employed, and that these older women accounted for most of the long-time absences. Fifty-two percent of the women in the first period were 40 years or older as compared with approximately 35 percent in this age category in the second and third periods.

Unfortunately neither firm kept adequate records on causes of lost time. Interviews with women workers in their homes revealed that these extended absences under the 40-hour schedule were often caused by personal illness or family illness. A number of the long-term illnesses were reported as due to teeth extraction, gall-bladder operation, high blood pressure, varicose veins, and neuritis. Sometimes absence was due to plant accidents. Catching a finger in the press caused an 8-week and a 10-week absence, respectively, for two women; and infection due to a cut caused a week's absence for another.

To turn now to a consideration of short-term absences: The proportion of women in each plant who lost time (in weeks in which they were in

attendance at least part of the week) increased as the hours increased. Under the 40-hour week 33.9 percent of the women in Plant B and 23.5 percent of the women in Plant C lost no time at all in the weeks they were in attendance. These proportions decreased to 29 percent and 17.5 percent respectively in the 48-hour period, and to 15.7 percent in Plant B in the 54-hour period. During the weeks in which they were in attendance, women press operators averaged 35.7 hours in Plant B and 38.2 hours in Plant C under the 40-hour week, 44 hours in both plants under the 48-hour week, and 47.8 hours in Plant B under the 54-hour week. Expressed in another way, the women averaged 89 percent, 92 percent, and 88.5 percent of the hours scheduled in the first, second, and third periods, respectively, in Plant B, and 95.5 percent and 91.5 percent in the first and second periods, respectively, in Plant C.

The home interviews with women workers indicated that these short-term absences were directly connected with "tiredness" or to the need to "catch up" with household or other family demands. Under the 9-54-hour schedule, the proportion of women who averaged over 1 day a week off was far larger than under the 8½-48-hour schedule in Plant C or the 8-48-hour schedule in Plant B.

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Shift — Plants B and C

| Period studied, scheduled hours, and shift | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| **PLANT B** | | | | | | |
| 1st period (8-40 hours)... | 62 | 51 | 82.3 | 2.8 | 17.1 | 16.8 |
| 1st shift ... | 52 | 42 | 80.8 | 2.8 | 17.6 | 17.0 |
| 2d shift ... | 3 | 3 | 100.0 | 2.0 | 13.3 | 11.1 |
| Both shifts [1] ... | 7 | 6 | 85.7 | 3.2 | 15.2 | 17.2 |
| 2d period (8-48 hours)... | 99 | 74 | 74.7 | 2.5 | 14.3 | 10.1 |
| 1st shift ... | 37 | 28 | 75.7 | 2.7 | 14.7 | 11.8 |
| 2d and 3d shifts [2]... | 22 | 16 | 72.7 | 2.4 | 15.7 | 10.0 |
| Two or more shifts [3]... | 40 | 30 | 75.0 | 2.4 | 13.1 | 8.8 |
| 3d period (9-54 hours)... | 102 | 88 | 86.3 | 4.4 | 13.9 | 16.6 |
| 1st shift ... | 46 | 43 | 93.5 | 5.2 | 12.7 | 19.3 |
| 2d shift ... | 25 | 19 | 76.0 | 3.7 | 20.9 | 19.3 |
| Both shifts [1] ... | 31 | 26 | 83.9 | 3.4 | 11.5 | 10.5 |
| **PLANT C** | | | | | | |
| 1st period (8-40 hours)... | 34 | 29 | 85.3 | 2.3 | 17.4 | 11.4 |
| 1st shift ... | 23 | 20 | 87.0 | 2.3 | 15.5 | 9.8 |
| 2d shift ... | 11 | 9 | 81.8 | 2.6 | 21.2 | 14.7 |
| 2d period (8½-48 hours)... | 40 | 34 | 85.0 | 3.4 | 16.2 | 12.1 |
| 1st shift ... | 24 | 20 | 83.3 | 3.4 | 21.9 | 16.2 |
| 2d shift ... | 16 | 14 | 87.5 | 3.4 | 8.1 | 6.2 |

[1] Women who had worked on both the first shift and second shift during the period studied.
[2] Only 4 of the 22 women worked on the third shift.
[3] The majority of these women worked both the first and second shifts, but a few worked all 3 shifts, and a few had worked on the first and third shifts.

Both plants operated at least two shifts in each period under study. Plant B, as stated earlier, attempted to operate a third shift in one department under the 48-hour schedule, but there were never enough women who wanted even the second shift to man it completely. Different women were assigned to the third (midnight) shift each week, so that in the same period some women worked on the day shift one week and on the night shift the next. It would appear that under the 48- and 54-hour weeks, a slightly smaller proportion of women on the night shift than on the day shift lost time, and that the hours lost in relation to man-hours of work were fewer. The transfer from day to night work was not accompanied by an increase in absenteeism, which would indicate that when women got the household chores done in the daytime, they took a little less time off from work. However, the fact that most women preferred the day shift indicates that the schedule of hours that brought them home in the afternoon fitted into the family life more satisfactorily.

### Attendance, Stable Group of Workers

Only 25 women in Plant B and 7 in Plant C worked in each week of each period under study. While this group would be too small to use as the basis for determining a plant hour policy, yet the response of this stable group to different hour schedules is worthy of note. In Plant B, the group averaged 37.5 hours under the 40-hour schedule, 45.9 hours under the 48-hour schedule, and 50.3 hours under the 54-hour schedule, as compared with the 35.7, 44.2, and 47.8 hours averaged by the entire group of women whose attendance was analyzed. Even so, the proportion who lost no time was reduced by one-half on the change from 40 hours to 54 hours. The tendency of the whole group to stay out more than 1 day a week as the hours increased to 54 was observed among this stable group also. Again, as among the whole group, night-shift workers lost less time under the 48-hour and the 54-hour week than did the day-shift workers.—In Plant C, the same general tendencies were observed.

It has frequently been said that workers take time off after pay day. Examination of the daily record of each woman showed that in Plant B, where pay day was on Friday for the day shift and on Thursday evening for the night shift, 27 percent of the absences under the 48-hour schedule followed pay day, and on the 54-hour schedule 39 percent followed pay day. Such lost time was of short duration, usually a half day or 1 day, and accounted for less than 9 percent of the lost time, even in the 9-54-hour period.

Experience was similar in Plant C. While about a fourth of the women were absent the day after a Wednesday pay day, such absence accounted for less than 6 percent of the time lost.

### Injuries in Relation to Attendance

The record of calls at the medical room for attention to injuries were available only in Plant B. These injuries included lacerations, bruises, abrasions, cuts, punctures, contusions, fractures, and soreness of muscles. Most of these injuries were industrial injuries caused by the sharpness of the metal pieces handled and occurred to the fingers and hands. Sometimes stock, piled carelessly on the floor, would slip and cut a worker's leg, or she would receive a gash when striking an edge that extended beyond the pile.

The kick-press operators wore gloves to avoid hands being cut. However, they wore no guards, as these small machines were not considered dangerous.

Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Shift — Plants B and C

| Period studied, scheduled hours, and shift | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | 5 weeks | 6 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| **PLANT B** | | | | | | | | | | | | | | | |
| 1st period (8-40 hours): | | | | | | | | | | | | | | | |
| Number | 62 | 43 | 19 | 14 | 2 | 1 | 1 | 1 | ..... | 62 | 21 | 15 | 19 | 7 | 35.7 |
| Percent | 100.0 | 69.4 | 30.6 | 22.6 | 3.2 | 1.6 | 1.6 | 1.6 | ..... | 100.0 | 33.9 | 24.2 | 30.6 | 11.3 | ..... |
| 1st shift: | | | | | | | | | | | | | | | |
| Number | 52 | 36 | 16 | 11 | 2 | 1 | 1 | 1 | ..... | 52 | 18 | 12 | 17 | 5 | 35.8 |
| Percent | 100.0 | 69.2 | 30.8 | 21.2 | 3.8 | 1.9 | 1.9 | 1.9 | ..... | 100.0 | 34.6 | 23.1 | 32.7 | 9.6 | ..... |
| 2d shift—Number | 3 | 2 | 1 | 1 | ..... | ..... | ..... | ..... | ..... | 3 | 1 | 1 | 1 | ..... | 37.8 |
| Both shifts [1] —Number | 7 | 5 | 2 | 2 | ..... | ..... | ..... | ..... | ..... | 7 | 2 | 2 | 1 | 2 | 34.6 |
| 2d period (8-48 hours): | | | | | | | | | | | | | | | |
| Number | 99 | 87 | 12 | 8 | 2 | 1 | 1 | ..... | ..... | 99 | 29 | 37 | 24 | 9 | 44.2 |
| Percent | 100.0 | 87.9 | 12.1 | 8.1 | 2.0 | 1.0 | 1.0 | ..... | ..... | 100.0 | 29.3 | 37.4 | 24.2 | 9.1 | ..... |
| 1st shift: | | | | | | | | | | | | | | | |
| Number | 37 | 32 | 5 | 3 | 1 | ..... | 1 | ..... | ..... | 37 | 11 | 13 | 8 | 5 | 43.5 |
| Percent | 100.0 | 86.5 | 13.5 | 8.1 | 2.7 | ..... | 2.7 | ..... | ..... | 100.0 | 29.7 | 35.1 | 21.6 | 13.5 | ..... |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2d and 3d shifts: [2] | | | | | | | | | | | | | | | |
| Number | 22 | 18 | 4 | 3 | 1 | | | | | 22 | 6 | 11 | 3 | 2 | 44.9 |
| Percent | 100.0 | 81.8 | 18.2 | 13.6 | 4.5 | | | | | 100.0 | 27.3 | 50.0 | 13.6 | 9.1 | |
| Two or more shifts: [3] | | | | | | | | | | | | | | | |
| Number | 40 | 37 | 3 | 2 | | 1 | | | | 40 | 12 | 13 | 13 | 2 | 44.4 |
| Percent | 100.0 | 92.5 | 7.5 | 5.0 | | 2.5 | | | | 100.0 | 30.0 | 32.5 | 32.5 | 5.0 | |
| 3d period (9-54 hours): | | | | | | | | | | | | | | | |
| Number | 102 | 79 | 23 | 13 | 4 | 3 | 1 | 2 | | 102 | 16 | 37 | 27 | 22 | 47.8 |
| Percent | 100.0 | 77.5 | 22.5 | 12.7 | 3.9 | 2.9 | 1.0 | 2.0 | | 100.0 | 15.7 | 36.3 | 26.5 | 21.6 | |
| 1st shift: | | | | | | | | | | | | | | | |
| Number | 46 | 31 | 15 | 9 | 3 | 2 | | 1 | | 46 | 5 | 16 | 15 | 10 | 47.8 |
| Percent | 100.0 | 67.4 | 32.6 | 19.6 | 6.5 | 4.3 | | 2.2 | | 100.0 | 10.9 | 34.8 | 32.6 | 21.7 | |
| 2d shift: | | | | | | | | | | | | | | | |
| Number | 25 | 19 | 6 | 3 | | 1 | 1 | 1 | | 25 | 6 | 8 | 6 | 5 | 46.6 |
| Percent | 100.0 | 76.0 | 24.0 | 12.0 | | 4.0 | 4.0 | 4.0 | | 100.0 | 24.0 | 32.0 | 24.0 | 20.0 | |
| Both shifts: [1] | | | | | | | | | | | | | | | |
| Number | 31 | 29 | 2 | 1 | 1 | | | | | 31 | 5 | 13 | 6 | 7 | 48.9 |
| Percent | 100.0 | 93.5 | 6.5 | 3.2 | 3.2 | | | | | 100.0 | 16.1 | 41.9 | 19.4 | 22.6 | |

PLANT C

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st period (8-40 hours): | 34 | 24 | 10 | 6 | 1 | 1 | 1 | 1 | | 34 | 8 | 23 | 1 | 2 | 38.2 |
| 1st shift | 23 | 18 | 5 | 3 | | 1 | 1 | | | 23 | 4 | 16 | 1 | 2 | 37.8 |
| 2d shift | 11 | 6 | 5 | 3 | 1 | | | 1 | | 11 | 4 | 7 | | | 38.9 |
| 2d period (8½-48 hours) | 40 | 31 | 9 | 7 | | | 1 | | 1 | 40 | 7 | 19 | 10 | 4 | 44.0 |
| 1st shift | 24 | 16 | 8 | 6 | | | 1 | | 1 | 24 | 5 | 9 | 7 | 3 | 43.0 |
| 2d shift | 16 | 15 | 1 | 1 | | | | | | 16 | 2 | 10 | 3 | 1 | 45.5 |

[1] Women who had worked on both the first shift and second shift during the period studied.
[2] Only 4 of the 22 women worked on the third shift.
[3] The majority of these women worked both the first and second shifts, but a few worked all 3 shifts, and a few had worked on the first and third shifts.

## Table III. — Injuries Causing Calls to Medical Department Under Different Scheduled Hours — Plant B[1]

| Type of injury | 1st period (8-40 hours) | | | | 2d period (8-48 hours) | | | | 3d period (9-54 hours) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Women | | Number of injuries | Number of visits | Women | | Number of injuries | Number of visits | Women | | Number of injuries | Number of visits |
| | Number | Percent | | | Number | Percent | | | Number | Percent | | |
| Total women | 62 | 100 | ..... | ..... | 99 | 100 | ..... | ..... | 102 | 100 | ..... | ..... |
| Women making no medical calls | 16 | 26 | ..... | ..... | 19 | 19 | ..... | ..... | 30 | 29 | ..... | ..... |
| Women making medical calls | 46 | 74 | 178 | 221 | 80 | 81 | 391 | 593 | 72 | 71 | 350 | 504 |
| Women reporting reasons for medical calls[2] | 46 | ..... | 178 | 221 | [2] 80 | ..... | 391 | 593 | [2] 72 | ..... | 350 | 504 |
| Industrial injuries[3] | 45 | ..... | 170 | 211 | 80 | ..... | 388 | 590 | 72 | ..... | 343 | 496 |
| Fingers, hands, or arms | 45 | ..... | 167 | 207 | 80 | ..... | 374 | 576 | 72 | ..... | 332 | 485 |
| Feet or legs | 2 | ..... | 1 | 2 | 11 | ..... | 12 | 12 | 9 | ..... | 11 | 11 |
| Other | 2 | ..... | 2 | 2 | 2 | ..... | 2 | 2 | ..... | ..... | ..... | ..... |
| Nonindustrial injuries | 6 | ..... | 8 | 10 | 3 | ..... | 3 | 3 | 6 | ..... | 7 | 8 |
| Fingers, hands, or arms | 5 | ..... | 6 | 8 | ..... | ..... | ..... | ..... | 4 | ..... | 4 | 5 |
| Feet or legs | ..... | ..... | ..... | ..... | 2 | ..... | 2 | 2 | 1 | ..... | 1 | 1 |
| Other | 2 | ..... | 2 | 2 | 1 | ..... | 1 | 1 | 1 | ..... | 2 | 2 |

[1] This table covers only calls to the medical department due to injuries.
[2] Details add to more than total because some women made medical calls for more than one injury.
[3] Injuries include lacerations, bruises, abrasions, cuts, punctures, contusions, fractures, and soreness of muscles.

Posson safety guards were worn by everyone operating the large manually fed power presses.

The average number of initial calls at the medical office on account of injuries, and the average number of such calls plus calls for dressings, per 100 man-hours worked, are shown below.

| Period | Average number of calls at medical office per 100 man-hours worked | |
|---|---|---|
| | Initial calls | Initial calls plus calls for dressings |
| 40-hour | 1.5 | 1.8 |
| 48-hour | 1.6 | 2.5 |
| 54-hour | 1.3 | 1.9 |

## PRODUCTIVE EFFICIENCY

### Nature of the Job

Punch-press operation was the only occupation studied, but within the two plants surveyed different types of punch-press operations were performed on many types of presses. Women usually were not assigned to the same press continuously. Rather they often worked on several presses each day in order to keep an even flow of work through the plant.

Department 1 in Plant B was equipped with heavy-duty flat presses. Women were not assigned to these presses until the war brought a shortage of men workers. Both men and women were currently operating these presses. The thin metal pieces, from 18 to 36 inches long and from 4 to 12 inches wide, were fed to the press by hand. The ram was started downward by pressure on a foot pedal. When the metal had been blanked or the gasket flanged or closed, it was removed by hand and placed on bench or truck and the scrap removed from the machine. Workers, as previously stated, wore Posson safety guards.

In addition to operating the presses, workers got their materials, oiled stock when necessary, opened crates of asbestos sheets, and carried piles of finished gaskets away from the machines. Approximately 1 to 1½ hours a day were spent on such miscellaneous tasks. As the pieces handled were large and the machine operation was relatively slow, successful operation called for a steady rhythm, the use of both hands, and perfect timing of hand and foot movements. The cycle of work averaged about 550 pieces an hour. The work performed by women in this department would be considered moderately light, even though the parts were among the largest handled by any of the women studied.

Department 2 performed the same kind of punch operations but on semi-automatic incline presses. Here the operator slid pieces into a slot, and the pieces were located automatically under the ram. She tripped the pedal just long enough for the gasket to locate itself before the ram descended. The finished piece slid onto an automatic piler behind the press. The press had gateguards. The operator watched the feed to see that the stock went off the slide correctly.

There was considerably more lifting and carrying in this department because of the relatively automatic nature of the work and the greater number of large-sized pieces run per hour. This meant operators had to leave their machines frequently to get more stock and remove completed stock from the automatic pilers. Sometimes they inserted fillers into gaskets. They either sat or stood to operate the trip pedal, as machines were equipped with two pedals, one for use while sitting and the other for use while standing. The cycle was short: about 750 gaskets with fillers inserted were run in an hour, and an even greater number were produced when simple blanking

was involved. The pace was steady and quite rapid. Not as close attention was required as in the other departments studied.

Department 3 in Plant B was equipped for the most part with small manually fed presses. The operator placed the piece of cut or scrap metal or asbestos on the die, tripped the pedal, received the piece, and placed it on a tray. For some operations the foot remained on the pedal while the operator moved a circular piece of metal about to blank out the pieces as the ram moved up and down at set intervals. The degree of coordination involved was high. Foot, hand, and eye movements had to be perfectly timed so the work would be properly located before the ram descended. Close attention was necessary to avoid spoilage and accidents. The workers were seated when operating presses. All persons had Posson safety guards. The majority of presses were equipped with metal guards around the area under the ram of the press.

Department 4 of Plant B had table presses of two types for attaching flanges to gaskets—manually operated kick presses and automatic eyelet machines. On kick presses the operator placed the flange under the die with one hand while placing or moving the gasket under the ram with the other; foot pressure brought down the ram. The completed piece was removed by hand. On the eyelet machines the operator merely fed gaskets to the press while the flanges automatically slid down a chute to be pressed into position on the gasket. The gasket was then removed by hand.

The coordination required on the kick press was high. The series of movements was rapid and repetitive and had to be timed accurately so the press would descend at the right moment each time. Since no safety guards were worn on these presses, the operator had to give close attention so that the flange and gasket would be placed in exactly the right position. An average of 500 gaskets were run per hour. The automatic press required less coordination, though the gasket had to be moved to the proper position for the next flange, in time with the automatic feeding of the flange and the tripping of the pedal. The number of gaskets run averaged 750 an hour.

Plant C had two types of presses in the same department. The most common press was a hand-fed, foot-tripped punch press. The operator held a stack of metal pieces in her left hand and slid the individual pieces into proper position on the press, using a small wooden "feed stick." She then depressed the foot pedal, which caused the ram to descend and make the required cutting or stamping. On the automatic press, the operator merely guided the strip of metal from an automatic roll feed. Stock was brought to the operator and bins of finished pieces and waste were carried away by men. Machines were set up, so that the operator could move from one to the next as each task was completed. The pace of work was faster than on the hand-fed, foot-tripped press. Further, only a few of the operators wore Posson safety devices.

It is generally agreed that some people cannot attain the type of eye, hand, and foot coordination necessary for punch-press operation. According to management, 3 weeks will determine whether a person will become an efficient operator. The women themselves stated that it took some months to learn the different operations and attain speed. There was a great difference among operators, for while some claimed they had attained maximum speed in 2 months, others said it required 4 months, and still others 6 months.

While most punch-press operators were hired for this occupation, there were some women who had worked elsewhere in the plant before being

assigned to this work. For the women so transferred, plant experience is longer than punch-press experience. In Plant C, where all women employed in either period under study were included, 15 percent had less than 3 months of punch-press experience, and nearly 30 percent had less than 6 months' of such experience. However, the majority had worked 5 or more years on punch presses. In Plant B, as previously stated, no woman was included who had been employed less than 3 weeks in each of at least two of the three periods under study. By this selection, the mass of women who were employed in one period only, and who were, therefore, the less experienced, were excluded from the study. All but 2 percent of those included in Plant B had at least 6 months' job experience; three-fourths had a year or more of experience; and about half had 5 years or more. For the most part, therefore, the punch operators studied were experienced workers.

### Performance on the Job — Plant B

Plant B, as noted in the introduction, had operated under an incentive wage system sometime prior to the Women's Bureau investigation. Time studies had been made and a standard time set for each punch-press operation. Although it had reconverted to payment on a straight hourly basis when the Bureau undertook its study, the plant continued to record production and efficiency rates. Records were kept of the individual worker's hours on time-studied production jobs and of hours on jobs which did not lend themselves to time study, such as repair work. Individual efficiency rates were computed by dividing the number of "standard-production hours" the operator achieved by the number of hours she actually worked on time-studied jobs.

A few women worked only on jobs not amenable to time-study, which accounts for the discrepancy in the number of women shown on all tables dealing with productive efficiency in Plant B and the number shown on tables dealing with attendance. Table IV, which follows, shows efficiencies by departments in Plant B, rather than by type of press operated, because of the variation in the types of presses in use.

It is obvious from table IV that experience is a much more potent factor in output than either management or the women interviewed reported. Practically without exception, efficiency in each department in Plant B increased as experience increased. The small flat-press department (3), which employed the largest number of women and where manually fed presses were operated, shows a distinct difference in efficiency under the 48- and the 54-hour week, not only as between beginners and experienced workers but as between those with experience of 6 months and under a year and those with a year or more of experience. In the latter comparison, under both schedules the efficiency increased from the low 80's to the middle 90's. The table-press department (4) shows a difference in efficiency as between those with experience of 6 weeks and under 6 months and those with a year's experience or more. The large-press department (1) also indicates the effect of experience on output. Only in the incline-press department (2), where automatic feeding and piling occurs, would the difference between output of workers whose experience was "6 months and under a year" and output of workers whose experience was "1 year or more" seem to be of no importance; however, the numbers of workers in these groups are too small to be conclusive.—In comparing efficiencies in relation to hours, therefore, the comparison must be limited to women with the same amount of experience.

Table IV. — Individual Efficiency by Length of Experience in Occupation, Under Different Scheduled Hours, by Department — Plant B

| Department, period studied, and scheduled hours | Total | | | | Length of time in occupation: 1 year or more | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of women studied | Average weekly hours worked | Average weekly hours on incentive work | Average efficiency rating | Number of women studied | Average weekly hours worked | Average weekly hours on incentive work | Average efficiency rating |
| Department 1: | | | | | | | | |
| 1st period (8-40 hours) | 3 | 37.3 | 27.4 | 85.3 | 2 | 40.0 | 29.1 | 102.2 |
| 2d period (8-48-hours) | 13 | 41.9 | 35.2 | 76.7 | 5 | 40.1 | 26.5 | 85.0 |
| 3d period (9-54-hours) | 12 | 43.4 | 37.5 | 85.8 | 4 | 39.8 | 25.2 | 94.9 |
| Department 2: | | | | | | | | |
| 1st period (8-40 hours) | 8 | 37.5 | 36.7 | 86.8 | 7 | 39.4 | 38.5 | 93.5 |
| 2d period (8-48-hours) | 12 | 43.2 | 42.1 | 83.5 | 8 | 42.6 | 41.0 | 92.5 |
| 3d period (9-54-hours) | 10 | 46.4 | 43.8 | 89.0 | 7 | 46.2 | 44.1 | 88.5 |
| Department 3: | | | | | | | | |
| 1st period (8-40 hours) | 24 | 36.1 | 34.1 | 89.9 | 24 | 36.1 | 34.1 | 89.9 |
| 2d period (8-48-hours) | 39 | 45.2 | 38.9 | 88.8 | 24 | 44.8 | 37.1 | 96.2 |
| 3d period (9-54-hours) | 48 | 47.9 | 41.0 | 86.9 | 24 | 46.6 | 35.5 | 94.7 |
| Department 4: | | | | | | | | |
| 1st period (8-40 hours) | 20 | 34.7 | 25.1 | 89.7 | 18 | 34.1 | 25.4 | 91.7 |
| 2d period (8-48-hours) | 26 | 44.6 | 36.8 | 83.0 | 18 | 45.4 | 35.9 | 85.3 |
| 3d period (9-54-hours) | 20 | 50.7 | 44.3 | 80.3 | 13 | 51.2 | 45.9 | 81.5 |

| Department, period studied, and scheduled hours | Length of time in occupation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 months, less than 1 year | | | | 6 weeks, less than 6 months | | | | Less than 6 weeks | | | |
| | Number of women studied | Average weekly hours worked | Average weekly hours on incentive work | Average efficiency rating | Number of women studied | Average weekly hours worked | Average weekly hours on incentive work | Average efficiency rating | Number of women studied | Average weekly hours worked | Average weekly hours on incentive work | Average efficiency rating |
| Department 1: | | | | | | | | | | | | |
| 1st period (8-40 hours) | 1 | 32.0 | 24.0 | 51.7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d period (8-48-hours) | ..... | ..... | ..... | ..... | 8 | 43.0 | 40.7 | 71.5 | ..... | ..... | ..... | ..... |
| 3d period (9-54-hours) | 7 | 45.9 | 44.1 | 81.7 | 1 | 40.2 | 40.2 | 77.6 | ..... | ..... | ..... | ..... |
| Department 2: | | | | | | | | | | | | |
| 1st period (8-40 hours) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 24.0 | 24.0 | 39.6 |
| 2d period (8-48-hours) | 1 | 46.7 | 46.7 | 92.3 | 1 | 42.7 | 42.7 | 65.0 | 2 | 43.8 | 43.8 | 52.4 |
| 3d period (9-54-hours) | 3 | 46.7 | 43.0 | 90.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Department 3: | | | | | | | | | | | | |
| 1st period (8-40 hours) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d period (8-48-hours) | 1 | 44.0 | 41.3 | 80.3 | 10 | 45.8 | 42.6 | 78.8 | 4 | 46.4 | 39.4 | 71.0 |
| 3d period (9-54-hours) | 18 | 50.0 | 46.5 | 83.9 | 2 | 43.0 | 43.0 | 74.1 | 4 | 48.3 | 48.3 | 60.2 |
| Department 4: | | | | | | | | | | | | |
| 1st period (8-40 hours) | 2 | 40.0 | 23.2 | 71.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d period (8-48-hours) | ..... | ..... | ..... | ..... | 7 | 44.4 | 40.3 | 81.1 | 1 | 32.0 | 28.7 | 55.3 |
| 3d period (9-54-hours) | 7 | 49.8 | 41.4 | 78.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

Department 1 was the department that was equipped with large punch presses and had employed only men before the war started. The few women who had a year or more of experience averaged not more than 40 hours a week, no matter what the scheduled hours; their efficiency in the three periods studied does not, therefore, reflect any hours change. What is also noticeable is the small proportion of time they spent on productive work.

In Department 2 the same type of work was done as in Department 1, but on semiautomatic incline presses; the work was more quickly learned and required less coordination. The women with a year or more of experience showed a slightly lower efficiency with the increase in hours. Some women reported that they thought their decreased efficiency was due to "more machine trouble because of poor die-setters," "more stock and scrap around," and "because the girls slow up the last hour to get ready to leave."

Department 3, with its small manually fed presses which require the highest degree of eye, hand, and foot coordination, had always been a woman's department. The 24 women with a year or more of experience did not average more than 46.6 hours in any period. Their hours on incentive work jobs averaged about 35 a week.

It is not known whether the reported hours spent on productive work are fewer for experienced than for inexperienced women workers because the experienced women kept a more careful record of time on nonproductive tasks or because they were actually assigned to more day-work jobs. Whatever the cause, the experienced women spent only 75 percent of their working time on productive work under the 9-54-hour schedule, 83 percent under the 8-48-hour schedule, and 91 percent under the 40-hour schedule. With so much time excluded from productive hours, their efficiency went from 89.9 under 40 hours to 96.2 under 48 hours, and 94.7 under 54 hours.

Women workers were impressed with the idea that they had to turn out 9 hours' production when they went on a 9-hour schedule. A 10-minute rest period was provided in the first half and a 15-minute rest period in the second half of each shift. The girls said, "You have to make up for those rest periods. Under the 8-hour day we did not have any rest period in this department, so we only had to make up the paid-for lunch period." Some women said they skipped the rest period when they were behind on production.

Department 4 was made up of table presses—the kick press, requiring foot pressure to bring the ram into position, and the automatic eyelet press. The first called for a high degree of coordination, the second for far less. Here again, in the second and third periods many women were introduced into the department who did not remain long enough to warrant inclusion in the detail of this study. As the presses were placed close together, the overcrowding may have accounted for part of the drop in efficiency from the 40-hour period to the 48-hour period, even among experienced operators, who showed a drop of 6.4 points.

The experienced women in this department averaged longer hours worked under the 54-hour schedule than the experienced women in any other department; that is, they averaged 51.2 out of the scheduled 54 hours, whereas experienced women in no other department averaged so much as 47 hours of work in the weeks they reported for work. Also, the experienced women's hours on production work were higher. Even so, their efficiency dropped to 81.5 in the 54-hour period, from 91.7 in the 40-hour period and 85.3 in the 48-hour period.

In each department over-all production data were secured, i.e., aggregate weekly figures on total hours worked, hours worked on incentive jobs, and the average efficiency rate for the group as a whole. These data reveal the extent to which introducing many new inexperienced workers into a department resulted in a drop in departmental efficiency. Under the 40-hour schedule, in Department 1, over-all efficiency was 89; it dropped to 79 under the 48-hour schedule when there was an influx of new workers, and to 74 when more new workers were added and the 54-hour week went into effect. In Department 3 efficiency dropped from 88 in the first period to 82 and 83, in the second and third periods, respectively. In Department 4 there was a decline in efficiency from 86 to 76 to 74 respectively, under the 40-, 48-, and 54-hour schedules.

### Performance on the Job — Plant C

In Plant C, average hourly earnings were used as a measure of production. This was not an entirely accurate yardstick, because, while the bulk of the earnings were from piecework, some "no price" work, that is, work paid on an hourly basis, was included. The plant recorded only total earnings and did not show piecework earnings separately. In the 40-hour period, all the women were experienced and averaged 97 cents an hour. (This figure is computed on the increased rate paid in the second period, is for purposes of comparison of output, and does not represent actual earnings.) During the 48-hour period women averaged $1 an hour, even though new workers had been introduced. Those with less than 6 months' experience could not make as much as experienced workers, but a small group with experience of from 6 months to a year exceeded the output of the most experienced group. These were young southern women who had taken hold of the punch-press operations and excelled the older, experienced workers. Some women reported that the foreman took pleasure in pointing out the greater speed of these new workers. This served as a stimulus to raise the level of output of the older women, which rose by about 5 percent. The increased efficiency was not, however, achieved without strain on these women; even though they said they did not mind working half an hour longer on 5 days a week, they complained at the pace set by the new girls.

### Performance on the Job — Summary

As has been stated, effort was made to increase output in the press departments in Plants B and C through increasing the numbers employed and the scheduled hours of work. In Plant C scheduled hours were increased 20 percent, but possible man-hours were increased 46 percent by the increase in numbers employed. Though the average hours worked did not exceed 44 a week under the 48-hour schedule, the increase in numbers working and the fact that some additional hours were worked resulted in a total gain of 44 percent in man-hours of work. The slight increase of 3 percent in efficiency resulted in a net increase in total production of 58 percent.

In Plant B, the Women's Bureau, as noted, confined its detailed analysis of workers to the women who were employed as press operators at least 3 weeks in each of 2 of the 3 periods studied. Among this group a 20-percent increase in hours to 48 a week and a 64-percent increase in number of press operators brought a 103-percent increase in man-hours worked. The inexperience of new workers resulted in a 9-percent drop in average hourly production, but nevertheless total production was increased by 98 percent. The 54-hour schedule, when actual hours worked averaged 47.8 hours, resulted in a 117-percent increase over the 40-hour period in man-hours worked. The

Table V. — Individual Efficiency, by Length of Experience in Occupation, Under Different Scheduled Hours, by Shift — Plant C

| Period studied, scheduled hours, and shift | Total | | | Length of time in occupation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 year or more | | | 6 months, less than 1 year | | | 6 weeks, less than 6 months | | |
| | Number of women studied | Average weekly hours worked [1] | Efficiency (average hourly earnings[2]) | Number of women studied | Average weekly hours worked [1] | Efficiency (average hourly earnings[2]) | Number of women studied | Average weekly hours worked [1] | Efficiency (average hourly earnings[2]) | Number of women studied | Average weekly hours worked [1] | Efficiency (average hourly earnings[2]) |
| 1st period (8-40 hours) | 34 | 38.2 | $.97 | 34 | 38.2 | $.97 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1st shift | 23 | 37.8 | .98 | 23 | 37.8 | .98 | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d shift | 11 | 38.9 | .96 | 11 | 38.9 | .96 | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d period (8½-48 hours) | 40 | 44.0 | 1.00 | 21 | 42.7 | 1.03 | 4 | 46.0 | $1.07 | 15 | 45.2 | $.94 |
| 1st shift | 24 | 43.0 | 1.01 | 17 | 41.8 | 1.04 | 1 | 48.0 | 1.13 | 6 | 45.8 | .93 |
| 2d shift | 16 | 45.4 | .98 | 4 | 46.8 | 1.01 | 3 | 45.3 | 1.05 | 9 | 44.7 | .95 |

[1] Only total weekly hours are shown because plant records did not show hours on piecework separately.
[2] Total average hourly earnings are shown because plant records did not give piecework earnings apart from total earnings.

hourly rate of production under 54 hours was 3 percent less than under 40 hours, but with the 64-percent increase in numbers employed total production increased 116 percent over the 40-hour period.

When all employees in the four press departments of Plant B are considered, the showing is not so satisfactory, for new employees who did not remain in the factory usually had not achieved a good efficiency rate. Such over-all figures as were available indicated that with an increase in hours to 48, that is, by 20 percent, and an increase in numbers employed of 118 percent, hours on production work increased by 129 percent and total production by 107 percent. When the hours scheduled increased to 54 a week, or 35 percent, the total number of press operators increased by 136 percent, resulting in a 168-percent increase in hours on production work. Total production increased 138 percent, which is not high in relation to the increase of 136 percent in personnel, and as contrasted with the 116-percent increase in production with a 64-percent increase in personnel of the more experienced group studied.

Table VI. — Summary of Possible Man-hours, Total Man-hours Worked, Total Man-hours Worked on Incentive Jobs, Efficiency, and Total Production, Based on Totals for All Women Studied, Under Different Scheduled Hours, by Groups of Workers — Plants B and C

| Group of workers, period studied, and scheduled hours | Index numbers of [1] — | | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of women | Scheduled hours | Possible man-hours | Total man-hours worked | Total man-hours worked on incentive jobs | Efficiency (average hourly production) | Total production |
| **PLANT B** | | | | | | | |
| Press operators studied [2]: | | | | | | | |
| 1st period (8-40 hours) | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 2d period (8-48 hours) | 164 | 120 | 186 | 203 | 210 | 91 | 198 |
| 3d period (9-54 hours) | 164 | 135 | 217 | 217 | 229 | 97 | 216 |
| All press operators [3]: | | | | | | | |
| 1st period (8-40 hours) | 100 | 100 | ..... | ..... | 100 | ..... | 100 |
| 2d period (8-48 hours) | 218 | 120 | ..... | ..... | 229 | ..... | 207 |
| 3d period (9-54 hours) | 236 | 135 | ..... | ..... | 268 | ..... | 238 |
| **PLANT C** | | | | | | | |
| Press operators studied [4]: | | | | | | | |
| 1st period (8-40 hours) | 100 | 100 | 100 | 100 | ..... | 100 | 100 |
| 2d period (8½-48 hours) | 118 | 120 | 146 | 144 | ..... | 103 | 158 |

[1] Blank spaces denote information not available.
[2] Includes women employed 3 weeks or more in two periods studied; this is same group shown in other tables for Plant B.
[3] Includes all women in each department studied regardless of length of employment.
[4] Includes all women in the occupation studied; this is same group shown in other tables for Plant C.

The foregoing analysis of performance in Plants B and C permits the following statements to be made:

1. Neither new nor experienced employees work a scheduled 48-hour or 54-hour week continuously. They average 44 as against a scheduled 48, 48 as against a scheduled 54.

2. Productive efficiency may be judged only on actual hours worked, not on scheduled (44 vs. 48, 48 vs. 54).
3. Among experienced workers, efficiency appears to be somewhat less under a 9-hour day than under an 8-hour schedule.
4. Introducing some new workers who remain long enough to learn the job may serve as a stimulus to the experienced workers and bring about a general increase in efficiency. Introducing a large number who do not stay long enough to learn the job creates confusion and lowers general efficiency.
5. When an operator's assignments remain similar and are on the same type of press, she may achieve full efficiency after 6 months; when her assignments require a variety of operations on different types of presses, a year or more is generally necessary to acquire speed.
6. When it is necessary for workers to service themselves with stock and equipment, the time lost on nonproductive work is excessive, and efficiency tends to be lowered.

# LIGHT PRECISION MACHINE OPERATORS — PLANT D

## INTRODUCTION

Plant D assumed as part of its war load the production of small precision parts unlike any the management had previously manufactured. It converted from peace production of burners, heaters, and lanterns to war production which included a ⅜-inch rotor for artillery ammunition. The women selected for study were drill-press operators, automatic-machine operators, and visual and gage inspectors performing a sequence of operations involved in the manufacture of these small rotors. Some women from other departments were transferred into the rotor department and many new workers were hired for this work.

Rotor production first started in the summer of 1942, and turn-over was very high during at least the first year of production. All workers had to be specially trained for this fine-precision work, and production methods were gradually devised that would ensure the high quality of production required.

During the first half year to a year of rotor manufacturing constant improvements were being made in production techniques. Even when management thought it had attained a certain stability in production, as well as more stability of personnel, there was a continued rise in efficiency regardless of hours worked. Because the effect of hours on production was distorted in this fashion, a further analysis was made of production records to show variations in production during different days of the week and by time of day.

Four periods, with 8 weeks in each period, were selected for study. Each hour schedule studied had been in effect at least 2 months prior to the first week studied. Periods of holidays, floods, epidemics, hot weather, storms, and so forth were eliminated because of the abnormal absenteeism that prevailed in such weeks. All four periods were studied for attendance data. Only the last two periods were studied for production data because of the very marked changes and improvements in production methods in the first two periods.

In the first period, there were three shifts on a 7½-45-hour schedule. In the second period, two shifts operated on a 9-54-hour schedule. There were two shifts and both an 8½-51-hour schedule and a 9-54-hour schedule in the third period: The automatic-machine operators, and loaders and inspectors (checkers) on the drill tables continued on the 9-54-hour schedule that prevailed in the second period; but, the 5 drill-press operators on each of the 7 drill tables were on an 8½-51-hour schedule because they came in 15 minutes later than the other workers and had a 15-minute longer lunch period to allow the loader on each drill table time to put in new drills and make machine adjustments before the drill operators started work.

In the fourth period, the miscellaneous machine operators, loaders, and inspectors had their hours increased to 10 a day and 5 on Saturday. Drill-press operators again worked a half hour less a day to allow machine adjustments to be made, so that their schedule was 9½ hours a day, 4¾ hours on Saturday, 52¼ hours a week. The few 10-hour workers on the second shift worked a 6½-hour stretch, Sunday midnight to Monday morning, instead of the 5-hour stretch worked by the day shift on Saturdays, so that their weekly hours totaled 56½ instead of 55.

Below is a résumé of the hour schedule in each period studied.

| *Period* | *Schedule* |
|---|---|
| *1st period:* | |
| October–November 1942 (8 weeks)<br>7½-hour day, 6-day 45-hour week | 1st shift: 7 a.m.–3 p.m.<br>(30-minute lunch period)<br>2d shift: 3 p.m.–11 p.m.<br>(30-minute lunch period)<br>3d shift: 11 p.m.–7 a.m.<br>(30-minute lunch period) |
| *2d period:* | |
| March–April 1943 (8 weeks)<br>9-hour day, 6-day 54-hour week | 1st shift: 7 a.m.–4:30 p.m.<br>(30-minute lunch period)<br>2d shift: 9:30 p.m.–7 a.m.<br>(30-minute lunch period) |
| *3d period:* | |
| September–November 1943 (8 weeks)<br>8½-9-hour day, 51-54-hour week | |
| (1) *Miscellaneous machine operators, loaders, inspectors:*<br>9-hour day, 6-day 54-hour week | Shifts and lunch periods same as in 2d period |
| (2) *Drill-press operators:*<br>8½-hour day, 6-day 51-hour week | 1st shift: 7:15 a.m.–4:30 p.m.<br>(45-minute lunch period)<br>2d shift: 9:45 p.m.–7 a.m.<br>(45-minute lunch period) |
| *4th period:* | |
| February–April 1944 (8 weeks)<br>9½-10-hour day, 52¼-55-56½-hour week | |
| (1) *Miscellaneous machine operators, loaders, inspectors:*<br>10-hour day, 5-6½-hour Saturday, 55-56½-hour week | 1st shift: 7 a.m.–5:30 p.m.<br>(30-minute lunch period)<br>Saturday—7 a.m.–12 noon<br>2d shift: 8:30 p.m.–7 a.m.<br>(30-minute lunch period)<br>Sunday—midnight–7 a.m.<br>(30-minute lunch period) |
| (2) *Drill-press operators:*<br>9½-hour-day, 4¾-hour Saturday, 52¼-hour week | 1st shift: 7:15 a.m.–5:30 p.m.<br>(45-minute lunch period)<br>Saturday—7:15 a.m.–12 noon<br>2d shift: 8:45 p.m.–7 a.m.<br>(45-minute lunch period)<br>Monday—12:15 a.m.–5 a.m. |

The women selected for study were employed at least 3 weeks in each of two periods studied. The personnel records secured were date of birth, marital status, last grade completed in school, hiring date, and dates of transfers, reclassifications, terminations, and rehires. Clock cards were used to ascertain daily hours worked. Reasons for lost time were ascertained when available. The dates of all calls to the first-aid room were recorded, together with the nature of the illness or accident which necessitated such a call.

As already stated, production data were secured for only the third and fourth periods. In this connection, time on productive operations as distinct from the total time worked had to be computed from the company's records, because time lost through machine difficulties, lack of materials, defective materials, and so forth, could not be charged against the productive efficiency of the worker. The number of imperfect units produced was also secured,

as were efficiency percentages as figured by management. Daily production rates and the number of rejections of defective pieces were analyzed in relation to different periods of the day. Gross earnings were secured for workers in the third and fourth periods.

Home visits were paid to a sample of the women workers, the cross section being chosen on the basis of marital status, age, and distance from plant. The women were questioned regarding the effect of different hour schedules on their personal and family life and on their productive efficiency. They were also asked what were the general causes for absence during different periods, to describe conditions that they felt affected their production, what were their family responsibilities, and so forth.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD

The women employed in the rotor department in Plant D were for the most part a young group. Three-fifths were under 25 years of age, and four-fifths were under 30. More than half had come from communities other than the one in which the factory was situated; for the most part, their living status changed during the periods under study. Living in rooms when they first arrived in town, they showed a marked tendency, as their employment was extended, to set up housekeeping establishments.

At the time they were interviewed, more than two-thirds of the women visited lived in household groups. Such a group might be made up of father and mother and daughters, but more frequently it was a two-family household composed of husband and wife and sisters or other relatives. There were children in only a third of the households at the time, and very few of these were under 6 years of age. Girls who lived independently tended, as noted above, to take an apartment and maintain a home for themselves, or to join with other girls in a housekeeping arrangement; roomers and boarders were few.

### HOME RESPONSIBILITIES

These women workers, though half were single, had household chores to do. Usually the groups with more than one adult woman shared the work of marketing, cooking, cleaning, and laundry; in the father-mother-daughter household the daughter helped out, but usually assumed full responsibility only for her own laundry; in the husband-wife household all duties seemed to fall to the wife.

The following comments were made by young women workers on the 8½- or 9-hour day for 6 days a week versus the 9½- or 10-hour day with a half day Saturday:

*A.* Girls don't gang up evenings and talk since we've been working 9½ hours, because we're too tired.

*B.* I'm too tired to do any reading after finishing the dinner dishes. I go to sleep the minute I open a book since working on the 10-hour day.

*C.* With long working hours, we have less time and energy for fun. Mostly we have fun Saturday and Sunday when we swim and dance, go to baseball games or shows.

*D.* Under the 9½-hour schedule I have to take time off for the dentist and occasional beauty-parlor appointments.

*E.* Since working 9½ hours, I find it more difficult to get marketing done, as the store closes at 6:30. It's hard to get utility bills and insurance paid, as those offices aren't open Saturday afternoon.

*F.* Now I must do all the necessary shopping Saturday afternoons but on the 9-hour day I could do the shopping between 4:30 and 6 any day, which was handier.

*G.* I gave up midweek church services on the 10-hour schedule.

*H.* I gave up membership in the Y. W. C. A.

*I.* My sixteen-year-old daughter takes care of the two younger children, who aren't 5 years old yet, when she is home from school, but even so I have to cut down on my activities under longer hours.

*J.* Under the 10-hour day I worked so hard Saturday afternoon and Sunday that I never felt rested Monday. This year the family is not attempting a garden, so I shan't do any canning.

### TIME OF RISING AND OF RETIRING

During all four periods of study, factory work for the first shift began at 7 or 7:15 a. m. This meant rising at 5:30 or 5:45 for most of the women. A number lived within walking distance of the factory; others went by bus and by private car. For only a minority did the round trip, going and coming, take over 45 minutes. When the factory day ended at 3, most women were home by about 3:30; when it ended at 4:30, they were home around 5; but when the 10-hour day pushed the closing time to 5:30, it was apt to be after 6 before they reached home, bus travel taking longer at that hour. Whereas hours away from home did not exceed 11 for many women under the 8½- or 9-hour schedule, under the 9½- or 10-hour schedule all were away more than 11 hours, and some as much as 12 hours.

The proportion of women day-shift workers whose day at work, in plant and home, reached 17 hours or more was increased when the factory day was extended to 10 hours. But the proportion who went to bed earlier also was increased slightly, the women saying they were "too tired to stay up."

A single girl who roomed and boarded out worked the third shift in the first period, the second shift in the second period, and the day shift in the fourth period. When on the night shifts, she retired at 8 or 8:15 a. m. For the third shift, which started at 11 p. m., she arose at 3:45 p. m. and left the house at 10:15 p. m. For the second shift, starting at 9:30 p. m., she left the house at 8:30 p. m. When on the first (day) shift, which she preferred, she rose at 5:30 a. m., reached home at 6:15 p. m., and retired at 9:30 p. m.

A married woman living with her husband, when on the third shift reached home at 7:30 a. m. and went to bed at 8:30; she did not rise until 5 p. m. if her husband would do the marketing, but if he did not, she had to sacrifice sleep to get it done; she left for work at 9 p. m. When on the second shift, she reached home at 11:30 p. m. and went to bed immediately; she was up at 9 a. m. and did her housework easily, leaving for the factory at 2:30 p. m.

All told, the over-all day of the night-shift workers without children usually was not so long as that of the day-shift workers.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

The majority of the women seemed to think they could attend to personal and household needs more easily on a schedule of 8½ or 9 hours for 6 days than on a schedule of 9½ or 10 hours with a half day Saturday. When asked the hours of work preferred, none mentioned the 9½- or 10-hour day. The 8-hour day was a 6 to 10 favorite; 4 out of 10 women voted for 7¼, 7½, 8½, or 9 hours. Over a third of the women wanted the 48-hour week, and a similar proportion wanted 44 or 45 hours a week. Only 8 percent wanted a 54-hour week.

### GROSS EARNINGS IN RELATION TO HOURS

Gross earnings of the 58 women employed at least 3 weeks in the third and fourth periods were secured.

Under the 8½-9-hour schedule in the third period, when the average weekly hours worked were 50.6, these women averaged $56.76 a week, or $1.12 an hour. Later, when the daily hours were lengthened to 9½ and 10 hours and Saturday hours were shortened, actual hours worked averaged 51.1, for which gross earnings of $62, or $1.21 an hour, were secured.

The night shift, which was paid 5 cents an hour more in the third period and 10 cents more in the fourth period, averaged $62.20 and $70.67, respectively, as compared with $55.48 and $61.36 on the day shift.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

#### Attendance, All Women Studied

Rotor production started in the summer of 1942, and the first period studied fell in the autumn of 1942 when new employees were still being hired and old employees were being transferred from regular departments to this new department. Turn-over in this new department during its first year was, as already noted, very high. Of a total of 146 women employed in the first period, only 85 were found in the second period who had worked at least 3 weeks in each of the two periods. A total of 122 women were employed in the second period in March and April 1943, and only 51 worked in each of two of the periods studied for at least 3 weeks. Employment was much more stabilized in the third and fourth periods: of a total of 89 employed in the third period (September-November 1943) 58 were employed at least 3 weeks in each of two of the periods studied; and 58 of the 66 employed at least 3 weeks in the fourth period (February-April 1944) had worked a minimum of 3 weeks in one other period studied.

In the first period there were 3 shifts working a 6-day schedule of 7½ hours, or 45 hours a week. Seventy-one percent of the women studied lost some time in the 2 months studied in the first period; the number of absences averaged more than two, and the average length of absence was 12.4 hours. Under the 9-54-hour schedule in the second period the proportion of women who took time off advanced to 82.4 percent, the average number of absences increased to 3½, but their length was shortened slightly to 11.7 hours. With the greater stabilization of work and staff reached by the time of the third period studied and with the half-hour shorter day (8½ hours) for the 35 drill-table operators, time lost was cut materially; only 60 percent of the women studied had any absence in the 2 fall months studied, but the average length of absence was increased to 14.9 hours. In 1944 the 9½-hour and 10-hour day with shorter Saturday went into effect. The number losing time in this fourth period increased to 78 percent; but the average number and duration of absences were practically unchanged from those incurred in the third period in late 1943.

As table II indicates, long-term absences of a week or more on the part of an eighth of the women explain the extent of time lost in the first and second periods. In the third period the proportion of women losing at least a week reached almost 20 percent, but this was also the period in which the largest proportion lost no time whatsoever during weeks in attendance. It would

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Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Shift — Plant D

| Period studied, scheduled hours, and shift | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period (7½-45 hours) | 85 | 60 | 70.6 | 2.4 | 12.4 | 6.0 |
| 1st shift | 28 | 23 | 82.1 | 2.8 | 15.3 | 10.0 |
| 2d and 3d shifts | 57 | 37 | 64.9 | 2.1 | 10.0 | 4.0 |
| 2d period (9-54 hours) | 51 | 42 | 82.4 | 3.5 | 11.7 | 8.3 |
| 1st shift | 33 | 28 | 84.8 | 3.9 | 10.6 | 8.8 |
| 2d shift | 18 | 14 | 77.8 | 2.6 | 15.0 | 7.5 |
| 3d period (8½-51; 9-54 hours) | 58 | 35 | 60.3 | 2.5 | 14.9 | 5.4 |
| 1st shift | 47 | 27 | 57.4 | 2.5 | 13.0 | 4.6 |
| 2d shift | 11 | 8 | 72.7 | 2.4 | 21.8 | 8.9 |
| 4th period (10-55 or 56½; 9½-52¼ hours) | 58 | 45 | 77.6 | 2.4 | 14.9 | 7.1 |
| 1st shift | 54 | 42 | 77.8 | 2.4 | 15.8 | 7.5 |
| 2d shift | 4 | 3 | 75.0 | 3.0 | 4.8 | 2.4 |

appear that this regularity in daily attendance in the third period was due not to the hours worked, but to stimulated competition among drill-table gangs. These groups were brought to compete with one another to see who could achieve the highest output. If one member of the gang did not arrive on time, her gang could not, with a substitute, make speed. The consequence was that girls felt they must be at work if they could possibly make it. Management did succeed in upping production by this method, but results showed that too great speed broke drills, causing down time (stoppage for repairs), and made for a greater number of imperfect rotors. In 1944 competitive runs were stopped, and girls were urged to work at an even speed. Rejects beyond a specific amount began to be charged to the gang. In the fourth period, in 1944, 14 percent of the women lost a week or more. The proportion who lost no time during weeks worked was higher than in the second period, but lower than in the first and third periods.

If the third period is eliminated from consideration because of the exceptional circumstance that drill tables were competing with one another, the least time was lost in the first period under the 7½-45-hour three-shift system, when lost time totaled 6 hours per 100 possible man-hours of work. The 9½-10-hour day with a half day on Saturday ranked second, having 7.1 hours lost in 100 man-hours of work, while hours lost under the 9-54-hour schedule totaled 8.3 hours.

Average hours worked during weeks the women reported for work were about the same in the second period (9-54 hours) and the third (8½-51 and 9-54 hours), or 50.1 and 50.6, respectively. In the fourth period (52¼, 55, and 56 hours) average hours worked increased to only 51.1. In the 7½-45-hour period, hours averaged 43.2 or 96 percent of possible man-hours.

A "control group" of women who worked every week in each period under study worked slightly longer hours than the entire group of women but exhibited the same tendencies under the different hour schedules as did the entire group.

### Attendance in Relation to Shift Worked

Under the 7½-45 schedule three shifts were in operation: 7 a. m. to 3 p. m., 3 p. m. to 11 p. m., and 11 p. m. to 7 a. m. The night shifts had a far better attendance record than the day shift, the total hours lost per 100 possible man-hours of work being 4 compared to 10 for the day shift. During weeks the women reported for work, 35.1 percent of the night shift lost no time, as compared with 21.4 percent of the day shift. The night shift also outranked the day shift in the proportion who worked each week in the periods studied.

In the spring of 1943, when the 9-hour day 6-day week was in effect, the second of the two shifts worked from 9:30 p. m. to 7 a. m. Again the night shift had a better attendance record than the day shift. In the competitive 1943 fall period, however, a few girls on the night shift were out a week or 2, increasing the night-shift average of hours lost.. But during weeks worked the night shift averaged 51.2 hours as compared with 50.5 hours averaged by the day shift. In the fourth period there were only 4 women employed on the second shift as compared with 54 on the day shift, and these few night workers lost little time.

### Causes of Lost Time and Calls to Medical Department

Causes of lost time were recorded by the firm for the third and fourth periods. The third 8-week period, September 27 to November 21, 1943, was one in which vacations taken by one-fourth of the women reporting cause of absence accounted for 60 percent of hours lost. In the fourth period, February 7 to April 2, 1944, vacations accounted for only a fifth of the hours lost, whereas personal illness accounted for two-thirds of the total; family illness added 11 percent to lost hours, a cause not reported in the fall of 1943.

In discussing absenteeism with individual girls, it appeared that some of the reported illness had an occupational origin. The oil used on the drill table caused skin rash among many. However, calls to the medical department for aid for dermatitis had decreased materially by 1944, the girls agreeing that the "oil was less irritating." A number reported taking time off because of headaches, to "have eyes checked," to "get glasses," or because "eyes hurt." According to the medical-department records, headaches were a frequent reason for applying for first aid, whatever the cause, and eyes were mentioned less frequently and probably referred to substances in the eye rather than eye strain. The eye concentration required of drill-table operators and checkers may well have been the cause of eye strain. Surgical dressings were the most frequent reason for receiving first aid, as may be seen from table III. The number of calls during the third period (in the fall of 1943) exceeded greatly those in February and March of 1944, though the women were somewhat fewer in the earlier period. It may be that the speed brought about by gang or group competition resulted in varying strains and injuries calling for first aid.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

The processes involved in rotor production were divided into two parts: First, the drilling of necessary holes by a gang of seven, made up of five drill-press operators, one inspector (checker), and one loader who acted as group leader; and second, a series of eight preliminary and finishing operations on automatic machines by women working independently. The rotor was an aluminum disk three-eighths of an inch in diameter and five thirty-

Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Shift — Plant D

| Period studied, scheduled hours, and shift | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| 1st period (7½-45 hours): | | | | | | | | | | | | | |
| Number | 85 | 75 | 10 | 6 | 3 | ..... | 1 | 85 | 26 | 48 | 9 | 2 | 43.2 |
| Percent | 100.0 | 88.2 | 11.8 | 7.1 | 3.5 | ..... | 1.2 | 100.0 | 30.6 | 56.5 | 10.6 | 2.4 | ..... |
| 1st shift: | | | | | | | | | | | | | |
| Number | 28 | 22 | 6 | 3 | 2 | ..... | 1 | 28 | 6 | 14 | 6 | 2 | 42.3 |
| Percent | 100.0 | 78.6 | 21.4 | 10.7 | 7.1 | ..... | 3.6 | 100.0 | 21.4 | 50.0 | 21.4 | 7.1 | ..... |
| 2d and 3d shifts: | | | | | | | | | | | | | |
| Number | 57 | 53 | 4 | 3 | 1 | ..... | ..... | 57 | 20 | 34 | 3 | ..... | 43.7 |
| Percent | 100.0 | 93.0 | 7.0 | 5.3 | 1.8 | ..... | ..... | 100.0 | 35.1 | 59.6 | 5.3 | ..... | ..... |
| 2d period (9-54 hours): | | | | | | | | | | | | | |
| Number | 51 | 45 | 6 | 4 | 1 | 1 | ..... | 51 | 9 | 30 | 7 | 5 | 50.1 |
| Percent | 100.0 | 88.2 | 11.8 | 7.8 | 2.0 | 2.0 | ..... | 100.0 | 17.6 | 58.8 | 13.7 | 9.8 | ..... |
| 1st shift: | | | | | | | | | | | | | |
| Number | 33 | 29 | 4 | 3 | ..... | 1 | ..... | 33 | 5 | 20 | 5 | 3 | 49.8 |
| Percent | 100.0 | 87.9 | 12.1 | 9.1 | ..... | 3.0 | ..... | 100.0 | 15.2 | 60.6 | 15.2 | 9.1 | ..... |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2d shift: | | | | | | | | | | | | | |
| Number | 18 | 16 | 2 | 1 | 1 | ..... | ..... | 18 | 4 | 10 | 2 | 2 | 50.6 |
| Percent | 100.0 | 88.9 | 11.1 | 5.6 | 5.6 | ..... | ..... | 100.0 | 22.2 | 55.6 | 11.1 | 11.1 | ..... |
| 3d period (8½-51; 9-54 hours): | | | | | | | | | | | | | |
| Number | 58 | 47 | 11 | 10 | 1 | ..... | ..... | 58 | 26 | 28 | 3 | 1 | 50.6 |
| Percent | 100.0 | 81.0 | 19.0 | 17.2 | 1.7 | ..... | ..... | 100.0 | 44.8 | 48.3 | 5.2 | 1.7 | ..... |
| 1st shift: | | | | | | | | | | | | | |
| Number | 47 | 40 | 7 | 7 | ..... | ..... | ..... | 47 | 20 | 24 | 2 | 1 | 50.5 |
| Percent | 100.0 | 85.1 | 14.9 | 14.9 | ..... | ..... | ..... | 100.0 | 42.6 | 51.1 | 4.3 | 2.1 | ..... |
| 2d shift: | | | | | | | | | | | | | |
| Number | 11 | 7 | 4 | 3 | 1 | ..... | ..... | 11 | 6 | 4 | 1 | ..... | 51.2 |
| Percent | 100.0 | 63.6 | 36.4 | 27.3 | 9.1 | ..... | ..... | 100.0 | 54.5 | 36.4 | 9.1 | ..... | ..... |
| 4th period: | | | | | | | | | | | | | |
| Number | 58 | 50 | 8 | 5 | 3 | ..... | ..... | 58 | 14 | 34 | 9 | 1 | 51.1 |
| Percent | 100.0 | 86.2 | 13.8 | 8.6 | 5.2 | ..... | ..... | 100.0 | 24.1 | 58.6 | 15.5 | 1.7 | ..... |
| 1st shift (10-55; 9½-52¼ hours): | | | | | | | | | | | | | |
| Number | 54 | 46 | 8 | 5 | 3 | ..... | ..... | 54 | 13 | 31 | 9 | 1 | 50.8 |
| Percent | 100.0 | 85.2 | 14.8 | 9.3 | 5.6 | ..... | ..... | 100.0 | 24.1 | 57.4 | 16.7 | 1.9 | ..... |
| 2d shift (10-56½ hours): | | | | | | | | | | | | | |
| Number | 4 | 4 | ..... | ..... | ..... | ..... | ..... | 4 | 1 | 3 | ..... | ..... | 55.2 |

[1] Women who worked on both day and night shifts are included in the shift where they spent the most time. In first period 4 women are included in day shift who spent an equal amount of time on night shift.

## Table III. — Causes of Calls to Medical Department Under Different Scheduled Hours — Plant D

| Causes of calls for medical aid | 3d period (8½-51; 9-54 hours) | | | | 4th period (9½-52¼; 10-55 or 56½ hours) | | | |
|---|---|---|---|---|---|---|---|---|
| | Women | | Visits | | Women | | Visits | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Total women | 58 | 100.0 | ..... | ..... | 58 | 100.0 | ..... | ..... |
| Women making no medical calls | 11 | 19.0 | ..... | ..... | 7 | 12.1 | ..... | ..... |
| Women making medical calls | 47 | 81.0 | 453 | ..... | 51 | 87.9 | 321 | ..... |
| Women reporting reasons for medical calls. | [1] 44 | ..... | 436 | 100.0 | [1] 51 | ..... | 292 | 100.0 |
| Cold | 28 | ..... | 67 | 15.4 | 24 | ..... | 40 | 13.7 |
| Dermatitis or skin eruption | 11 | ..... | 35 | 8.0 | 13 | ..... | 15 | 5.1 |
| Dysmenorrhea | 7 | ..... | 10 | 2.3 | 7 | ..... | 7 | 2.4 |
| Eye (foreign body in, etc.) | 22 | ..... | 42 | 9.6 | 12 | ..... | 17 | 5.8 |
| Foreign body removed (splinters, etc.) | 7 | ..... | 7 | 1.6 | 6 | ..... | 6 | 2.1 |
| Gastro-intestinal | 17 | ..... | 32 | 7.3 | 14 | ..... | 25 | 8.6 |
| Gums, teeth, mouth, lips | 2 | ..... | 3 | .7 | 6 | ..... | 13 | 4.5 |
| Headache | 25 | ..... | 69 | 15.8 | 25 | ..... | 37 | 12.7 |
| Nervousness | 8 | ..... | 21 | 4.8 | 7 | ..... | 12 | 4.1 |
| Surgical dressing | 36 | ..... | 145 | 33.3 | 29 | ..... | 118 | 40.4 |
| Temperature reading | 1 | ..... | 1 | .2 | 2 | ..... | 2 | .7 |
| Other [2] | 3 | ..... | 4 | .9 | ..... | ..... | ..... | ..... |
| No report on reason for calls | 10 | ..... | 17 | ..... | 20 | ..... | 29 | ..... |

[1] Details add to more than total because some women made medical calls for more than one illness or injury.
[2] "Heat to knee," "heat to back."

seconds of an inch thick. It was first broached on automatic machines, the operators merely feeding the hopper, removing filled pans after spot-gaging a sample, and watching that the machine functioned properly. The rotor then went to the gangs of drill-table operators: the loader placed the rotor blank in a jig and slid the loaded jig to the first driller; from her it was slid along from one operator to another, each performing a series of drilling operations while sitting around a semicircular table. The last drill-press operator slid the jig back to the loader, who cleaned it with an air jet and released the rotor from the jig. The rotors then went to the inspector in the gang, who checked them with special dial gages and plug gages and also made a visual inspection for scratches and mars. Individual machine operators then ground the outside circumference of the rotors, inserted lead weights into the rotor holes, staked weights, trimmed weights, faced the rotor, and did the final sizing.

It was apparent from observation at the time of the survey that the work by the gangs on drill table operations and the jobs on automatic machines differed materially in the demands made on the workers. The operation of automatic machines did not require much concentration. The pace was set by the machine, but as the operator's bonus depended on output, it behooved her to see that there was no lag in feeding the machine. Stools or high chairs with backrests were available for all workers. While the machine was operating, the worker could stand or sit as she kept the rotors in motion or gaged them; changing pans and filling the feeders or hoppers required moving about. It took 2 to 4 weeks to learn the operation of one of these automatic machines. Learning to make minor machine adjustments took several months.

Working in a gang on the drill tables made very different demands on the women. Operators were seated on high chairs with backs, and their feet rested on footrests built into the drill table. The drilling operations had to be performed with oil flowing over the drill and rotor to prevent overheating. The operators wore large rubber aprons and cloths over the aprons, to absorb excessive amounts of spattered oil.

The drilling of small holes in a three-eighths-of-an-inch disk was a precision job calling for constant attention, deftness of hand, and a high rate of speed. Locating the jig accurately against stops on the drill table with the left hand, while using the right to bring down the drill, required a keen sense of touch, for grasping the jig too tensely or moving it against the stop with too much force might dislocate the hole, whereas proper depth to the hole was gained by the correct pressure on the drill. Since rotors passed from one operator to the next, operators had to have the same speed to work well together. Management had attempted as far as possible to put girls who worked at the same pace at the same drill table. Experienced operators could operate in all positions, others in only one or two. When a girl was absent and a substitute was employed, the production and earnings of the group usually fell.

The drill-table operators were trained as a gang. New workers were on a time rate for 4 weeks before being started on the group bonus system in effect. It took several months to attain enough speed to earn more than the guaranteed base rate; it required 6 to 12 months to bring the individual workers to top speed and fit them into proper gangs. Even though the job was monotonous, the precision and speed required, and the ability to work as a team, were qualities that called for a selected group of workers.

The drill-table gangs and the automatic machines were in the same room. The machines were well spaced and there was no crowding. Daylight was ample; good artificial lighting was used for night shifts. Ventilation was by window, and there were many portable fans. Nevertheless, the aprons and other covering worn by drill-table operators to keep oil from their clothing, and their speed of motion, made them too warm in the same room where other less active workers were comfortable.

### Method of Wage Payment on the Job

The workers studied were on an incentive wage system with a guaranteed base rate. The gangs of drill-table operators were paid on a group bonus basis, all other workers studied were on an individual incentive basis. The base task for each operation was expressed in minutes or hours required to complete a given operation on 100 pieces. Net hours "saved" plus hours worked divided by hours worked gave the "percent bonus earned," by which efficiency was measured.

When an operator was transferred to nonincentive work or was kept waiting, because of machine trouble or for some other reason, she was paid the hourly base rate plus 20 percent.

Charges for spoilage were inaugurated in 1944. All spoilage over 150 rotors on weekdays and 75 rotors on Saturdays had to be paid for at the rate of 3 cents for nonsalvagable rotors and 1½ cents for salvagable rotors. The gang also had to bear part of the labor cost of making a 100-percent inspection of rejected pans of rotors.

Night workers received 5 cents more per hour than day workers up to January 31, 1944, when this shift differential was increased to 10 cents per hour.

### Performance on the Job

From the inception of rotor production in the summer of 1942 on, improvements in methods of operation were so numerous that they invalidated any comparison which might be made of efficiency under the 45-hour schedule in the first period with efficiency under the 54-hour schedule in the second period. The newness and inexperience of the workers also invalidated any such comparisons. Even after the fall of 1943, when management believed it had attained stability in production, there was a general increase in efficiency. In the beginning of the third period (Sept. 26, 1943) average efficiency for all operators was 146.7; by the end of October 1943 it had reached 160.1. By the end of February 1944, an efficiency of 189.5 was reached, which was not exceeded during the fourth period of study.

Efficiency comparisons, therefore, were made for the fall of 1943 and spring of 1944, contrasting the 8½-9-hour day and 51-54-hour week schedules with the 9½-10-hour day and 52¼-55-56½-hour week schedules.

Examination of 24 identical drill operators' performance in the two periods shows that though they totaled the same hours of work, 49.8, on this operation in both periods, their efficiency rose from 170.6 to 184.1 between the fall of 1943 and early 1944. Study of 7 identical automatic-machine operators, who averaged 2 hours less in the period of longer scheduled hours, also showed an increase in efficiency: from 144.2 to 154.4.

Examination of the detailed record of production for these two groups of operators shows that this general rise was not due to the shift in hours but to the elimination of some tables of operators of low productive capacity and to the increased efficiency in those remaining. The number of workers

on the drill tables was cut from 112 to 56 persons, and from 14 gangs in the 1943 fall period to 7 gangs in the 1944 period.

The examination, by length of service, of the record of 58 women who had been employed at least 3 weeks in both the fall of 1943 and the spring of 1944, did not reveal any constant relation between experience and efficiency. Some of the women with experience of a year or more were working at the same pace as girls of less than 6 months' experience. On the other hand, a girl with quick reaction time placed in a gang of fast workers soon acquired their speed and attained the group efficiency rating. Among the individual machine operators also, extended experience played no noticeable part in output.

The drill operators' efficiency was built up by bringing together a group of girls who could work well as a team and who would maintain regularity in attendance as a team. One gang was outstanding in its efficiency in both periods: In the third period it attained 206.9, and in the fourth period 215.3. The leader of this gang, a girl under 25 years of age, reported:

> Our gang has worked as a unit longer than any. I wouldn't like it if I had to change any member of the gang for another worker. It takes a year to become a good operator . . . The speed of the job makes it tiring. Since the whole gang depends on everyone doing her best work, we can't go to work feeling tired. We must get to bed by 9:30 or sometimes earlier. Now, on 9½ hours, every girl gets so tired she can't give the extra spurt to break a former record as she did on the 8½-hour day.

A member of this gang said:

> Efficiency is increased by having a compatible group and having a good service girl as leader and a quick checker. If the service girl keeps our drills in condition and the checker catches any mistake, they can save us a lot of wasted time and bad rotors.

There seemed general agreement among the drill operators that the following factors affected their production in 1944:

> When girls are absent the table may have to be "broken down" and the remaining girls put on other tables. This cuts production.
>
> If one girl fails to work up to standard speed, the whole gang is slowed down.
>
> Drills break, stops get worn, or other factors cause machines to be out of operation from a few minutes to a few hours while adjustments are made, preventing average production totals.
>
> Toolroom men "build up" the entire table every few months, which means less production while using other tables; it may take a week to get accustomed to one's own table when back on it.
>
> When the girls get tired, they get out of line and miss the stops. They only try to make 500 rotors the last hour; there is more salvage between 4:30 and 5:30 p.m., when girls are tired.

### Performance on the Job — Daily Production and Defective Pieces Produced

As the many variables bringing about increased efficiency clouded the effect of the change in hours on efficiency, a further study was made of daily production and of defective pieces. Production records for 9 weeks, April 24 to June 24, 1944, were examined for the 6 gangs of drill-table operators, each gang being composed of 5 drill-press operators, one inspector, and one group leader. As only the production on the drill tables was analyzed and as all rotors were of one type and size, units produced, rather than efficiency rates, could be used as a measure of efficiency. For this period the inspectors' running record of "down time" was totaled for each gang for each day. "Down time" represents time in which the drill table was not operating because of mechanical difficulties, because power was shut off, and so forth. Defective pieces were rotors rejected either because

Table IV. — Index Numbers of Total Production, Hourly Production, and Rejections of Defective Rotors, for 6 Gangs of Drill-table Operators, by Day of the Week, 9 Weeks in 1944 — Plant D [1]

| Day of week | Total | | | Gang 1 [2] | | | Gang 2 | | | Gang 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Index number of— | | | Index number of— | | | Index number of— | | | Index number of— | | |
| | Total production | Hourly production | Defective pieces | Total production | Hourly production | Defective pieces | Total production | Hourly production | Defective pieces | Total production | Hourly production | Defective pieces |
| Monday | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 107.5 | 96.0 | 96.0 | 107.3 | 94.0 | 100.0 | 118.1 |
| Tuesday | 94.8 | 93.1 | 108.9 | 91.2 | 93.9 | 115.7 | 86.1 | 86.1 | 137.8 | 96.7 | 91.5 | 123.1 |
| Wednesday | 93.1 | 94.1 | 100.5 | 90.8 | 91.9 | 100.0 | 83.0 | 94.6 | 110.4 | 100.0 | 95.6 | 105.6 |
| Thursday | 98.9 | 95.7 | 100.0 | 88.1 | 88.1 | 119.5 | 100.0 | 100.0 | 100.0 | 96.0 | 90.8 | 114.4 |
| Friday | 94.3 | 91.2 | 104.4 | 88.5 | 88.5 | 103.8 | 86.9 | 87.0 | 109.1 | 92.0 | 86.9 | 129.4 |
| Saturday | 37.5 | 91.3 | 105.4 | 30.1 | 93.4 | 101.3 | 35.7 | 82.4 | 105.5 | 35.8 | 89.7 | 100.0 |

| Day of week | Gang 4 | | | Gang 5 | | | Gang 6 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Index number of— | | | Index number of— | | | Index number of— | | |
| | Total production | Hourly production | Defective pieces | Total production | Hourly production | Defective pieces | Total production | Hourly production | Defective pieces |
| Monday | 100.0 | 100.0 | 100.0 | 97.2 | 99.2 | 104.7 | 100.0 | 100.0 | 104.8 |
| Tuesday | 96.4 | 96.4 | 109.6 | 94.3 | 88.4 | 107.9 | 93.0 | 98.7 | 106.2 |
| Wednesday | 93.2 | 94.3 | 110.0 | 89.8 | 92.0 | 111.0 | 90.8 | 91.8 | 103.8 |
| Thursday | 98.7 | 98.7 | 107.7 | 100.0 | 93.6 | 100.8 | 99.4 | 99.4 | 100.0 |
| Friday | 89.8 | 89.8 | 115.8 | 99.1 | 92.8 | 100.0 | 99.4 | 99.4 | 111.4 |
| Saturday | 38.4 | 88.7 | 133.0 | 46.2 | 100.0 | 101.6 | 36.0 | 92.7 | 118.1 |

[1] Day of highest production is 100; day of lowest rejections is 100.
[2] Gangs are arranged according to efficiency, the gang with highest efficiency being No. 1. Each gang is composed of 5 drill press operators, 1 inspector, and 1 group leader (loader).

of the operator's poor performance or because the drills did not operate properly; the numbers of such rejects set forth in table IV were taken from the table-checkers' records.

In the period of this special study the same hours prevailed as in the fourth period in the spring of 1944. The five drill-press operators on each drill table worked 52¼ hours, or 5 days of 9½ hours, and 4¾ hours on Saturday. The group leader (loader) and inspector worked 55 hours, or 5 days of 10 hours, and 5 hours Saturday.

Gang 1 had the highest efficiency, not only in the 9 weeks under study in 1944, but also in the fall period of 1943. These girls produced most and achieved their highest efficiency on Mondays. Both total production and efficiency began to drop on Tuesday and continued to drop for the rest of the week. The low points reached on Thursday and Friday were due partly to machine trouble on these days in a week in which the table was "down" approximately 5 hours on each day. The Saturday low in production resulted because on 2 Saturdays of the 9 so few girls appeared that the table could not be operated. The record of this gang would have been higher, also, had it not been that its loader, who acts as a group leader, was out 2 weeks in the period; her absence caused a drop in production during the entire 2 weeks. On her return it was another week before the former record of production was regained. The percent of rejections caught by the checker bore no direct relationship to the production of this group.

Gang 2, which at times almost reached as high production as Gang 1, had its own distinct pattern of production. This gang worked up to a midweek peak in production 4 times on Thursday, twice on Friday, and once on Wednesday. Wednesday and Saturday production were low because on one Wednesday the table was under repair and the women had to work elsewhere, and on one Saturday too few workers came to work to operate the table. This gang had a minimum of checker rejections when operating at highest efficiency and maximum production, and the largest number of defective pieces on days when least was produced.

Gang 3 achieved highest efficiency on Mondays, but because the table was being repaired on one Monday, the total Monday production over the 9-week period was lower than that of Wednesday, the day of second highest efficiency. Rejects increased as efficiency decreased.

Gang 4 was very regular in attendance and had no major machine difficulties during the 9-week period under study. Monday was its best day—in efficiency, total production, and minimum of defective pieces. Thursday represented the second best day in all three measurements.

Whereas the leader and one drill operator of Gang 5 worked all 9 weeks of this period, others were absent part of 1, 2, or 3 weeks, so that substitutes were required. No noticeable effect was seen in production during the days of such substitution. However, extensive machine difficulty on 2 of the 9 Mondays unquestionably lowered production on the first day of the week. One Tuesday, one Wednesday, and one Thursday also had lessened production because of machine defects. This gang produced more on the Saturday half day than any other gang, achieving its highest efficiency on that day. Rejections seemed to be lowest when production was greatest.

A very definite pattern of performance is traced through this detailed analysis of each gang's performance. When machine difficulties, which shortened production time, are taken into account, Monday was the day of greatest efficiency and highest production for 5 of the 6 gangs. Under this consideration, Thursday becomes the day of next highest performance,

and it was the highest day for one gang. The failure of many girls to appear on one or two Saturdays in late June made Saturday's production less than half in value; although efficiency was not at its lowest level on Saturday in all gangs, it was not high.

### Performance on the Job — Production and Defective Pieces Produced in Relation to the Time of Day

Rotors came from the drill table in pans containing approximately 1,000 units (rotors). Starting in April 1944, management began numbering each pan and making a 7-point inspection of a sample of 50 rotors out of each. This special inspection followed the checker's spot check and rejection of defective rotors at the drill table. If a certain proportion of the 50 rotors checked did not pass inspection requirements, the entire pan was rejected for a 100-percent inspection. Since the pans were numbered as they came from the table, an estimate could be made of the approximate time of the day that defective rotors were most numerous.

Some of the defects found usually resulted from mechanical difficulties such as faulty jigs, drills, or reamers; others were due to faulty performance of the operators. The gage control laboratory regarded the operator as chiefly responsible for the following "inspection points:"

Angle: Getting the proper angle depended very much on getting the jig properly located in the stops on the drill table. When the angle was off, it generally could be traced to missing this stop.

Depth: The depth of this hole was determined mainly by the pressure of the drill. The operator had to develop just the right touch to get the proper depth.

Detent: There are four tiny holes on the face of the rotor called the "detent pattern." Rejection on this "point" was generally due to the operator missing one of the stops to drill the hole, or having the jig improperly located in the stop so that the hole was not spaced properly.

Nicks and mars: Nicks and mars were usually due to improper triming on the part of the operator, so that she nicked or marred the rotor with the drill point.

An analysis was made of the special inspection reports, giving consideration only to defective pieces rejected for failing to pass inspection on the four points enumerated. The analysis covered a period of 6 weeks in the spring of 1944. In this period the 5 drill-table operators in each group worked 9½ hours on 5 days, 4¾ hours on Saturday, or a total of 52¼ hours a week. The group leader (loader) and inspector in each group worked 10 hours on 5 days, 5 hours on Saturday, or 55 hours a week.

The two gangs of fast operators both showed an increase in defective pieces on the 7th or 8th, and 9th pans, which were the last pans produced at the end of the day. The two slowest gangs showed the same tendency. Only one gang of medium speed workers had a higher rate of error at about the lunch hour; this was the same group that did not conform to the daily pattern of production of other gangs. In general, errors were fewer in the morning hours and most numerous in the last 2 hours of the afternoon under the 9½-10-hour day which prevailed in this period.

Drill-table operators who were interviewed stated quite generally that their production "petered out" in the last hour of a 9½- or 10-hour day. Inspectors said they believed defective pieces were more numerous toward the end of the day and just before the afternoon rest period.

### Performance on the Job — Summary

The preceding analyses of the many factors that brought about a gradual but marked increase in the efficiency of the rotor department indicate that improvements were being effected by both management and employees, ir-

respective of the working-hour schedules. They also reveal that an occupation that calls for welding individual effort into group effort in the maintenance of speed—an occupation that also involves eyestrain—produces fatigue that is evident in decreased production and defective work in the last 2 hours of a 9½- or 10- hour day. Monday was found to be the day of greatest efficiency and highest production, Thursday the day of next highest performance. With greater efficiency came increased earnings, which probably accounted in part for a tendency of some of the fastest workers not to appear on Saturday mornings.

Table V summarizes findings on the productive efficiency of all women employed in the rotor department during the periods studied, as against only those who worked at least 3 weeks in each of two periods, reported in previous tables. The table shows that the number of drill-table operators decreased in the spring of 1944 (fourth period) to 60 percent of the number employed in the fall of 1943 (third period). Because of the fewer quits among the smaller number of women in the fourth, 9½-10-hour-day period, the man-hours actually worked were about three-fourths as many as in the third, 8½-9-hour period. The average hours worked per week on incentive jobs varied only slightly from one period to the other, averaging 46 in the third period and 46.4 hours in the fourth. Efficiency, as measured by average hourly production of good pieces, increased by more than 8 percent in the 9½-10-hour period. The result was that 81 percent of the third period production was achieved with 60 percent of the workers. Had the stabilized groups of young women workers secured by the fourth period been put on their mettle to make the same production in an 8-hour day as in the 10-hour day, there is ample indication in the records and their own statements that they could have done so. With a hot summer ahead and many workers living at some distance, a system of rotation of Saturday work might have kept more tables at work on an 8-hour Saturday and made unnecessary the 10-hour day Monday through Friday.

When the force of automatic-machine operators was reduced in the fourth period to 61 percent of the number employed in the third period, many of the women were shifted from one machine to another to keep an even flow

Table V. — Summary of Total Man-hours Worked, Efficiency, and Total Production, Based on Totals for All Women in Occupations Studied,[1] Under Different Scheduled Hours, by Occupation — Plant D[2]

| Occupation, period studied, and scheduled hours | Index numbers of — | | | |
|---|---|---|---|---|
| | Number of women | Total man-hours worked[3] | Efficiency (average hourly production) | Total production |
| Drill-table operators: | | | | |
| 3d period (9-54; 8½-51 hours) | 100.0 | 100.0 | 100.0 | 100.0 |
| 4th period (10-55 or 56½; 9½-52¼ hours) | 59.8 | 74.4 | 108.6 | 80.8 |
| Automatic-machine operators: | | | | |
| 3d period (9-54 hours) | 100.0 | 100.0 | 100.0 | 100.0 |
| 4th period (10-55 or 56½ hours) | 61.0 | 72.6 | 110.6 | 70.0 |

[1] In other tables for Plant D, only women employed 3 weeks or more in each of 2 periods are included.
[2] Indexes of scheduled hours and possible man-hours could not be shown because of the combination of different scheduled hours under one period.
[3] Hours on incentive jobs were the same as total man-hours worked.

of production. As the machines had merely to be fed and the product checked for possible machine disorders, efficiency was not decreased but average hours on incentive work were. Average hourly efficiency rose 10.6 percent in the fourth period. With 61 percent of the number of workers, 70 percent of the third period production was secured in the fourth period.

# LIGHT PRECISION WORKERS (BUSHING-LAPPERS)[1] — PLANT E

## INTRODUCTION

Plant E was a new war plant engaged in manufacturing Diesel engines and Diesel-engine parts, which included mass production of injectors. The women selected for study were lapping bushings for these injectors. Employment expanded rapidly from 1,600 in December 1941 to 7,000 in June 1944. New workers had to be trained, engineering details developed, and production methods devised which would ensure the necessary fine precision work involved in the production of injectors.

With the introduction of new war workers, turn-over was very high in the initial stages of manufacturing development. Gradually both management and workers gained experience, and some stability of personnel and production was achieved. However, the Women's Bureau investigation of production revealed that continuous improvements in manufacturing methods were made throughout the periods studied and that the last period studied was therefore the most efficient, regardless of hours scheduled. In addition to analyzing productive efficiency under different hour schedules, a further research was made into production by different days of the week.

Three periods were selected for study, each covering a period of 6 weeks. Weeks when absenteeism was extraordinarily high were avoided, such as weeks in which there were flu epidemics, storms, holidays, extremely hot weather, and so forth.

In the first period three 7⅔-hour shifts operated on a rotating day-off basis. The plant operated 7 days a week, the workers taking different days off each week and two consecutive days off once in every 6 weeks. The 5 weeks in which they worked 6 days, they worked 46 hours; and in the 1 week of 5 days, they worked 38⅓ hours. In the second period the plant went on a 6-day schedule, daily hours remained the same, but rotating days off and Sunday work were discontinued. In the third period, there were two shifts of 9⅘ hours, 5 hours Saturday, and a 54-hour week.

Below is a summary of the hour schedules in each of the three periods.

| *Period* | *Schedule* |
|---|---|
| *1st period:* | |
| January–February 1943 (6 weeks)<br>7 2/3-hour day, average 44 2/3- hour week[1] | 1st shift: 8 a.m.–4 p.m.<br>(20-minute paid lunch period)<br>2d shift: 4 p.m.–12 midnight<br>(20-minute paid lunch period)<br>3d shift: 12 midnight–8 a.m.<br>(20-minute paid lunch period) |
| *2d period:* | |
| May–June 1943 (6 weeks)<br>7 2/3-hour day, 6-day 46-hour week | Shifts and lunch periods same as in 1st period, but rotating day-off system discontinued |
| *3d period:* | |
| August–October 1943 (6 weeks)<br>9 4/5-hour day, 5-hour Saturday, 5½-day 54-hour week | 1st shift: 7 a.m.–5:18 p.m.<br>(30-minute lunch period)<br>Saturday–7 a.m.–12 noon<br>2d shift: 7 p.m.–5:18 a.m.<br>(30-minute lunch period)<br>Monday–12-18 a.m.–5:18 a.m. |

[1] Rotating day-off system, working 5 weeks of 6 days and 46 hours and 1 week of 5 days and 38 1/3 hours over a 6-week cycle.

The women selected for detailed study were those who worked 30 days or more in each of at least two of the three periods studied. However, attendance and production data were secured for the remaining women in the department also for purposes of comparison.

Data on age, marital status, last grade completed in school, hiring date, job and rate at which hired, and subsequent transfers, reclassifications, terminations, and rehires were obtained from plant personnel records. From weekly clock cards were obtained the number of hours worked per day and the shift worked. Reasons for absence were ascertained wherever possible by checking personnel files, clock cards, and medical records. Medical records were searched for dates and causes of illness and accidents in the periods studied. Gross earnings were also secured.

Home visits were paid to a cross section of the women workers. The sample represented normal distribution with respect to marital status, age, and distance between home and plant. The women were questioned regarding their family responsibilities, their time schedule under various plant hours, the effect of different hour schedules on their personal and family life, and conditions they believed had caused absences or had brought about changes in their efficiency.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD

Two-thirds of the women in Plant E were over 30 years of age, only 15 percent were under 25. As might be expected, the great majority (80 percent) were or had been married. This meant that with the exception of a few single or divorced women, the women lived in family households. Some households had 2 or 3 members, but the 4-, 5-, 6-person households predominated. About half the women workers had children 14 years of age or younger living at home.

Half the women interviewed had all or the major responsibility for home and family; in 4 of every 10 cases this included the care of children. In a third of the homes the woman worker, though carrying the general responsibility, had a mother, daughter, aunt, or other relative who did much of the daily work. A few reported maid service.

### HOME LIFE AND TIME OF RISING AND OF RETIRING

When work on the first shift began at 8, under the 7⅔-hour schedule in the first and second periods, women workers rose from 5:30 to 6:45 in the morning. They returned home at 4:30 or 5 p. m. and retired usually from 10 to 11. When they had to reach the factory at 7 in the morning, under the 9⅕-hour schedule, those who had been getting up at 6 or later had to join the 5 o'clock risers. Home was reached usually at 6 p. m. The retiring hour remained the same as under the shorter workday.

Opinion usually was against the rotating-day-off system because it meant work on 5 of every 6 Sundays:

> *A.* The swing shift didn't fit in with my family's plans [family was husband, wife, and two children between 10 and 13 years of age]. The family had a holiday on Sunday. I had to get up in time to go to 6 o'clock Mass alone. In the second period it was nice having Sundays off so we could all go to church together.
>
> *B.* When I had a swing day, I could look after my business on that day. But even so, I preferred having Sunday with my family.
>
> *C.* On swing shift I did downtown shopping on that day. I did my washing, ironing, and cleaning after work in the evenings. During the second period I liked it

better. I never did enjoy working Sundays. My husband and I liked to cook our Sunday meal and go to a show after dinner. I also found time to do the laundry on Sunday.

The following statements are indicative of the difficulties of carrying on household duties when the woman head of the household is absent from 11¼ to 12¾ hours a day under the 9⅘-hour schedule.

*A.* I didn't like the 9 4/5-hour day at all. Shopping conditions were bad. You had to break your neck to get there before 6. Those 9 4/5 hours were too much for a woman. I used my Saturday afternoons to wash and did my ironing evenings. A lot of my work didn't get done. There was no time for leisure this period. I was just exhausted and got so many colds. [Daughter of 13 chimed in and said, "Mother was cross and got mad easily."] Those 9 4/5-hour days pretty near killed me. It's too many hours to work. I had to get up always at 5:30 to get my husband off to work. After Wednesday, the rest of the week was awful.

*B.* On the 9 4/5-hour day especially, getting washing and ironing done at night for three boys was the hardest. I had 18 to 24 shirts to iron each week. I would never again work those hours when I had a house to take care of. It wore me out, and I had to take a leave of absence for nervous stomach.

*C.* In the third period I cut my laundry down to once every 2 weeks instead of every week, but still had meals and housework — there was no cutting down there. I was too tired to go out very often.

The second shift worked from 4 p. m. to midnight in both the first and second periods. Leaving the plant at midnight meant arriving home at from 12:30 to after 1 o'clock. Usually women went to bed an hour or two later, so that 2 or 2:30 a. m. became the retiring time. They would usually rise at from 8 to 10 in the morning and leave the house for work usually at from 2:45 to 3:30 in the afternoon.

Some young single girls worked this shift. They did not like the rotating day off, but some of them seemed to like the 4 p. m. to midnight hours of work. Some married women also preferred this shift. For example, a worker with two small children and a paid helper said:

I liked this shift because I could get up in the morning and clean my house and still get enough sleep. I also had some time during the day to shop. My husband works days, but we had our Saturdays and Sundays together. When I went to work he was working, and when he went to work I was sleeping, so we just wrote notes.

A mother of two children, with an aunt of 75 years to care for also, said:

I got enough sleep under the 4-to-12 schedule and kept up my housework. I had to take care of my son until my daughter got home at 4 p.m., because my husband works days.

No one liked the 9⅘-hour day, whether working in the daytime or at night. Even the younger girls said:

Never found time to do anything. Didn't feel like going to work at 6 p.m. and never got enough sleep after 8 in the morning.

Seemed as though I was married to the firm, at 54 hours.

On Fridays and Saturdays under the 54-hour week I would be tired and my head would about burst with pain.

Fifty-four hours a week were too many. I didn't do my own housework this period. I was too tired to do anything but sleep and work. I had no recreation whatever. When I worked almost 10 hours and spent 1 hour in travel and 8 hours in sleep, it left only 5 hours a day for personal laundry, mending, and the thousand and one things that someone you employ to keep house can't do.

The shift in the first period that began at midnight and ended at 8 a. m. resulted in much irregularity of sleeping among women workers. One woman who reached home at 9 a. m. and went to bed at 10 a. m. got up at 1 p. m., did her housework, got evening dinner, and went back to bed until 10 p. m. This break in sleeping hours made it difficult to get enough sleep. Another

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young wife said she liked the midnight shift for the simple reason that she had more time with her husband and family. The baby slept until around 10 or 10:30 a. m., and the mother got up when the baby wakened, though she had gone to bed only 2 hours before. The husband got home at 5 p. m., at which time she had dinner ready. After dinner she slept until time to go to work. She did her washing after the baby's breakfast and her ironing and housework in the late morning and afternoon. When this woman was transferred to the 9⅘-hour shift from 7 p. m. to 5:18 a. m. she had 2 hours' more sleep in the morning before she rose at 10:30, but she got no evening sleep. She was "just too tired to do anything."

Other women working from midnight to 8 rose later, at 2 p. m. or thereabouts, but even this meant only 5 hours of sleep. Nevertheless, they seemed to prefer this to the 7 p. m. to 5:18 a. m. schedule. Women generally found it difficult to sleep in the daytime. The doorbell or telephone ringing, and house service if living in an apartment, were not conducive to rest.

### WORKER'S OVER-ALL DAY

While the time away from home ranged from some 8¾ hours to 11 hours on all shifts under the 7⅔-hour schedule, and from 10⅔ to 12¾ hours under the 9⅘-hour schedule, the over-all day, plant and home combined, was longer for the night-shift than for the day-shift workers. While in all three periods studied 18½ hours was the longest over-all day for day-shift workers, some night-shift workers were up and about for 20 and 21 hours. However, these exhausting hours were not those of the largest group of workers. When the day shift was 7⅔ hours, about half of the women were up from 13½ to 16 hours; when the hours were 9⅘ a similar proportion had an over-all day of 17 to 18½ hours. The 4 o'clock to midnight shift, and the midnight to 8 a. m. shift had in most cases a 17- to 19-hour day.

About half the women interviewed traveled to work by bus and half by private automobile. The travel time varied from just under 1 hour to 3 hours. For the second shift in the third period, or the shift that got out at 5:18 a. m., special bus arrangements were made by the firm, which decreased travel time materially for those workers.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

Roughly seven-tenths of the women workers interviewed preferred the first shift, one-fifth the second shift, and one-tenth the third shift. Almost half wanted an 8-hour day, 5-day week of 40 hours, and a third preferred an 8-hour day, 6-day week. Only 4 percent wanted a 10-hour day. The remaining women wanted a 7- or 7½-hour day.

### GROSS EARNINGS IN RELATION TO HOURS

The women studied were paid on an hourly basis. After 30 days on the job, an automatic increase of 5 cents an hour was received. The top rate for the job was granted when, at the discretion of the foreman, the employee's production merited it. In most cases it was received within 90 days of coming on the job, or the worker was transferred. A 5-percent shift differential was paid to second- and third-shift workers. Time and a half was paid for work over 8 hours a day and 40 hours a week.

In the first period, average weekly earnings of the women who had been employed 30 days or more in each of at least two of the three periods studied were $53.53; in the second period, $56.43; and under the 9⅘-hour

day, with time and a half for 14 hours overtime a week, gross earnings averaged $66.19.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

The first women were hired for lapping in September 1942. By January 4, 1943, the beginning of the first period included in the study, they numbered 182. As stated earlier, women employed during this period worked on 3 shifts of 7⅔ hours each, under a rotating-day-off system which provided for 1 week of 5 days' work and 5 weeks of 6 days' work, making an average of 44⅔ hours worked per week over the 6 weeks.

Again, as stated heretofore, only those women who had worked at least 30 days in each of at least two periods studied were included in the detailed comparisons of the study. Only two-thirds of the women employed in the bushing-lapping department during the first period studied fulfilled this requirement.

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Shift, for All Women in Department and For Those Employed 30 Days or More in Each of Two Periods Studied — Plant E

| Periods studied, scheduled hours, and shift | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| *All women in bushing department* | | | | | | |
| 1st period (7 2/3 - 44 2/3 hours) | 182 | 135 | 74.2 | 2.3 | 13.5 | 9.1 |
| 1st shift | 65 | 47 | 72.3 | 2.1 | 11.8 | 6.8 |
| 2d shift | 58 | 43 | 74.1 | 2.5 | 12.0 | 8.3 |
| 3d shift | 59 | 45 | 76.3 | 2.5 | 16.5 | 12.5 |
| 2d period (7 2/3 - 46 hours) | 168 | 124 | 73.8 | 2.5 | 15.1 | 10.5 |
| 1st shift | 69 | 56 | 81.2 | 2.3 | 12.7 | 8.9 |
| 2d shift | 56 | 38 | 67.9 | 2.5 | 14.9 | 10.0 |
| 3d shift | 43 | 30 | 69.8 | 2.8 | 19.0 | 13.5 |
| 3d period (9 4/5 - 54 hours) | 138 | 120 | 87.0 | 3.0 | 15.8 | 13.3 |
| 1st shift | 70 | 62 | 88.6 | 2.6 | 18.3 | 13.8 |
| 2d shift | 68 | 58 | 85.3 | 3.3 | 13.7 | 12.8 |
| *Women employed in bushing department 30 days or more in each of two periods* | | | | | | |
| 1st period (7 2/3 - 44 2/3 hours) | 121 | 89 | 73.6 | 2.1 | 11.0 | 6.4 |
| 1st shift | 45 | 32 | 71.1 | 1.9 | 10.8 | 5.3 |
| 2d shift | 43 | 32 | 74.4 | 2.4 | 11.0 | 7.4 |
| 3d shift | 33 | 25 | 75.8 | 2.0 | 11.3 | 6.4 |
| 2d period (7 2/3 - 46 hours) | 141 | 106 | 75.2 | 2.4 | 14.5 | 9.8 |
| 1st shift | 61 | 50 | 82.0 | 2.3 | 12.3 | 8.5 |
| 2d shift | 45 | 32 | 71.1 | 2.8 | 13.9 | 10.4 |
| 3d shift | 35 | 24 | 68.6 | 2.3 | 20.1 | 11.2 |
| 3d period (9 4/5 - 54 hours) | 116 | 104 | 89.7 | 2.9 | 16.1 | 13.4 |
| 1st shift | 67 | 61 | 91.0 | 2.7 | 18.4 | 14.0 |
| 2d shift | 49 | 43 | 87.8 | 3.3 | 13.6 | 12.6 |

In the second period studied, which began May 3, 1943, the rotating-day-off system had been discontinued and 7⅔ hours were worked Monday through Saturday, making a 46-hour week. Of the 168 women then employed in the department, just about five-sixths worked at least 30 days in this period and at least one other.

In the fall of the year, during the third period studied when scheduled hours were 9⅕ daily and 54 weekly, 138 women were employed, again just about five-sixths of whom worked at least 30 days in this period and at least one of the two foregoing.

The tables on attendance are concerned with two groups: those employed 30 days in at least each of two of the three periods studied; and, to determine the effect on attendance of the women who did not stay with the job, all women employed in the department in each period studied.

All women in the department lost 9.1 hours per 100 possible man-hours of work in the first period. The more stable group, those who had been employed in the department 30 days or more in each of two periods, lost just 6.4 hours per 100 possible man-hours in the first period, compared with 15.2 hours lost by the remainder (not shown on the tables), who quit or were transferred to other departments. The difference occurred not so much in the proportion who lost time, nor in the number of absences, but in the length of absence, which averaged 13.5 hours for the entire group and 11 for the more stable group. Also, the proportion of the whole department who lost a week or more in the first period was almost twice as large as the proportion of the stable group who lost a week or more in that period. During the weeks they worked, 10 percent of the department as a whole averaged more than 1 day a week of absence as compared with 6 percent among the more stable group.

In the second, 46-hour-week period, when the department employed 168 women, 10.5 hours per 100 possible man-hours of work were lost. The record of the more stable group alone with lost time of 9.8 hours per 100 possible man-hours, was not appreciably better. The short-time workers alone lost about the same amount of time as in the first period, 15.1 hours ( not shown on tables).

In the third, 54-hour-week period, the few new workers taken on lost less time than the experienced workers, or 12.9 compared with 13.4 hours per 100 possible man-hours. A greater proportion of the experienced workers lost time than in either of the previous periods, and the average absence was longer. However, when the record of the entire department is contrasted with that of the more stable group, there is practically no difference in the man-hours lost per possible 100 and average hours per absence.

The proportion of experienced women in the third, 54-hour period, who lost a week or more was twice the proportion in the 46-hour period. During weeks worked the percentage who had no lost time dropped from 24.8 in the second period to 13.8 in the third.

Instead of working 54 hours during the weeks worked, these experienced women actually averaged 50 hours, which was also the average for the group as a whole. In the first and second period the experienced group had averaged 42.3 hours and 42.8 hours, respectively, during weeks worked.

Figures for the department as a whole show that under the three-shift system, in effect during the first and second periods, the second and third shifts lost more hours per 100 man-hours in both periods than did the first shift. In the first period the third shift lost almost double the time lost by the day shift. The major factor accounting for this difference was the length

Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), for All Women in Department and for Those Employed 30 Days or More in Each of Two Periods — Plant E

| Period studied and scheduled hours | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| *All women in bushing department* | | | | | | | | | | | | | |
| 1st period (7 2/3 - 44 2/3 hours): | | | | | | | | | | | | | |
| Number | 182 | 162 | 20 | 11 | 7 | 1 | 1 | 182 | 47 | 86 | 31 | 18 | 41.7 |
| Percent | 100.0 | 89.0 | 11.0 | 6.0 | 3.8 | 0.6 | 0.6 | 100.0 | 25.8 | 47.3 | 17.0 | 9.9 | ..... |
| 2d period (7 2/3 - 46 hours): | | | | | | | | | | | | | |
| Number | 168 | 148 | 20 | 13 | ..... | 4 | 3 | 168 | 44 | 74 | 32 | 18 | 42.6 |
| Percent | 100.0 | 88.1 | 11.9 | 7.7 | ..... | 2.4 | 1.8 | 100.0 | 26.2 | 44.0 | 19.0 | 10.7 | ..... |
| 3d period (9 4/5 - 54 hours): | | | | | | | | | | | | | |
| Number | 138 | 106 | 32 | 18 | 11 | 3 | ..... | 138 | 22 | 72 | 34 | 10 | 50.0 |
| Percent | 100.0 | 76.8 | 23.2 | 13.0 | 8.0 | 2.2 | ..... | 100.0 | 15.9 | 52.2 | 24.6 | 7.2 | ..... |
| *Women employed in bushing department 30 days or more in each of two periods* | | | | | | | | | | | | | |
| 1st period (7 2/3 - 44 2/3 hours): | | | | | | | | | | | | | |
| Number | 121 | 114 | 7 | 5 | 2 | ..... | ..... | 121 | 32 | 62 | 20 | 7 | 42.3 |
| Percent | 100.0 | 94.2 | 5.8 | 4.1 | 1.7 | ..... | ..... | 100.0 | 26.4 | 51.2 | 16.5 | 5.8 | ..... |
| 2d period (7 2/3 - 46 hours): | | | | | | | | | | | | | |
| Number | 141 | 124 | 17 | 12 | ..... | 3 | 2 | 141 | 35 | 66 | 26 | 14 | 42.8 |
| Percent | 100.0 | 87.9 | 12.1 | 8.5 | ..... | 2.1 | 1.4 | 100.0 | 24.8 | 46.8 | 18.4 | 9.9 | ..... |
| 3d period (9 4/5 - 54 hours): | | | | | | | | | | | | | |
| Number | 116 | 87 | 29 | 16 | 11 | 2 | ..... | 116 | 16 | 65 | 26 | 9 | 50.0 |
| Percent | 100.0 | 75.0 | 25.0 | 13.8 | 9.5 | 1.7 | ..... | 100.0 | 13.8 | 56.0 | 22.4 | 7.8 | ..... |

of the absences: average hours per absence on the first shift were 11.8 and on the third shift, 16.5. In the second period these averages were 12.7 and 19, respectively.

Only two shifts operated under the 9⅘-54-hour schedule in the third period. The night shift had a greater number of absences, but shorter in duration, than had the day shift—a larger proportion of the day shift than of the night shift lost a week or more—so that the hours lost per 100 possible hours of work were 12.8 for the night shift and 13.8 for the day shift. Actually, during the weeks the women worked, the day shift put in 50.7 hours, and the night shift 49.3 hours.

Only 54 women worked part or all of each week of each period studied. Among this "control group," the number who lost time increased materially under the 9⅘-hour day. Whereas 68.5 percent lost time under the first period of 7⅔ hours, 92.6 percent lost time under the 9⅘-hour day. The hours this "control group" worked averaged 42.8 in the 44⅔-hour period, 44.1 in the 46-hour period, and 49.8 in the 54-hour period.

Causes of lost time in the three periods were traced wherever possible, but unfortunately were not reported in so many cases that comparisons are of doubtful validity. However, in the second and third periods almost twice as many absences were reported as due to personal reasons than as due to sickness. In the first period about 70 percent were due to personal reasons and 30 percent to illness.

The proportion of women treated, number of industrial injuries, and number of treatments increased as the hours of work were lengthened. The greatest increase occurred in the number of treatments which would seem to indicate that the injuries were more severe. Oleum, the liquid used to clean the bushings caused a rash and burn on some skins. These usually occurred on the hands. Oleum was also sometimes blown into the eyes. The increase in accidents and first-aid treatments in the longer-hour period seemed primarily due to cuts, abrasions, and soreness. The edges of the bushings were sharp and sometimes caused cuts on fingers. Fingers were sometimes hit with mallets. Soreness in hands and wrists resulted from "plugging" bushings with gages. A number of women interviewed believed arthritic finger joints were caused by the job. Table III indicates the number of women treated and the causes of industrial injuries. Data on nonindustrial calls to the medical department were incomplete and therefore were not included in the table.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

Plant E, as stated in the introduction, manufactured injectors for Diesel engines and the women studied lapped the bushings of these injectors. The bore of the bushings had to be lapped to very precise tolerances of 4/100,000 to 6/100,000 of an inch. The bore was only 1⅞ inches long and ¼ inch in diameter. It had to be absolutely round and straight so that there would be a perfect fit with the plug gage. In the first period studied, the processes involved were as follows:

The woman worker secured 9 or 10 bushings to be lapped as a set. A spirally split lap was driven on a tapered arbor for several inches by means of a small mallet. The lap was dressed by rubbing it with flat hollow stones. A carborundum lapping compound was applied to the lap with a paddle. The bushing was slid over the lap, and the operator moved it back and forth as the lap rotated. After using abrasive compound, the bushing and lap had

## Table III. — Calls to Medical Department Due to Industrial Injuries Under Different Scheduled Hours — Plant E

| Causes of calls for medical aid | 1st period (7 2/3 - 44 2/3 hours) | | | | 2d period (7 2/3 - 46 hours) | | | | 3d period (9 4/5 - 54 hours) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of— | | | | Number of— | | | | Number of— | | | |
| | Women studied | Women treated | Injuries | Treatments | Women studied | Women treated | Injuries | Treatments | Women studied | Women treated | Injuries | Treatments |
| Totals | 121 | 27 | 30 | 33 | 141 | [1] 37 | 41 | 52 | 116 | [1] 34 | 44 | 51 |
| Ratio to total women studied | | 22.3 | 24.8 | 27.3 | | 26.2 | 29.1 | 36.9 | | 29.3 | 37.9 | 44.0 |
| Burns or skin irritation from oleum | | 5 | 6 | 7 | | 11 | 12 | 15 | | 11 | 11 | 13 |
| Hands or arms | | 2 | 2 | 3 | | 10 | 11 | 14 | | 9 | 9 | 9 |
| Feet or legs | | 3 | 4 | 4 | | | | | | 1 | 1 | 2 |
| In eyes | | | | | | 1 | 1 | 1 | | 1 | 1 | 2 |
| Cuts, abrasions, lacerations | | 13 | 15 | 15 | | 19 | 20 | 21 | | 19 | 23 | 25 |
| Hands or arms | | 12 | 14 | 14 | | 18 | 19 | 20 | | 14 | 18 | 18 |
| Steel splinter in hand | | 1 | 1 | 1 | | 1 | 1 | 1 | | 4 | 4 | 5 |
| Feet or legs | | | | | | | | | | 1 | 1 | 2 |
| Pains, soreness, contusions—hands or arms | | 9 | 9 | 11 | | [2] 9 | 9 | 16 | | 10 | 10 | 13 |

[1] Details add to more than total because some women made medical calls for more than one illness or injury.
[2] One of these women was injured when a grinder, 20 to 30 feet away, broke and a piece of the machine flew across and struck her arm, resulting in a contusion and slight abrasion. She had 5 treatments or check-ups in the plant hospital.

to be washed with oleum and flushed with a compressed air hose. The bushing was cleaned and dried by drawing a soft rag through it. Plug gages were periodically inserted to indicate how much stock needed to be removed.

The women worked at a steady but unhurried pace. The nature of the job was such that any attempt at rushing a job would result in greatly increased spoilage, and emphasis was therefore placed on precision of craftsmanship rather than quantity of output.

The success of a lapper depended primarily on ability to "feel" the amount of lapping that had to be done to get a bushing properly sized, straight, and smooth. Without this "feel," too much stock might be removed, or the hole might remain narrower in the middle than at the ends, or wider at one end than at the other, or it might have an uneven surface. This "feel" was developed to the point at which some lappers could tell to within a few 10-thousandths of an inch the stage of a particular bushing. The lapper had to pay continuous and close attention to her work. Lapping a bushing even a few seconds too long might enlarge the opening beyond permitted tolerances and cause the bushing to be scrapped. The women could either sit or stand at their work. The main muscular pressure involved was "plugging" the bushing with a gage, which was hard on hands and wrists.

"I've worked for 14 years," said one woman, "on a lathe, a punch press, a power sewing machine, and done every kind of a job in a box factory. I've typed, kept books, and done general office work. Lapping bushings was by far the hardest job of all to learn."

In February 1943 a school at which lapping bushings was taught was started, and girls were sent into the shop only when they had acquired the knack of the job. Some women learned this work quickly and became proficient in 2 or 3 months. Many others could never quite develop the "feel."

The shop was air conditioned the year round. In winter, however, girls complained because the department studied was near a large truck entrance to the building, and as doors were opened blasts of cold air struck the workers. Lighting was by means of large overhead fluorescent fixtures. Floors were of wooden blocks. Work benches were at a comfortable height for either sitting or standing. Straight-backed stools were provided.

The oleum used in washing the bushings and lap was the cause of some skin burns. Splashing or spilling it on the hands or legs caused both minor irritations and first-degree burns. Cuts were caused by the sharp edges of the bushings. Constant pressure on the palm while pushing the plug through the bushing caused hand and wrist pains in new workers.

### Performance on the Job

As the first women were hired for lapping bushings in September 1942, the group was relatively inexperienced at the beginning of the first period studied, January 4, 1943. Also, the job, tools, and materials had not been standardized. Differences occurred in the grain and hardness of the cast-iron laps, in the taper of the lap and arbor, and in the lapping compound, and the bore of some bushings were "bowed" or slightly curved to 2/100,000 to 3/100,000 of an inch, so that an operator had to develop a very sensitive touch to know the condition of her tools and materials and make the proper adjustments and allowance in lapping the bushings.

Prior to the beginning of this study, assurances were given by management that the same irregularities of materials and tools existed in the entire period of manufacture, so that the effect of increased hours on production

would be discernible. However, the girls, when interviewed, believed the laps were inferior in the second period; some thought it was a condition of the metal and the others the fault of a new lapmaker in the toolroom.

Further, in late June to August 1943 micromatic lapping machines were gradually introduced to do the rough lapping automatically, so that only the fine lapping and "plugging" to size remained. A very few operators on the micromatic machines could do the rough lapping for the entire group, and this in itself caused a marked increase in production. The machines were installed one by one, and by the beginning of the third period studied the new system was operating throughout the department.

It was only with great difficulty that a standard time was set on lapping. The plant stressed precision of craftsmanship on this job much more than quantity of output, because of the extremely fine tolerance required. It was felt that the greater the pressure for production, the greater the spoilage would be. Each bushing spoiled at this stage meant the loss of many hours of production previously applied. Time studies were made of a group of good, average, and fair lappers, but there were so many apparent variables that entered into production that no definite conclusions could be reached with respect to a positive standard time. After much discussion of the matter, a standard hour's production was determined to be 3½ bushings. When lapping was done by machine, 4½ bushings an hour was considered acceptable. However, individual efficiency percentages were not systematically kept, and the foreman was the main judge of whether or not a worker was "making out."

Production charts were kept of the number of bushings produced each day by each woman, but no distinction was made between those that had to be both rough and fine lapped and those that came from the micromatic machines and only had to be fine lapped. There was also no way of knowing how many the workers received of "bowed" pieces that required an average of 25 percent more time to lap.

Production data for the department as a whole were also regularly recorded and these have been used for the most part rather than individual production data. Neither, however, provides a true measure of relative production under the three periods studied.

### Performance on the Job — Individual Production

From all statements made by women workers, individual production varied widely. But records do not reveal this situation in its entirety. As stated by one woman:

> The girls felt funny about anyone who could get the bushings out easily. If a girl only had 12 bushings out and maybe I had 70 or 75, I would give mine to the girl so her production would be up. When I got bushings ahead, because we weren't allowed to take them to our lockers, I either had to leave them in my box or give them away. If I left them in my box the day shift would take them, so I always gave my extra bushings away.

"Killing a job," or exceeding the production of the mass of workers, was contrary to the spirit of the group; the speedier girls helped their coworkers rather than be outlawed by the group. As a consequence, the records do not reveal the number who made the output expected by management at any time. In the second period only five woman reported output of 800 or more in a 36-day period when the expected output was 965. However, management did know relative output, for they seated the girls in four rows according to ability to do the work and then set a different quota for each row. If a girl made below the row quota, she was moved to the next

row. This was an embarrassing moment for any worker, which her fellow workers spared her if she was at all popular.

In the third period, management expected 1,585 bushings per individual over a 36-day period. While the record of 24 women's production exceeded an average of 1,200, the highest recorded production was 1,511. The custom of giving away finished bushings undoubtedly served to throw all individual production records askew.

An analysis of daily production records also is of questionable validity. The worker would have a set of bushings almost finished; these would be put in her box to be finished the next day. If she hid her plug gage, it might take not more than 10 minutes to finish them the next day; but if the other shift used the gage and she could not find the correct size, she might have to lap her bushings a size or two larger to fit an available gage. Hoarding gages became a practice and had to be forbidden by management. In the third period, with the advent of the micromatic machines, the girls could turn out more bushings than they had plugs to fit the bushings. The company finally permitted two or three girls to use the same plug. When one girl finished her set, she would put it aside until the other girl or girls finished theirs, and they would then turn all the sets in at the same time with one plug. (Each set of bushings had to be accompanied by its plug when sent to the room where plungers were made to fit the bushings. It took 2 or 3 days to get the plugs back to the lapping department.)

An examination of daily production in several weeks of the third period showed that Mondays and Thursdays were the highest production days, as was also true in Plant D. However, the daily differences in production were ironed out very materially by the practices prevailing among the women workers.

Table IV. — Productive Efficiency of All Workers in the Bushing Lapping Department[1], by Weeks in Each Period Studied — Plant E

| Period studied, scheduled hours, and week | Total hours worked on incentive jobs[2] | Efficiency (average hourly production) |
|---|---|---|
| 1st period (7 2/3 - 44 2/3 hours) | 71,774 | 48.7 |
| 1st week | 12,247 | 52.4 |
| 2d week | 12,209 | 29.7 |
| 3d week | 11,646 | 45.0 |
| 4th week | 12,035 | 45.5 |
| 5th week | 12,088 | 57.7 |
| 6th week | 11,549 | 62.5 |
| 2d period (7 2/3 - 46 hours) | 69,429 | 67.0 |
| 1st week | 11,652 | 63.3 |
| 2d week | 11,451 | 63.6 |
| 3d week | 11,284 | 65.9 |
| 4th week | 11,530 | 69.6 |
| 5th week | 11,987 | 70.6 |
| 6th week | 11,525 | 69.1 |
| 3d period (9 4/5 - 54 hours) | 63,773 | 86.2 |
| 1st week | 9,713 | 93.2 |
| 2d week | 11,183 | 83.5 |
| 3d week | 9,969 | 82.5 |
| 4th week | 10,786 | 85.7 |
| 5th week | 10,923 | 87.6 |
| 6th week | 11,199 | 85.1 |

[1] Includes approximately 12 men in the department.

[2] Lunch hours have been deducted from actual hours worked in all periods. Hours credited for time wasted on scrap have been deducted from actual hours and from standard hours produced in 2d and 3d periods because there was no credit given for scrap in the first period.

### Performance on the Job — Department Production

The relative productive efficiency of the department as a whole in the three periods studied is shown in table IV. These figures include the work of some 12 men employed in the department over the periods studied. The average hourly production or efficiency rates represent standard production hours achieved divided by actual hours worked on time-studied jobs. Eliminated are hours on non-production tasks, such as supervision, clerical work, handling material, clean-up, machine set-up, rework, maintenance labor, waiting time, and so forth.

The rise in efficiency from the first period through the second shows the influence of experience among the workers and the continued rise through the third period shows the influence of increased experience plus the use of micromatic machines. The introduction of micromatic machines in the third period completely obscured any effect of increasing hours from $7\frac{2}{3}$ to $9\frac{4}{5}$ a day.

# SOLDERERS, WELDERS, METAL FABRICATORS, AND ALLIED WORKERS IN RADIATOR MANUFACTURING — PLANT F

## INTRODUCTION

Plant F is situated in a small town and draws its workers from the town and surrounding rural areas. The company was founded in 1937 for the manufacture of automobile radiators. In April 1943 the wartime manufacture of aircraft radiators, cabin heaters, and oil coolers was begun. The women studied were predominantly metal fabricators, solderers, and welders. Because the area had no trained labor reserve to draw on for factory work, the company instituted a 10-hour day, 60-hour week to replace an 8-hour day, 48-hour week, in June 1943. In November 1943 an industrial engineering firm was engaged to study general plant organization, make new time studies of the jobs, and recommend plant changes.

The engineers' suggestions for changes in operating set-up, combined with the workers' increased experience, and pressure from the State labor commissioner, appeared to warrant a reduction in the hours of work for women from 10 to 8 a day and from 60 to 48 a week and was put into effect in December 1943. In April 1944 the company decided to try a schedule of five 9-hour days and 5 hours on Saturday. As the Women's Bureau study was begun in May of 1944, this third schedule had been in operation too short a time to show its effect on workers' performance, though the women interviewed were keenly conscious of the change and outspoken in their opinion, not only of the 60- and 48-hour schedules, but of the new 50-hour week.

All women in the plant working on production operations were included in this study. The majority were engaged in soldering, welding, brazing, sheet-metal assembly, and a variety of metal-fabricating jobs.

Comparative records were secured of women workers' performance from October 25 to December 19, 1943, under the 60-hour week and from February 21 through April 9, 1944, under the 48-hour week. Pay-roll records gave the attendance each day, as well as total weekly hours, gross earnings, deductions, and so forth. A good record on causes of lost time was kept by the company and was copied. The log of each call to the medical department during the period under study was analyzed. Personnel files gave date of birth, marital status, date of entering job, and job-changes data. Production data, week by week, for the plant as a whole were taken down. Individual production data of one department for 11 working days under each hour schedule were also studied. In addition, visits were paid to women workers in their homes to discuss their personal and family responsibilities and their methods of adjusting these to meet different working hours.

The hours worked and periods studied are summarized below:

| *Period* | *Schedule* |
|---|---|
| *1st period:* | |
| October–December 1943 (8 weeks)<br>10-hour day, 6-day 60-hour week | 7 a.m.–5:30 p.m.<br>(30-minute lunch period) |
| *2d period:* | |
| February–April 1944 (7 weeks)<br>8-hour day, 6-day 48-hour week | 7 a.m.–3:30 p.m.<br>(30-minute lunch period) |

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

Fewer than half the women employed at Plant F lived in the town in which the plant was situated or in the nearby country. The remainder lived on farms or in small towns 10 to 21 miles distant. As there was no public transportation serving the community, town workers walked to the plant; others rode in private automobiles with fellow workers. Over half the women were entirely dependent on private automobiles for going to and from work, while about an eighth used automobiles but could walk if need be. One effect of the dependence on private cars was that when women were put on an 8-hour and a 9-hour day, they had to wait 1 and 2 hours for the men in the car pools, who were on a 10-hour day. The women were not permitted to remain in the shop, no place was arranged for them to wait, and the hours waiting in the automobile were regarded as harder than working in the shop.

In both periods, the transit time for women who lived in town was 30 minutes or less. Twenty percent spent 1 to 1½ hours and 6 percent spent over 1½ hours in travel time. The remaining women required from 30 minutes to an hour for transit each workday. Under the 10-hour schedule the time away from home was 11 or 12 hours for two-thirds of the women and from 12 to 13 hours for one-fifth. Under the 8-hour schedule more than half were absent from home less than 10 hours and about one-third away from 11 to 13 hours.

Not quite 25 percent of the women were under 20 years of age; 13 percent were from 20 to 24; and 17 percent were 25 to 29. About 12 percent were in each of the 5-year age groupings from 30 through 44. Twelve percent were 45 years of age or older.

Fifty-eight percent of the women were married or widowed, and 42 percent were single. It is not surprising to find, therefore, that three-fourths of the total lived in their family households, which ranged in size up to 9 members. The majority of the households contained children of all ages. About half the married, widowed, separated, and divorced women had children under 16, the largest number of such children being between 6 and 13 years old.

Half the group of married or widowed women had all or the major responsibility for the household duties. Only a few lived in households in which another woman—mother, mother-in-law, daughter, or sister—did the major part of the work. Some of the single women lived alone and boarded and roomed out, others lived with their families and did the marketing and cooking, helped with the cleaning and did their own laundry.

The plant opened at 7 a. m. during both periods under study. Because many workers lived on farms, their work was arduous. A 5 a. m. rising hour was usual among women who lived at a distance from the plant. Some attempted "gardens" in addition to their other home duties. Sewing for children also was a responsibility of these rural women.

Among their brief case histories are the following:

> A 45-year-old woman, living on a farm 15 miles from the plant, gets up at 4, packs lunches for herself and two sons in high school, gets the family breakfast, and leaves home at 6 o'clock. For her ride home she has to wait for men who work longer hours, so regardless of the hours worked it is after 6 when she reaches home. Then she has dinner to get, dishes to wash, and the whole round of household work to do. The washing and ironing for three men as well as herself, with no running water in the house, is arduous in itself. It is 11 p.m. when she retires, allowing only 5 hours for rest.

A young wife in her twenties has three children from 2 to 9 years old. Her husband rents a farm 18 miles from the plant and her earnings of $25.45 a week help to supply the cash to keep the family. She gets up at 5:15 and leaves home at 6:25 after getting breakfast for the 5 of them. She takes 5 riders into town in her car. A neighbor keeps an eye on her children during the day. When she is on the 8-hour day, she sometimes stops in town to do errands. If she does not stop, she is home by 4:30, whereas under the 10-hour schedule she was not home until 6. The 10-hour day made the evening meal late and left little time to enjoy the children or to sew for them or care for their clothes.

Another women, in her thirties, has a sick husband, a daughter in high school, one son in service, another on a nearby farm, and four children from under 2 to 13 years of age. Her weekly earnings of $28.25 ($3 of which goes to pay for her ride to and from work) support the family. The housework is shared, the 17-year-old daughter taking full charge when she gets home from school. The mother herself does the laundry and cleaning on Sundays, as she goes to bed by 8 on workdays, only 1¾ hours after arriving home.

Women living in town did not need to rise so early, but as remarked by a single woman living with her father:

The 10-hour day was a handicap for father, for he had to get his own evening meal. I couldn't do the marketing on the 10-hour day unless I laid off earlier or was late at noon. I had to send laundry out, also, on the 10-hour day.

A single girl, who rented a room and had her evening meal where she lived said:

On the 8-hour day I come home and sleep before supper so I can go out more frequently at night. I do all my laundry except heavy work clothes now, whereas on the 10-hour day I sent everything out. On the 8-hour day, I organized the bowling team. I had more time to write letters and could sometimes go out of town.

A young girl who lived with her grandmother said:

On the 8-hour day I can go to the city on the bus after work and return, but I couldn't do it on the 10-hour day. I couldn't do shopping, either, on the 10-hour day, so grandmother had to do everything.

Under both periods the largest proportion of women workers visited had an over-all day of 16 to 17 hours, the second largest group a day of 17 to 18 hours. There were a few women in each period who had only 4 to 5 hours' rest at night.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

At the time of the study, a considerable group of women had worked at this plant under an 8-hour day, a 9-hour day, and a 10-hour day, and weeks of 48 hours, 50 hours, and 60 hours, respectively. In the light of this experience, half the women preferred the 8-48-hour schedule. However, a number expressed this preference in these terms. "We want an 8-hour day and more pay." About a third who liked the 9-50-hour schedule had in mind the overtime pay for 10 hours a week. Those who preferred the 10-hour day did so mainly because they had to wait around for their daily ride home and preferred working to waiting.

### GROSS EARNINGS IN RELATION TO HOURS

Women workers began at 40 and 45 cents an hour, men at 60 cents an hour. The maximum rate for women was 60 cents; for men, 80 cents (although a few received 95 cents). Time and a half was paid for overtime beyond 8 hours a day or 40 hours a week. Three-tenths of an hour's pay was deducted for lateness up to and including 15 minutes. As many of the women were receiving beginning rates in the first (60-hour) period studied, their

basic rates averaged less in that period than in the second (48-hour) period. As a consequence, average hourly earnings in the second period, in spite of fewer hours of overtime, were only seven mills less than in the first period—58.1 cents as against 58.8 cents. Averaging 8.4 more hours of work under the 60-hour schedule, women's average gross earnings were $30.70 a week as compared with $25.50 under the 48-hour schedule.

Because the community had suffered greatly in the depression period of the thirties, women were keenly conscious of their pay envelopes. There was general belief that the same work paid much better in large cities nearby and that men were paid higher rates for the same work in the plant. When women expressed a desire for the 9-hour day, it was primarily because of their need for higher earnings.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

Time lost under the 8-48-hour week as compared with the 10-60-hour week was less by almost 1 hour per 100 possible man-hours of work, that is, 10.4 hours as against 11.3 hours. This was accomplished by a decrease in the number of absences as well as by a decrease in the number of women who were tardy and a reduction in average tardiness from half an hour to 20 minutes.

The average hours per absence showed no decrease under the shorter hour schedule. This is surprising in view of the fact, apparent from table II, that fewer women lost a full week of time. The firm's custom of granting women 2 weeks of absence without suspending them, in recognition of the need for house-cleaning, did not eliminate the practice of taking 2 or more scattered days off under the 60-hour schedule in order to catch up on household demands, a practice that continued in the 48-hour period.

During the weeks each woman worked, the average hours worked over the 8-week period under the 10-60-hour schedule were 52.3; and average hours worked over the 7-week period under the 8-48-hour schedule were 43.9. This meant that the women worked 87 percent of the scheduled hours in the 60-hour period and 91 percent of scheduled hours in the 48-hour period.

Friday was pay day in each period under study. Under the 10-60-hour schedule more than two-thirds of the women lost time on the following Saturday in 1 or more weeks, but their absences were for less than a day more frequently than for a full day. This Saturday lost time accounted for

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours — Plant F

| Period studied and scheduled hours | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period (10-60 hours)..... | 70 | 65 | 92.9 | 4.1 | 11.5 | 11.3 |
| 2d period (8-48 hours)..... | 70 | 64 | 91.4 | 3.1 | 11.5 | 10.4 |

Table II. — Analysis of Time Lost by Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended) — Plant F

| Period studied and scheduled hours | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 5 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| 1st period (10-60 hours): | | | | | | | | | | | | |
| Number | 70 | 59 | 11 | 9 | 2 | ..... | 70 | 6 | 36 | 17 | 11 | 52.3 |
| Percent | 100.0 | 84.3 | 15.7 | 12.9 | 2.8 | ..... | 100.0 | 8.6 | 51.4 | 24.3 | 15.7 | ..... |
| 2d period (8-48 hours): | | | | | | | | | | | | |
| Number | 70 | 65 | 5 | 2 | 2 | 1 | 70 | 6 | 35 | 21 | 8 | 43.9 |
| Percent | 100.0 | 92.9 | 7.1 | 2.8 | 2.8 | 1.5 | 100.0 | 8.6 | 50.0 | 30.0 | 11.4 | ..... |

only 16 percent of the man-hours lost. Fewer women lost time on the Saturday after pay day under the 8-48-hour schedule, though some women did take off an occasional Saturday. Even so, such absences accounted for only 13.5 percent of the man-hours lost. Apparently, the receipt of pay was less important as a cause of Saturday absenteeism than the fact that Saturday was the best day for shopping or gave 2 consecutive days to engage in home and family activities.

Some workers who lived in town walked home for lunch, for which only 30 minutes was allowed. The demands made on them when children had to be fed were responsible for a high lateness record at noon. In the 10-hour period, workers used the lunch time to do errands, delaying the hour of reappearance at the plant.

## CAUSES OF LOST TIME AND CALLS TO MEDICAL DEPARTMENT

Table III shows in detail the causes of lost time under each hour schedule. Personal illness is the reason given for a third to a half of the absences under the 60- and 48-hour schedules, respectively. Family illness as a cause of lost time ranked far below personal illness but was second in importance in both periods. Business or shopping ranked third in the 60-hour period.

The number of calls to the medical department decreased materially, from 318 in the 60-hour period to 244 in the 48-hour period, although the number of women studied remained the same. This decrease is accounted for primarily by a decrease in the number of calls due to acid burns or skin irritations or to acid or foreign bodies in the eyes, the hands, and so forth. These were industrial causes; the shorter and less-fatiguing day, coupled with increased experience in handling soldering and welding materials, may have resulted in their decrease.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

Departments in Plant F were arranged both according to the type of heater, radiator, or oil cooler manufactured and according to the nature of work. Similar work was performed by women in several departments, and they were sometimes transferred from their major task to other tasks to keep work flowing evenly through the plant. The study covered all women on production operations in the plant, and all of them, except the ribbon-line operators, worked on radiators, cabin heaters, and oil coolers for airplanes. Ribbon-line operators worked on auto and truck radiators. Fifty-seven percent of the women studied worked on soldering or soldering and assembly, 17 percent worked on assembly and miscellaneous metal fabricating jobs, 15 percent worked as ribbon-line operators and assemblers, and 11 percent worked on welding and brazing.

Solderers used a soldering torch and solder stick, first brushing the metal with flux. Solderer-riveters assembled parts on semiautomatic riveting machines, securing parts in place and making them airtight by soldering. Solderer-assemblers combined soldering with various types of assembly involving use of hand tools such as drills, wrenches, and pliers. Soldering seams on thin metal tubes was one of the more continuous soldering jobs because of the large number of tubes required. The worker had to develop a very steady hand to lay an even line of solder on the seam of the tube.

The assembly and metal fabricating jobs included such operations as inserting metal stiffeners in tubes; smoothing edges of tubes and stiffeners on an emery wheel; opening tubes on each end of core with a flanged hand

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Table III. — Causes of Lost Time Under Different Scheduled Hours — Plant F

| Causes of lost time | 1st period (10-60 hours) | | | | 2d period (8-48 hours) | | | |
|---|---|---|---|---|---|---|---|---|
| | Women losing time | Absences | | Total hours lost | Women losing time | Absences | | Total hours lost |
| | Number | Number | Percent | Percent | Number | Number | Percent | Percent |
| Total women losing time | 65 | 267 | | | 64 | 199 | | |
| Total reporting causes | [1] 63 | 175 | 100.0 | 100.0 | [1] 64 | 180 | 100.0 | 100.0 |
| Personal | 47 | 118 | 67.4 | 72.1 | 50 | 133 | 73.9 | 69.4 |
| Illness | 34 | 63 | 36.0 | 52.8 | 44 | 85 | 47.2 | 57.9 |
| Medical appointment | 6 | 9 | 5.1 | 2.5 | 4 | 15 | 8.3 | 3.0 |
| Business, shopping | 17 | 31 | 17.7 | 6.7 | 12 | 17 | 9.4 | 4.1 |
| Vacation | 2 | 2 | 1.1 | 6.1 | | | | |
| Other, as funeral, birthday | 13 | 13 | 7.4 | 4.0 | 13 | 16 | 8.9 | 4.3 |
| Family | 23 | 39 | 22.3 | 17.0 | 25 | 36 | 20.0 | 27.3 |
| Home duties | 5 | 5 | 2.9 | 1.8 | 5 | 5 | 2.8 | 5.2 |
| Care of children | 3 | 5 | 2.9 | 1.5 | 2 | 2 | 1.1 | 2.9 |
| Family illness; quarantine | 13 | 20 | 11.4 | 8.7 | 13 | 16 | 9.0 | 9.1 |
| Service men visting family | 2 | 2 | 1.1 | .9 | 4 | 4 | 2.2 | 5.4 |
| Other | 5 | 7 | 4.0 | 4.2 | 8 | 9 | 5.0 | 4.8 |
| Factory | 7 | 11 | 6.3 | 7.2 | 2 | 2 | 1.1 | .2 |
| Lack of work | 6 | 10 | 5.7 | 2.0 | 2 | 2 | 1.1 | .2 |
| Disciplinary lay-off | 1 | 1 | .6 | 5.2 | | | | |
| Miscellaneous—Transportation | 3 | 7 | 4.0 | 3.7 | 8 | 9 | 5.0 | 3.1 |

[1] Details add to more than total because some women report more than one cause of absence.

## Table IV. — Causes of Calls to Medical Department Under Different Scheduled Hours — Plant F

| Causes of calls for medical aid | 1st period (10-60 hours) | | | | 2d period (8-48 hours) | | | |
|---|---|---|---|---|---|---|---|---|
| | Women | | Visits | | Women | | Visits | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Total women | 70 | 100 | ..... | ..... | 70 | 100 | ..... | ..... |
| Women making no medical calls | 14 | 20 | ..... | ..... | 13 | 19 | ..... | ..... |
| Women making medical calls | 56 | 80 | 318 | ..... | 57 | 81 | 244 | ..... |
| Women reporting reasons for medical calls | [1] 56 | | 318 | 100 | [1] 57 | ..... | 244 | 100 |
| Burns, skin irritations, redresses, etc. | 78 | ..... | 166 | 52 | 55 | ..... | 124 | 51 |
| Acid or foreign body in eye, hand, etc. | 17 | ..... | 27 | 9 | 9 | ..... | 10 | 4 |
| Colds, sore throats | 16 | ..... | 32 | 10 | 19 | ..... | 43 | 18 |
| Headaches | 17 | ..... | 29 | 9 | 19 | ..... | 22 | 9 |
| Dysmenorrhea | 6 | ..... | 9 | 3 | 4 | ..... | 4 | 2 |
| Pains, aches (neck, back, leg, arm) | 5 | ..... | 10 | 3 | 7 | ..... | 8 | 3 |
| Indigestion | 15 | ..... | 16 | 5 | 8 | ..... | 10 | 4 |
| Other [2] | 9 | ..... | 9 | 3 | 7 | ..... | 7 | 3 |
| No diagnosis—"called in ill" | 14 | ..... | 20 | 6 | 12 | ..... | 16 | 6 |

[1] Details add to more than total because some women made medical calls for more than one illness or injury.
[2] Includes: diarrhea, broken fingernail, toothache, infected ear, cold sore, etc.

fork and small hand pick, to allow water to pass down the tube; building cores for oil coolers by manually placing the tubes in position in core frames; chasing threads with hand chaser, to remove solder; and straightening fins with hand pliers. Welders did acetylene welding, brazing, and silver soldering. Acetylene welders were equipped with safety goggles or face shields and were provided with gloves.

The ribbon machines automatically crimp or corrugate very thin sheets of metal and cut them the desired length for use in making automobile radiator cores. Several women worked as a team on the ribbon line, the work passing from one machine to another. The actual machine operating was predominantly automatic and repetitive, mainly involving guiding the metal pieces into the machines, or taking away the metal lengths coming out and pressing a foot lever to actuate the machine. The more experienced workers adjusted dies and changed the gears on the crimping machines that make the imprints on ribbons of thin metal; they also reset the locking and cutting machines. There were also ribbon-line assemblers who manually assembled spacers into tubes and filled core trays with these tubes, seeing that the tubes were the proper depth and size for each type of tray.

The varieties of jobs broke the monotony of the work; however, for the most part, the women complained of having to change about, preferring to work continuously at their major job. Solderers, assemblers, ribbon-line operators, some riveters, and those on miscellaneous jobs stood during most of their work. The major reason for not sitting down was that the work-table level, plus the height of the parts, made it difficult to work from the stools provided.

While the ribbon-line work, riveting, assembling, and metal fabricating jobs had no harmful conditions inherent in the job itself, the placing of some of the workers near badly ventilated areas near dip pots and solderers subjected the operators to the acid fumes that arise from the molten flux. Soldering was a hot job. Where workers were placed close together, the soldering fumes and the heat from the torches caused discomfort on summer days. Acid burns from soldering flux were of frequent occurrence. Red spots on hands, arms, face, and neck were not uncommon. On some women these spots become open sores. Workers also complained that clothes were eaten by the acid.

Many of the jobs could be learned in 2 or 3 days, but 4 to 8 weeks were usually necessary to meet minimum productive efficiency. The more difficult jobs, such as welding, core building, and ribbon-line operating, took 6 weeks to 2 months to learn.

### Performance on the Job

Workers studied were paid on a straight hourly rate. The company had made time studies of the various operations and set a standard time on each one. It was not until the last 2 weeks of the 10-60-hour period, however, that records were kept of the number of units produced daily and weekly by each worker. Prior to that time only total labor costs on each type of radiator, cabin heater, or oil cooler were recorded for the plant as a whole. Thus, the change in total plant-wide efficiency, based on labor costs in relation to total units produced, was available for both periods studied. However, individual productive efficiency data were only available for one department, beginning with the last 11 days of the first period studied.

Individual records of production were secured for the last 11 days of the 10-60-hour period and for a corresponding 11 working days 2 months

later when these women were at the same work in the department but on an 8-48-hour schedule. Records taken gave the actual hours worked, the hours on production work (that is, with allowance for time spent on repairs or in waiting for work) the number of pieces produced, and the efficiency ratings (standard hours achieved divided by hours actually worked on incentive jobs).

During neither the 10-60-hour period nor the 8-48-hour period did these women work the full 11 days; rather, they averaged 9 and a fraction days of work. Under the 10-hour schedule they averaged 9.1 hours of work on the days worked, and under the 8-hour day, 7.2 hours a day. The difference in time actually worked per day as between the two periods was approximately 2 hours. During the longer-hour period average efficiency was 75.9, under the shorter schedule, 108.8. The following summary shows this contrast in productive efficiency:

| Period studied, scheduled hours, and length of time in occupation | Number of women studied | Average number of days worked in 11 days | Average daily hours worked | Average efficiency rating |
|---|---|---|---|---|
| Last period (11 days of 10 hours): | | | | |
| Total | 23 | 9.1 | 9.1 | 75.9 |
| 6 months, less than 1 year | 2 | 10.5 | 9.2 | 62.7 |
| 6 weeks, less than 6 months | 10 | 8.6 | 9.0 | 85.1 |
| Less than 6 weeks | 11 | 9.4 | 9.0 | 69.9 |
| 2d period (11 days of 8 hours): | | | | |
| Total | 20 | 9.2 | 7.2 | 108.8 |
| 6 months, less than 1 year | 4 | 9.3 | 7.5 | 117.9 |
| 6 weeks, less than 6 months | 13 | 9.1 | 7.0 | 108.0 |
| Less than 6 weeks | 3 | 9.3 | 7.4 | 100.1 |

As already stated, the plant kept labor-cost records for each week on the different types of wartime radiators, oil coolers, or heaters manufactured, showing total labor costs in relation to number of units produced. These combined the labor cost for all productive work done on the part, whether by men or women. Radiators, oil coolers, and heaters were being manufactured for two types of airplanes, and cost records were kept separately for each. At the time of the first period studied production had so recently been started on radiators, oil coolers, and heaters for one type of airplane, that differences in efficiency in the two periods would have been principally due to improvements in production techniques and added experience of the workers. The other airplane job had been in production for a considerably longer period, and the labor-cost records revealed an over-all increase in efficiency from 102 to 110 when women's hours were shortened from 60 to 48 and men's hours remained at 60 a week.

It was believed both by management and by the women workers that their increased efficiency was due in part to shorter hours, in part to simplification of work methods, more orderly planning of the flow of work and materials, improvements in equipment and tools, and the added experience of the workers as a whole.

# AIRCRAFT GENERAL ASSEMBLERS AND RIVETERS—PLANT G

## INTRODUCTION

The transformation within a few short years, of our small peacetime aircraft industry into an industry producing 78,000 planes annually was accompanied by a continuous growth in the rate of production per man-hour. Great strides were made toward a better utilization of employees, as new technical and supervisory staff and production workers gained experience, and as manufacturing short cuts were evolved. The industry, therefore, was not one whose output could be associated directly with the hours the productive force worked. In fact, although departmental production records were necessary, aircraft management usually made little or no attempt to keep individual production records during the war period. Experimentation with different hour schedules, in an effort to achieve regular attendance, was continuous. To make that experience available for future use, a study of attendance under different hour schedules in one airframe assembly plant in the Middle West was included in this study of plants operating in wartime under various hour schedules, even though a comparison of productive efficiencies was not possible for that plant.

A uniform work schedule for the entire plant was nonexistent. Keeping an even flow of parts from one department to another under an ever-changing production schedule, from time to time required different departments to shift hours. One of the largest riveting departments, later divided into two departments and still later reorganized again to make a third department, was chosen for study. In this department, where wing center sections were fabricated and assembled, large numbers of women were employed as general assemblers and riveters and a few as installers and spot welders. It was a department with high turn-over and much absenteeism.

This wing center section assembly department, while originally on a 6-day 9-hour schedule, began a 6-day 8-hour schedule in March 1943. In July 1943 it went back to a 6-day 9-hour schedule. In October 1943 all women were put on a 10-hour day 5-day week or 50-hour schedule. In the spring of 1944 the production schedule of planes per month was increased, fabrication of nacelles was added to the departments studied, and there was a growing labor shortage in the area. Saturday work became necessary, and the men were placed on a 60-hour schedule. The women workers were asked to make an effort to work on Saturday, but their failure to report on Saturdays was not charged against lost time.

Weeks for study of each of the four differing hour schedules were chosen out of the period from May 1943 to May 1944. To allow the usual 2-month adjustment period to the 6-day 9-hour schedule prior to undertaking its study, the second-period weeks chosen had to be limited to 4, in contrast to the usual 6 to 8 weeks taken in other plants. To simplify comparisons, other periods studied were similarly reduced to 4 weeks. The fact that 48-hour and 60-hour periods chosen were in a season in which there was apt to be some hot weather had no bearing on attendance data, as the plant was completely air-conditioned. Using the company's records, care was taken to eliminate weeks of abnormal absenteeism. The hours worked in the periods under study were as follows:

| Period | Schedule |
|---|---|
| *1st period:* | |
| May–June 1943 (4 weeks)<br>8-hour day, 6-day 48-hour week | Day shift: 6:30 a.m.–3:12 p.m.<br>(42-minute lunch period)<br>Night shift: 4:42 p.m.–1:24 a.m.<br>(42-minute lunch period) |
| *2d period:* | |
| September 1943 (4 weeks)<br>9-hour day, 6-day 54-hour week | Day shift: 6:30 a.m.–4:12 p.m.<br>(42-minute lunch period)<br>Night shift: 4:42 p.m.–2:24 a.m.<br>(42-minute lunch period) |
| *3d period:* | |
| January-February 1944 (4 weeks)<br>10-hour day, 5-day 50-hour week | Day shift: 7 a.m.–5:42 p.m.<br>(42-minute lunch period)<br>Night shift: 5:42 p.m.-4:24 a.m.<br>(42-minute lunch period) |
| *4th period:* | |
| March–April–May 1944 (4 weeks)<br>Optional 6-day 60-hour week, 10-hour day | Same as in 3d period |

The wing center section assembly department employed 1,477 different women during the 4 weeks studied in each of the four periods. Reports of actual hours worked were copied for each woman. About 38 percent of the women—560—were studied further to determine the reasons for absence on specific dates. The purpose of all calls at the medical department during the periods studied were also listed for this group.

The number of women employed in any one period did not exceed 1,015, and in the first period, under the 48-hour schedule, the number was half this figure. One-fourth of the women were employed in all 4 periods studied, about one-fifth were employed in 3 periods, and the remainder were at work in only 1 or 2 periods.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD

The women studied were predominantly young women: 48 in every 100 were under 25 years of age, and only 3 percent were over 45 years of age. Most were or had been married; fewer than one-third were single. About seven-eighths lived in family households. The women came to the plant from two major cities, smaller cities, and rural areas as far as 40 miles away, traveling back and forth chiefly by private car.

The women workers visited in their homes worked on both day and night shifts and more than two-fifths of them had been employed in all 4 periods studied. Their educational record was high; one-half had completed high school or attended college, and less than a fifth had not gone beyond the eighth grade.

### HOME RESPONSIBILITIES

Seven-eighths of the women visited lived at home. Families composed of 2 or 3 members were predominant, but 30 percent of the households had 5, 6, or more members.

In large families the household labors were shared. For example, in one 40-year-old working mother's home, there were 10 members, the children varying in age from under 2 years to a married son. The mother said her husband and daughter of 12 shared with her the responsibility of the housework. Her husband did the marketing, and she did the cooking with the help of the boys, who also washed the dishes. She also did the family washing, her young daughters did the ironing. She did her housework during

the day, and worked in the factory on the night shift. In another family of 6 members, the oldest daughter helped her mother, who worked on the night shift, by caring for the baby and helping with the household tasks.

About a third of the mothers in families with 5 or more members said they did no household work. By contrast, practically all women with children in smaller households had general responsibility for the home and did a major part of the work. For example, Mrs. T, who had 2 sons, 10 and 13 years old, did all the household work for the family. Under the 10-hour-day schedule she worked on the night shift and went to bed when she got home at 5:30 in the morning. When she got up, she did a little housework and barely saw her boys before it was time to get ready for work. She was "on the run all the time." On the free Saturday she "washed, ironed, cleaned the house, and maybe baked a pie or cake for the kids." She just said "hello" and "goodbye" to her husband, who worked the day shift.

About two-thirds of the single women living in family households did some housework but, as a rule, did not have any major home responsibilities. Married women, widows, and divorcees, in seven-eighths or more households, did have home duties, about half having full responsibility and half sharing the responsibility with others.

In 9 percent of the homes with children under 14 years of age, children were cared for by paid service. However, relatives (other than husband or older children) were the main reliance for child care in the greatest number of homes. Nurseries were used by only 3 percent of the mothers; 6 percent of the households provided no child care at all during the mother's absence.

## TIME OF RISING AND OF RETIRING

The opening factory hour was 6:30 a. m. and 7 a. m. for the day shift in the several periods. While some women had to rise at 4 a. m., the larger number got up at 5 o'clock. The earlier rising hour was usually occasioned by distance between home and plant, a fourth of the women workers spending 1 to 2 hours each way in travel. Half the women workers interviewed required from 1/2 to 1 hour for each trip.

Women on the day shift, under the 8-hour-day schedule left the plant at 3:12 p. m. and the majority reached home before 4 o'clock. Under the 9-hour day, the hour of reaching home was advanced to 5 o'clock; under the 10-hour day to 6 o'clock for those requiring less than an hour for travel. Under the 8-hour-day schedule, the largest proportion, 64 percent, were absent from home 10 to 11 hours; under the 9-hour day, about two-thirds were away 11 to 12 hours; and under the 10-hour day two-thirds again, were away 12 to 13 hours. The one-fifth who lived farther away from the aircraft plant had correspondingly longer periods away from home.

In spite of the early rising hour, almost as many women workers did not get to bed until 10 p. m. or later as went to bed at an earlier hour. Regardless of the length of the workday, the largest proportion of day-shift workers had 7 hours of rest, although many reported shorter periods for sleep.

The night shift started at 4:42 p. m. under the 8- and 9-hour-day schedules and at 5:42 p. m. under the 10-hour schedule. Women left the plant at 1:24 a. m., 2:24 a. m., and 4:24 a. m. under the 8-, 9-, and 10-hour schedules, respectively. Under the 8-hour day women night-shift workers usually went to bed upon reaching home, some time between 2 and 3 o'clock; under the 9-hour schedule the retiring hour was usually after 3:30 a. m.; and under the 10-hour schedule, it was 5 a. m. to 11 a. m. The hour of rising varied greatly among night-shift workers in each period. Under each

schedule some women got up to have breakfast with the family at 7 or 8 o'clock. But the majority remained in bed until noon or later in the second and third periods. Under the 9- and 10-hour days, the proportion of women who slept 8 hours or more increased materially. There were, however, still 30 percent who worked 10 hours a day in the factory and who got less than 7 hours of sleep, as compared to 20 percent under the 9-hour day, and 14 percent under the 8-hour day.

### WORKERS' OVER-ALL DAY

With the lengthening of the workday, the over-all day from the time of rising until retiring increased for many workers. Under the 8-hour day, 5 percent had an over-all day of 18 hours to 20½ hours; under the 10-hour day, 9 percent had this long day. About 48 in every 100 kept their active hours to between 16 and 17 per day under the 8-hour factory schedule, but this proportion dropped to 40 in every 100 under the 10-hour day. A slightly larger proportion had less than 16 hours of active service under the 10-hour day than under the 8-hour day because they were "just too tired to stay up."

The statements of women concerning the 10-hour day shows that many considered it detrimental to their health. Even when they preferred 5 days of 10 hours to 6 days of 9 hours, they spoke of tiredness or illness. Some comments follow:

A young woman said:

> Ten-hour days allow very little time for anything but necessary small amounts of personal laundry, shampooing, hair setting, reading newspapers or magazines. But the extra day on the 5-day week more than made up for the lack of time during the week. I seemed to have more time on the 50-hour week than on the 48- or 54-hour week. [Nonetheless, this worker believed her fatigue was the result of months on a strenuous schedule and not being able to sleep well when on the 10-hour day.] I was so tired, I ached all over. The long hours—I couldn't stand it. I would be so exhausted when I got home, I would sit down and cry.

A housewife said:

> During the first and second periods when I worked 6 days a week, I did all my work at night so I could rest on Sunday. Sometimes I would work almost all night on Saturday in order to have Sunday free. When I had Saturday off, I would wash, iron, and clean the house and didn't have to work so hard during the week. I enjoyed having Saturday and Sunday off, even though the 8- and 9-hour day was better for recreation and pleasure. When I worked 10 hours a day, I had no leisure and no time to rest. By the time I get up and we have something to eat, it is time to go to work. When we worked 8 hours a day, we would go to swimming parties and skating parties after work and still get our sleep. On the 10-hour day if we did anything like that, we were cheating ourselves out of our rest.

Another informant said:

> When on the 8-hour day, I gained weight, but when I was on the 10-hour shift I lost weight and got headaches.

Said another woman:

> The extra hour or two from an 8-hour to a 9- or 10-hour day made a lot of difference. I was much more tired because I got so little sleep, as well as having to work harder. I was irritable and hard to get along with at home and with my friends.

During the first period, another informant said:

> I had time to go to shows or go out skating, dancing, and so forth. On a 10-hour day it was too late to go any place after work because the places were closed. On a 10-hour day I had time only to work, eat, and sleep. I was physically run down.

Four women, respectively, made the following comments:

> On the 10-hour day I have no time to cook dinners and have to eat out. Since I've been working 10 hours a day, I have had to go to a foot doctor once a month. I have been so tired on Saturday that I never got anything done anyway.
>
> There's no time on the 10-hour day to phone, shop, or market, but on the 8-hour day I could manage more easily. Certain parts of home responsibility require daily attention.
>
> The second period was the hardest to find any free time to do any shopping. I got more sleep in the third period because of the later starting hour.
>
> Although I had headaches, colds, and eye strain on the 10-hour shift, I preferred this shift because I had the week end for recreation and personal shopping and could go out on Saturdays.

## WORKERS' PREFERRED FACTORY HOURS

Women, in discussing the hours of work preferred, were asked to take into consideration the loss of overtime pay (time and a half after 8 hours per day and after 40 hours per week). Nevertheless, 39 in every 100 interviewed stated that they preferred the 8-hour day 5-day week. The 6-day week of 8-hour days was preferred by 24 percent. A few favored the 8-hour day with a half day on Saturday. Three in every hundred wished fewer hours per day than 8. A 9-hour day 5-day week was favored by 11 percent, the 9-hour day 6-day week by 1.6 percent, and the 10-hour day 5-day week was preferred by 18 percent. To summarize: almost two-thirds the women workers preferred the 8-hour day, 13 in every 100 the 9-hour day, and 18 in every 100 the 10-hour day. However, over seven-tenths wanted a 5-day week.

Among single women the 10-hour day was less popular than among married women, the 8-hour day being given overwhelming preference, however, by both groups. Over 25 percent of the single women interviewed preferred to work 6 days of 8 hours, as compared to 34 percent who asked for the 5-day week of 8 hours. Of the married women, 70 percent preferred an 8-hour day, whereas 17 percent preferred the 10-hour day. However, 85 percent of the married women wanted a 5-day week.

The number of widows and divorcees interviewed was small. However, a larger proportion among them than among single and married women wished the 10-hour day 5 days a week. This desire was occasioned by their complete dependence on their own earnings for family support.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### NATURE OF THE JOB

The wing center section assembly department studied was, as already noted, one of the largest riveting departments in the airframe assembly plant. The women workers were classified as general assemblers, riveters, installers, or spot welders. The preliminary jobs involved sheet-metal fabricating and laying out small subassemblies at benches, using a variety of hand tools. Typical of such jobs would be forming metal over a corking block, using a rawhide mallet; filing parts to remove burrs or for proper fit; drilling, reaming, and counter-sinking holes; fastening parts with Cleco clips; and inserting bolts and screws, using an electric screw driver. Small parts laid out in bench work were assembled into small and medium-sized jigs where they were fitted and clamped into proper position, drilled, reamed, countersunk, and riveted.

Large skins or panels, such as those in tank doors, and the lower and upper panels of the wing center section were riveted on a line-conveyer system. The panels were attached to an overhead track and were moved from one worker to another for a sequence of drilling and riveting operations. The first groups of workers stood on the floor and worked on the bottom half of the panel; progressively higher platforms served workers who riveted the upper half of the panel. Most of the work could, therefore, be done at waist level, and much of the work requiring kneeling and stretching was eliminated. On these open panel conveyor lines the workers were placed close together; massed straight riveting made greater speed possible, and the result was terrific noise—far greater than anywhere else in the department.

The major subassemblies, such as upper and lower skins, top deck, tank doors, and crawl deck, were moved to the master jigs for final assembly. This department had some of the plant's largest jigs, built to hold the wings in an upright or vertical position. The jigs were about 12 feet high; platforms were built around at different levels to enable as much work as possible to be done at waist level. The highest platforms were 5 feet off the floor. Even with platforms, there was much climbing, kneeling, stretching, and working in cramped quarters inside and outside the wings. Only occasionally was it possible to work while sitting. Most of the jobs involved continuous standing or working in different positions. Smaller women were selected for much of the work because of the necessity of working in such cramped quarters and in so many awkward positions.

After the wings had gone through all the positions on the master jigs, they were placed in a vertical position on a moving conveyor line for final installations and assembly. The line moved so slowly that it appeared to be standing still. A wooden platform, slightly raised from the floor, moved on a track from one station to another, and stands about 3 feet high were used for some of the work. However, much of the work on this line also involved working in very awkward positions, standing, kneeling, and crawling inside wings.

Women worked mainly on the lighter assemblies and installations on both the master jigs and moving conveyor lines. They used rivet guns, portable squeezer riveters, portable pneumatic and electric drills, air screw drivers, and small hand tools. Their work was chiefly composed of drilling, reaming, countersinking, riveting, and installing parts and equipment such as nut plates, channels, wing flap cylinders, landing gear struts, and so forth.

While women classed as riveters spent about three-fourths of their time on riveting, general assemblers also spent about one-fourth of their time on riveting. Riveters must develop speed, proper timing, and coordination to select the proper size rivet and feed it into a hole with one hand while driving the rivet gun with the other. Proper timing in driving different types of rivets is essential, as well as developing coordination with a partner who is bucking the rivets. Riveters and buckers work as a team and alternate positions. Riveters should be able to drive rivets with either the left or right hand because of the necessity of getting into so many cramped places. While the vibration and strains from riveting are felt mainly in the shoulder, forearm, hand, and wrist, bucking causes more vibration in the palm of the hand. The largest rivet gun used by the women weighed about 4 pounds, the average gun weighed 2 to 3 pounds. The average bucking bar weighed around 1 pound, and the heaviest 3 pounds.

There had been a series of improvements in production methods which removed many strains and lightened work. Overhead conveyors were in-

stalled, as already noted, to move medium sized and large subassemblies from one station to another; wooden platforms were built at various levels to enable workers to work at waist height on large subassemblies, eliminating much stretching and kneeling. Wings were set in vertical instead of horizontal jigs to minimize the amount of overhead drilling and riveting. Rivet guns, drills, and portable squeezer riveters, and automatic wrenches were counterbalanced wherever possible, taking much of the weight and strain off arm muscles. These and other improvements made work less strenuous in 1944 than in the previous year and also served to increase output.

The factory was new, and very modern in design. Blacked out, it had no windows, and all illumination came from fluorescent tubes and high-powered bulbs. With complete airconditioning the temperature was the same winter and summer. Ample space had been allowed in all work areas and aisles. The plant was kept exceptionally clean throughout; very few rivets, bolts, or metal shavings lay around the floor, even though these are constantly being dropped in large riveting departments, such as the one studied.

## ATTENDANCE RECORD

### Plant Definition of Lost Time

Throughout this study of 13 plants, all time away from work of more than 15 minutes duration is counted as time lost; time away up to 15 minutes is counted as lateness.

The foregoing classification is not to be confused with Plant G's use of the term "absenteeism." A person had to be absent an entire shift to be considered an absentee by the plant. A woman on vacation, or on other leave up to 60 days, authorized for good and sufficient reasons, was not absent by plant definition. Until the fall of 1944 when a 6-day limit was set, persons away without authorization were carried on the pay roll and counted as absentees for varying periods whose length was in the discretion of the department head. The union contract provided that an employee absent 5 days without reporting was a "quit." For the purposes of this study all persons who were continued on the pay roll after an absence of any duration were considered as having lost time. Persons were considered as transfers, quits, or lay-offs only when listed as terminated or transferred by the plant or when their names did not reappear on the pay roll in a later period under study, in which case the last day worked was taken as the termination date.

### Attendance

The first period studied had a schedule of 8 hours a day, 48 hours a week; the second, 9 hours a day, 54 a week; the third, 10 hours a day, 50 a week; and the fourth had a 10-hour day and a requested, but not compulsory, 6-day week. The last period is considered a 60-hour week in measuring attendance, in order to evaluate time lost under a noncompulsory 60-hour-week schedule. Weekly hours were recorded for each of the 1,477 women employed in the departments during the periods studied.

In assessing the influence of different hour schedules upon time lost, the several drives carried on by company officials to combat absenteeism should be noted. In January 1944 it became a rule to place an absenteeism card in a worker's clock card rack when the worker was absent a full day. This card listed 25 possible reasons for absence, one of which was checked by the worker upon returning. The card had to be signed by the foreman. In March 1944, the employee relations department sent investigators to the homes of absentees to ascertain why they were absent. Meetings were then

held with supervisors to develop solutions for such absences. These efforts may have influenced attendance during the last 2 periods included in this study. Later attempts to decrease absenteeism occurred after May 1944, the last month included in this survey.

Examination of table I shows that time lost increased as the daily hours were lengthened. Under the 8-hour day a total of 8.6 hours were lost per 100 possible man-hours of work; under a 9-hour day 12.4 hours; under the 10-hour day 5-day week, 15 hours; and under the 10-hour day 60-hour week, 19.4 hours.

Under the 8-hour day, 54 percent of the women lost some time during this 4-week period. The proportion increased to 71 percent when the daily hours were increased to 9 hours. When the daily hours were changed to 10 with no Saturday work, 68 percent of the women lost time. When Saturday work was requested, under the 60-hour schedule, 89 percent of the women employed worked less than 60 hours per week. In this fourth period, apparently, the extent to which women came to work on Saturday was dependent upon the amount of persuasion used by leadmen and supervisors. An examination of the pay rolls during the 6 weeks over which women were asked to work on Saturday shows the proportion who reported on the sixth day in each week:

1st week—25 percent
2d week—51 percent
3d week—21 percent
4th week—15 percent
5th week—46 percent
6th week—59 percent

Obviously, the 60-hour week was not desired by many women.

In the four periods under study women worked on 2 shifts, the number employed on each shift being approximately the same. Except during the 8-hour period, the night shift had a lower proportion of lost time in relation to possible working hours, and fewer women lost time than on the day shift.

How was this time lost? In each period some women workers lost 1 week or more. This long-term absence was taken by the largest proportion in the third period studied, or under the 10-hour day 50-hour week. During this period 17 percent were out a week or more, whereas 9 percent had long-term absences under the 9-hour day 54-hour week; 13 percent under the 10-hour day 60-hour week; and but 6 percent under the 8-hour day

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Shift — Plant G

| Period studied, scheduled hours, and shift | Total number of women studied | Women losing time | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|
| | | Number | Percent | |
| 1st period (8-48 hours) | 505 | 272 | 53.9 | 8.6 |
| Day shift | 232 | 120 | 51.7 | 7.3 |
| Night shift | 273 | 152 | 55.7 | 9.5 |
| 2d period (9-54 hours) | 919 | 653 | 71.1 | 12.4 |
| Day shift | 474 | 353 | 74.5 | 13.0 |
| Night shift | 445 | 300 | 67.4 | 11.8 |
| 3d period (10-50 hours) | 812 | 551 | 67.9 | 15.0 |
| Day shift | 404 | 279 | 69.1 | 16.2 |
| Night shift | 408 | 272 | 66.7 | 13.9 |
| 4th period (10-60 hours) | 1,015 | 901 | 88.8 | 19.4 |
| Day shift | 531 | 485 | 91.3 | 20.6 |
| Night shift | 484 | 416 | 86.0 | 18.0 |

Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Shift — Plant G

| Period studied, scheduled hours, and shift | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | Total number of women [1] | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— ½ day or less | Over ½ day and including 1 day | Over 1 day | Average hours worked per week in weeks attended |
| 1st period (8-48 hours): | | | | | | | | | | | | | |
| Number | 505 | 475 | 30 | 19 | 3 | 3 | 5 | 500 | 238 | 162 | 50 | 50 | 45.0 |
| Percent | 100.0 | 94.1 | 5.9 | 3.8 | 0.6 | 0.6 | 1.0 | 100.0 | 47.6 | 32.4 | 10.0 | 10.0 | ..... |
| Day shift: | | | | | | | | | | | | | |
| Number | 232 | 222 | 10 | 7 | 1 | ..... | 2 | 230 | 112 | 71 | 26 | 21 | 45.2 |
| Percent | 100.0 | 95.7 | 4.3 | 3.0 | 0.4 | ..... | 0.9 | 100.0 | 48.7 | 30.9 | 11.3 | 9.1 | ..... |
| Night shift: | | | | | | | | | | | | | |
| Number | 273 | 253 | 20 | 12 | 2 | 3 | 3 | 270 | 126 | 91 | 24 | 29 | 44.8 |
| Percent | 100.0 | 92.7 | 7.3 | 4.4 | 0.7 | 1.1 | 1.1 | 100.0 | 46.7 | 33.7 | 8.9 | 10.7 | ..... |
| 2d period (9-54 hours): | | | | | | | | | | | | | |
| Number | 919 | 834 | 85 | 54 | 16 | 9 | 6 | 913 | 285 | 291 | 178 | 159 | 48.7 |
| Percent | 100.0 | 90.8 | 9.2 | 5.9 | 1.7 | 1.0 | 0.7 | 100.0 | 31.2 | 31.9 | 19.5 | 17.4 | ..... |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day shift: | | | | | | | | | | | | | |
| Number | 474 | 432 | 42 | 24 | 9 | 6 | 3 | 471 | 128 | 165 | 91 | 87 | 48.1 |
| Percent | 100.0 | 91.1 | 8.9 | 5.1 | 1.9 | 1.3 | 0.6 | 100.0 | 27.2 | 35.0 | 19.3 | 18.5 | ..... |
| Night shift: | | | | | | | | | | | | | |
| Number | 445 | 402 | 43 | 30 | 7 | 3 | 3 | 442 | 157 | 126 | 87 | 72 | 49.2 |
| Percent | 100.0 | 90.3 | 9.7 | 6.7 | 1.6 | 0.7 | 0.7 | 100.0 | 35.5 | 28.5 | 19.7 | 16.3 | ..... |
| 3d period (10-50 hours): | | | | | | | | | | | | | |
| Number | 812 | 675 | 137 | 92 | 14 | 19 | 12 | 797 | 297 | 276 | 120 | 104 | 45.5 |
| Percent | 100.0 | 83.1 | 16.9 | 11.3 | 1.7 | 2.3 | 1.5 | 100.0 | 37.3 | 34.6 | 15.1 | 13.0 | ..... |
| Day shift: | | | | | | | | | | | | | |
| Number | 404 | 338 | 66 | 39 | 7 | 10 | 10 | 392 | 136 | 137 | 56 | 63 | 45.2 |
| Percent | 100.0 | 83.7 | 16.3 | 9.7 | 1.7 | 2.5 | 2.5 | 100.0 | 34.7 | 34.9 | 14.3 | 16.1 | ..... |
| Night shift: | | | | | | | | | | | | | |
| Number | 408 | 337 | 71 | 53 | 7 | 9 | 2 | 405 | 161 | 139 | 64 | 41 | 45.8 |
| Percent | 100.0 | 82.6 | 17.4 | 13.0 | 1.7 | 2.2 | 0.5 | 100.0 | 39.8 | 34.3 | 15.8 | 10.1 | ..... |
| 4th period (10-60 hours): | | | | | | | | | | | | | |
| Number | 1,015 | 884 | 131 | 74 | 50 | 3 | 4 | 1,006 | 129 | 294 | 248 | 335 | 50.5 |
| Percent | 100.0 | 87.1 | 12.9 | 7.3 | 4.9 | 0.3 | 0.4 | 100.0 | 12.8 | 29.2 | 24.7 | 33.3 | ..... |
| Day shift: | | | | | | | | | | | | | |
| Number | 531 | 462 | 69 | 35 | 29 | 2 | 3 | 526 | 50 | 149 | 135 | 192 | 49.8 |
| Percent | 100.0 | 87.0 | 13.0 | 6.6 | 5.5 | 0.4 | 0.6 | 100.0 | 9.5 | 28.3 | 25.7 | 36.5 | ..... |
| Night shift: | | | | | | | | | | | | | |
| Number | 484 | 422 | 62 | 39 | 21 | 1 | 1 | 480 | 79 | 145 | 113 | 143 | 51.2 |
| Percent | 100.0 | 87.2 | 12.8 | 8.1 | 4.3 | 0.2 | 0.2 | 100.0 | 16.5 | 30.2 | 23.5 | 29.8 | ..... |

[1] Totals are sometimes less than total number of women studied because some women were absent the total number of weeks they were on the pay roll in the period studied.

48-hour week. The same trend is shown when the comparison is confined to women who were on the pay roll the 4 weeks studied in each period, that is, when newcomers during the period were eliminated. As the period when absences were longest fell in January and February 1944 and the period when shortest, in July 1943, the cause was obviously not a desire for summer vacations.

During weeks in which women were in attendance at least part of the week, about half lost no time under the 8-hour day. This proportion was markedly decreased under the 9-hour schedule, when increasing proportions averaged over half a day and over a day out each week. While the record was not as bad under the 10-hour day 5-day week, this schedule did not achieve as good results as the 8-hour day. Under the noncompulsory 60-hour week, at no time did as many as 3 in 5 women work a 60-hour week, and in the 4-week period only an eighth worked 6 days each week.

The results achieved in terms of average hours worked during weeks worked were about the same, 45 and 45.5 hours per week, respectively, under the 48-hour schedule with an 8-hour day and under the 50-hour schedule with a 10-hour day. The 9-hour day 54-hour week raised the actual hours worked to 48.7 a week, and the noncompulsory 60-hour week brought the week to 50.5 hours. Under both the 54 and 60-hour weeks the record of time worked during weeks worked was higher on the night than on the day shifts.

When comparisons are made of the attendance of 122 women who worked during each week in all four periods studied, the same general tendencies are seen. The proportion who lost time increases as the weekly hours are lengthened. The average hours worked per week are somewhat higher for these steady workers than for all workers; 46.8, 51.4, 47.5, and 53.2 in the 48-, 54-, 50-, and 60-hour period, respectively.

### Pay Day in Relation to Attendance

In determining the influence of pay day on absenteeism, an absence of a day or less after pay day for any reason other than "medical pass" was considered an "absence following upon pay day." An extended absence occurring after pay day was not included.

The 48- and 54-hour periods were examined. In the 8-hour day, 48-hour-week period, pay day came on Friday. Only 16 percent of women workers lost time next day as compared to a total of 52 percent who lost some time during the period. Nor did all women take off the entire day. The time lost on the day after pay day accounted for but 7 percent of the total time women lost during the 4-week period.

Time lost on the day following pay day was still less in the second, or 9-hour-day period, when pay day was on Monday. Then only 10 percent of women workers were away next day, and such absence accounted for only 3 1/2 percent of total time lost.

The fact that family earnings were high in war-industry areas so that earnings permitted a supply of available cash for use when purchases were necessary, and the fact that supplies of household and personal goods were limited, may have accounted for this limited tendency of women war workers to wait until pay day to make purchases.

Viewed from many angles, the record of attendance was best under the 8-hour day 48-hour week. More women than in any other period worked in every week of the period. Fewer women lost as much as a week or more, and fewer lost over half a day a week. The 10-hour day 5-day week in-

creased the proportion of women who were absent, the length of the time lost during the week, and time lost in terms of weeks, and there was no gain over the 8-hour day 48-hour week in the weekly attendance record.

### Tardiness

The figures on lost time throughout these studies include tardiness only when it exceeded 15 minutes. As reported by the company under its definition, however, tardiness varied in average length from 11 minutes during the 8-hour-day period to 32.6 minutes during the 10-hour-day period. Between a fourth and a third of the women were considered tardy by the firm in each period. The percent of time lost through lateness was 0.6 percent in all periods save in the 50-hour week, when it reached 1 percent.

### Causes of Lost Time and Calls to Medical Department

Attempts were made by plant officials to secure accurate reporting by employees on the causes of each day's absence and to check absenteeism. Mention has been made of the absentee card system started in January 1944, and although the "no reports" on causes of absence decreased, failure to report reasons still were numerous.

As stated in the introduction, causes of absences were checked for 560 women, which represented a 38 percent sample of the 1,477 women employed in the periods studied.

In each period studied, illness or injury was the prevailing reason reported for absences. Illness or death in the family usually held second place, other personal reasons playing a lesser role. Vacations were important only in the third, a winter period. The study shows that when Saturday work was requested by management in the 60-hour period, over three-fourths of the women did not report on at least one Saturday in the 4 weeks studied, and that this failure to meet the firm's requests caused 44 percent of the hours lost during this period. The only differences that may be noted under different hour schedules are, (1) more time was lost because of unspecified "personal reasons" under the 10-hour day than were lost under the 8-hour day and (2) tardiness in excess of 15 minutes increased under the 10-hour day. It was noted incidentally that one difficulty in using pooled car services as a means of transportation was that a late driver caused the late arrival of the whole car of workers.

Drilling, riveting, and bucking rivets in the departments studied was too hard for some frail women workers. One 22-year-old girl said:

> Ten hours was a long time to hold those heavy motors over your head and drill. The vibration bothered me at my menstrual periods. For the first 2 or 3 days of my periods, I just couldn't do the work. I felt worse tacking rivets than drilling.

Another girl of 19 reported:

> My back bothers me. I have treatments all the time and believe the nature of the work and the long hours and the extra days have made me have many minor ailments.

A 40-year-old widow said:

> I got so nervous, I could not sleep. My doctor told me I couldn't continue the work I was doing for such long hours. I had nervous headaches for 10 days straight. They wouldn't transfer me, so I quit.

Another woman reported:

> After working several months on the 10-hour schedule, I got so overtired that I had a flare-up of thyroid trouble. I ate so irregularly on the 10-hour night schedule that I developed digestive disturbance.

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Table III. — Causes of Calls to Medical Department

| Causes of calls for medical aid | 1st period (8-48 hours) | | | | | |
|---|---|---|---|---|---|---|
| | Women | | Visits | | Women | |
| | Number | Percent | Number | Percent | Number | Percent |
| Total women | 173 | 100.0 | ..... | ..... | 307 | 100.0 |
| Women making no medical calls | 57 | 39.0 | ..... | ..... | 113 | 37.0 |
| Women making medical calls | 116 | 61.0 | 300 | ..... | 194 | 63.0 |
| Women reporting reasons for medical calls | [1]116 | ..... | 300 | 100.0 | [1]194 | ..... |
| Industrial causes | ..... | ..... | 242 | 80.7 | ..... | ..... |
| Cuts, abrasions, contusions: | | | | | | |
| Hands or arms | 81 | ..... | 190 | 63.3 | 137 | ..... |
| Feet or legs | 7 | ..... | 7 | 2.3 | 10 | ..... |
| Back | 1 | ..... | 1 | .3 | 2 | ..... |
| Head, face, eyes, neck | 5 | ..... | 6 | 2.0 | 5 | ..... |
| Sprains, strains, soreness: | | | | | | |
| Hands or arms | 3 | ..... | 3 | 1.0 | 9 | ..... |
| Feet or legs | 2 | ..... | 2 | .7 | 2 | ..... |
| Back | 4 | ..... | 5 | 1.7 | 3 | ..... |
| Burns—hands or arms | 1 | ..... | 1 | .3 | 2 | ..... |
| Foreign body: | | | | | | |
| In eyes | 17 | ..... | 19 | 6.3 | 23 | ..... |
| In hands or arms | 4 | ..... | 5 | 1.7 | 9 | ..... |
| In feet or legs | 1 | ..... | 1 | .3 | 2 | ..... |
| Skin irritation: | | | | | | |
| Hands or arms | 2 | ..... | 2 | .7 | 1 | ..... |
| Feet or legs | ..... | ..... | ..... | ..... | 1 | ..... |
| Face | ..... | ..... | ..... | ..... | 1 | ..... |
| Nervous, faint | ..... | ..... | ..... | ..... | ..... | ..... |
| Nonindustrial causes | ..... | ..... | 58 | 19.3 | ..... | ..... |
| Cold (including sore throat and related ailments) | 16 | ..... | 19 | 6.3 | 24 | ..... |
| Dysmenorrhea | 3 | ..... | 3 | 1.0 | 6 | ..... |
| Headache | 12 | ..... | 12 | 4.0 | 13 | ..... |
| Gastro-intestinal | 2 | ..... | 2 | .7 | 14 | ..... |
| Other | 18 | ..... | 22 | 7.3 | 40 | ..... |

[1] Details add to more than totals because some women made medical calls for more than one illness or injury.

And another said:

I don't believe I would have had that strep throat if I had not been exhausted from the 60-hour week.

One young woman admitted:

Sometimes I am absent to be with my fiance, sometimes I am sick, and sometimes I am too tired to work.

Firm reports on causes of separation, as well as individual reports from women not now employed with the firm, indicate that a "nervous condition" induced or aggravated by the noise and vibration of riveting was responsible for a number of visits to private practitioners and for transfers and separations. "Nervous condition" probably accounts for some of the absence reported as illness.

The proportion of the women workers in the wing center section assembly department reporting to the medical office for assistance varied only slightly under different hour schedules. The calls per person average over 2 but less than 3 during each period.

Under Different Scheduled Hours — Plant G

| 2d period (9-54 hours) | | 3d period (10-50 hours) | | | | 4th period (10-60 hours) | | | |
|---|---|---|---|---|---|---|---|---|---|
| Visits | | Women | | Visits | | Women | | Visits | |
| Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| ..... | ..... | 272 | 100.0 | ..... | ..... | 338 | 100.0 | ..... | ..... |
| ..... | ..... | 95 | 35.0 | ..... | ..... | 132 | 40.0 | ..... | ..... |
| 437 | ..... | 177 | 65.0 | 459 | ..... | 206 | 60.0 | 455 | ..... |
| 437 | 100.0 | [1]177 | ..... | 459 | 100.0 | [1]206 | ..... | 455 | 100.0 |
| 327 | 74.8 | ..... | ..... | 346 | 75.4 | ..... | ..... | 342 | 75.2 |
| 234 | 53.5 | 119 | ..... | 253 | 55.1 | 131 | ..... | 241 | 53.0 |
| 20 | 4.6 | 9 | ..... | 11 | 2.4 | 8 | ..... | 10 | 2.2 |
| 3 | .7 | 1 | ..... | 1 | .2 | ..... | ..... | ..... | ..... |
| 5 | 1.1 | 9 | ..... | 11 | 2.4 | 5 | ..... | 8 | 1.8 |
| 11 | 2.5 | 10 | ..... | 13 | 2.8 | 6 | ..... | 6 | 1.3 |
| 2 | .5 | ..... | ..... | ..... | ..... | 1 | ..... | 1 | .2 |
| 5 | 1.1 | 2 | ..... | 3 | .7 | 3 | ..... | 3 | .7 |
| 4 | .9 | 3 | ..... | 4 | .9 | 7 | ..... | 13 | 2.9 |
| 27 | 6.2 | 17 | ..... | 22 | 4.8 | 28 | ..... | 34 | 7.5 |
| 10 | 2.3 | 18 | ..... | 19 | 4.1 | 15 | ..... | 19 | 4.2 |
| 2 | .5 | 1 | ..... | 1 | .2 | ..... | ..... | ..... | ..... |
| 2 | .5 | 3 | ..... | 3 | .7 | 5 | ..... | 6 | 1.3 |
| 1 | .2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 1 | .2 | 2 | ..... | 3 | .7 | 1 | ..... | 1 | .2 |
| ..... | ..... | 2 | ..... | 2 | .4 | ..... | ..... | ..... | ..... |
| 110 | 25.2 | ..... | ..... | 113 | 24.6 | ..... | ..... | 113 | 24.8 |
| 29 | 6.6 | 28 | ..... | 31 | 6.8 | 26 | ..... | 28 | 6.2 |
| 6 | 1.4 | 6 | ..... | 6 | 1.3 | 10 | ..... | 10 | 2.2 |
| 14 | 3.2 | 11 | ..... | 11 | 2.4 | 13 | ..... | 13 | 2.9 |
| 14 | 3.2 | 10 | ..... | 12 | 2.6 | 9 | ..... | 12 | 2.6 |
| 47 | 10.8 | 33 | ..... | 53 | 11.5 | 41 | ..... | 50 | 11.0 |

Three-fourths or more of the calls for medical assistance were occasioned by injuries occurring in the plant. Cuts, abrasions, and contusions on hands or arms were responsible for more than half the calls. Foreign bodies in eyes accounted for approximately 6 percent of the calls.

### Attendance in Relation to Personal Characteristics

Records of age, race, marital status, number of children or other dependents in the home, were available for over four-fifths, or 1,237 of the 1,477 women employed in the four periods under study, and attendance was reviewed in relation to these factors to determine their influence upon the amount of time away from work.

*Age.*—In each of the first three periods the proportion of women losing time was highest among girls under 25 years of age and lowest among women 45 years of age and over. In the latter group about 38 percent lost time under a 48-hour schedule and 44 percent under the 50-hour schedule compared to 63 percent and 74 percent, respectively, of girls under 25 years

Table IV. — Causes of Lost Time Under Different Scheduled Hours — Plant G

| Causes of absence | 1st period (8-48 hours) | | | |
|---|---|---|---|---|
| | Women losing time | Absences | Total hours lost | Women losing time |
| | Number | Number | Percent | Number |
| Total women losing time | 101 | 177 | ..... | 230 |
| Total reporting causes | [2] 59 | [2] 119 | 100.0 | [2] 130 |
| Personal: | | | | |
| Illness or injury | 49 | 72 | 80.9 | 135 |
| Industrial illness or injury | ..... | ..... | ..... | 2 |
| Medical or dental services | 1 | 1 | .3 | 10 |
| Vacation | 3 | 3 | 5.8 | 5 |
| Personal reasons | 6 | 7 | 3.2 | 24 |
| Family: | | | | |
| Illness or death in family | 12 | 13 | 8.3 | 16 |
| To be with spouse or other family member in service | 1 | 2 | 1.0 | 2 |
| Child care | ..... | ..... | ..... | 7 |
| Miscellaneous: | | | | |
| Transportation | ..... | ..... | ..... | 1 |
| Weather | ..... | ..... | ..... | ..... |
| Military necessity | ..... | ..... | ..... | ..... |
| Disciplinary lay-off | ..... | ..... | ..... | ..... |
| Lateness (over 15 minutes) | 18 | 27 | .4 | 52 |

[1] Saturday absences were excluded for the 10-60-hour period because Saturday work was not compulsory.
[2] Details add to more than totals because some women report more than one cause of absence.

of age. The in-between age group, women 25 to 45 years of age, occupied an intermediate position, 50 percent and 63 percent losing time under the 8-hour day 6-day week and 10-hour day 5-day week, respectively. For each age group the proportion losing time was larger under the 9-hour day 6-day week of 54 hours than under the 8-hour day 48-hour week, and still larger when the 10-hour day 6-day week was in effect.

*Marital Status.*—When marital status is considered, the proportion of single girls who lost time was smaller than the proportion of married women or of widows and divorcees who lost time. Considering single women alone, during the first three periods a larger percent of those under 25 years of age were absent than of those 25 to 45 years old. (Very few single women over 45 years of age were employed.) Young married women were more frequently away from work than mature married women. The same was true of the widowed and divorced women—the younger were absent more often. The single women aged 25 to 45 years were the most regular in attendance under each hour schedule.

These 25-to-45-year-old single women also worked longer hours in each of the first three periods than did other groups of women, save a small group of widows aged 45 years and over. Under the 48-hour schedule, these women averaged 45.5 hours; under the 50-hour schedule, 45.8 hours; under the 54-hour schedule, 50.9 hours; and under the 60-hour schedule, 49.1 hours. Save in the noncompulsory 60-hour period, the hours they worked each period represented 90 to 95 percent of the scheduled hours.

| 2d period (9-54 hours) | | 3d period (10-50 hours) | | | 4th period (10-60 hours)[1] | | |
|---|---|---|---|---|---|---|---|
| Absences | Total hours lost | Women losing time | Absences | Total hours lost | Women losing time | Absences | Total hours lost |
| Number | Percent | Number | Number | Percent | Number | Number | Percent |
| 491 | ..... | 183 | 365 | ..... | 238 | 453 | ..... |
| [2] 336 | 100.0 | [2] 124 | [2] 273 | 100.0 | [2] 151 | 344 | 100.0 |
| 197 | 68.0 | 105 | 142 | 62.8 | 125 | 167 | 75.4 |
| 3 | .6 | 3 | 3 | 1.0 | 3 | 3 | 1.6 |
| 10 | 2.2 | 5 | 5 | 1.2 | 4 | 4 | .8 |
| 5 | 4.6 | 20 | 20 | 14.6 | 5 | 5 | 3.5 |
| 27 | 7.8 | 26 | 30 | 9.2 | 30 | 36 | 9.6 |
| 19 | 10.4 | 12 | 13 | 7.2 | 15 | 15 | 4.3 |
| 2 | 2.2 | 1 | 1 | 1.5 | 5 | 5 | .7 |
| 9 | 3.4 | 2 | 2 | .7 | 4 | 4 | 2.0 |
| 1 | .2 | 4 | 5 | .7 | 3 | 3 | .4 |
| ..... | ..... | 1 | 1 | .1 | 1 | 1 | .1 |
| ..... | ..... | ..... | ..... | ..... | 1 | 1 | .4 |
| ..... | ..... | ..... | ..... | ..... | 1 | 1 | .1 |
| 80 | .6 | 50 | 70 | 1.0 | 59 | 102 | 1.1 |

Significant, because they form the largest group of women employed in the department, is the record of married women of the same age group (25 to 45 years): under the 48-hour week, they averaged 43.6 hours; under the 50-hour week, 41.7 hours; under the 54-hour week, 46.1 hours; and under the 60-hour week, 46.6; i.e., they worked 90, 83, 85, and 78 percent respectively of possible man-hours.

The single women under 25 years of age formed the second largest group. These were present 91 percent of the time under the 48-hour week, 90 percent under the 54-hour week, 87 percent under the 50-hour week, and 84 percent under the 60-hour noncompulsory week.

An analysis of time lost by shift worked shows that under the 50-, 54-, and 60-hour week single women lost less time on the night shift than on the day shift. There was no uniformity, however, among married women in this respect, either in the proportion who lost time on the day shift as compared to the night shift, or in the hours worked on each shift; for under the 8-hour day and under the 10-hour day 50-hour week, fewer married women lost time on the day shift, whereas under the 9-hour day and under the 10-hour day 60-hour week, the reverse conditions prevailed.

*Number of Dependents.*—Two-fifths of the women employed in the wing center section assembly department had dependent children in their households, and seven in every hundred had elderly or invalided family members dependent upon them, making a total of 48 in every 100 women employed who had dependents. Of this group 36 were married women, 7 were widowed

## Table V. — Number of Women Losing Time and Their Ratio to Total Women Reported, and Average Hours Worked per Week During Weeks in Attendance, Under Different Scheduled Hours, by Marital Status and Age — Plant G

| Period studied and scheduled hours | Total | | | | Single | | | | Married | | | | Widowed and divorced | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Age | | | Total | Age | | | Total | Age | | | Total | Age | | |
| | | Under 25 | 25, under 45 | 45 and over | | Under 25 | 25, under 45 | 45 and over | | Under 25 | 25, under 45 | 45 and over | | Under 25 | 25, under 45 | 45 and over |
| Total women reported | 1,237 | 590 | 610 | 37 | 399 | 322 | 75 | 2 | 722 | 244 | 453 | 25 | 116 | 24 | 82 | 10 |
| Percent | 100.0 | 47.7 | 49.3 | 3.0 | 32.3 | 26.0 | 6.1 | 0.2 | 58.4 | 19.7 | 36.6 | 2.0 | 9.4 | 1.9 | 6.6 | 0.8 |
| *Number of women losing time and their ratio to total women reported* | | | | | | | | | | | | | | | | |
| 1st period (8-48 hours): | | | | | | | | | | | | | | | | |
| Number of women losing time | 235 | 107 | 120 | 8 | 74 | 59 | 15 | ..... | 132 | 43 | 84 | 5 | 29 | 5 | 21 | 3 |
| Ratio to total women | 54.3 | 62.9 | 49.6 | 38.1 | 49.3 | 55.7 | 35.7 | ..... | 56.9 | 74.1 | 51.5 | 45.5 | 56.9 | 83.3 | 56.8 | ..... |
| 2d period (9-54 hours): | | | | | | | | | | | | | | | | |
| Number of women losing time | 585 | 288 | 281 | 16 | 179 | 151 | 27 | 1 | 342 | 122 | 209 | 11 | 64 | 15 | 45 | 4 |
| Ratio to total women | 70.2 | 73.3 | 67.9 | 61.5 | 63.5 | 68.0 | 46.6 | ..... | 73.9 | 79.7 | 71.3 | 64.7 | 72.7 | 83.3 | 71.4 | ..... |
| 3d period (10-50 hours): | | | | | | | | | | | | | | | | |
| Number of women losing time | 498 | 244 | 243 | 11 | 165 | 143 | 21 | 1 | 282 | 89 | 184 | 9 | 51 | 12 | 38 | 1 |
| Ratio to total women | 67.1 | 74.4 | 62.5 | 44.0 | 63.2 | 69.8 | 38.9 | ..... | 70.1 | 80.9 | 66.7 | 56.3 | 64.6 | 92.3 | 64.4 | ..... |
| 4th period (10-60 hours): | | | | | | | | | | | | | | | | |
| Number of women losing time | 763 | 355 | 385 | 23 | 250 | 200 | 48 | 2 | 433 | 142 | 277 | 14 | 80 | 13 | 60 | 7 |
| Ratio to total women | 89.1 | 89.9 | 88.1 | 95.8 | 85.6 | 85.1 | 87.3 | ..... | 90.6 | 96.6 | 87.7 | 93.3 | 93.0 | 100.0 | 90.9 | ..... |
| *Number of women in attendance and average hours worked per week during weeks in attendance* | | | | | | | | | | | | | | | | |
| 1st period (8-48 hours): | | | | | | | | | | | | | | | | |
| Number of women in attendance | 433 | 170 | 242 | 21 | 150 | 106 | 42 | 2 | 232 | 58 | 163 | 11 | 51 | 6 | 37 | 8 |
| Average weekly hours worked | 43.5 | 42.9 | 43.9 | 43.7 | 44.3 | 43.8 | 45.5 | ..... | 43.2 | 40.9 | 43.6 | 43.7 | 43.5 | 45.5 | 43.3 | ..... |
| 2d period (9-54 hours): | | | | | | | | | | | | | | | | |
| Number of women in attendance | 833 | 393 | 414 | 26 | 282 | 222 | 58 | 2 | 463 | 153 | 293 | 17 | 88 | 18 | 63 | 7 |
| Average weekly hours worked | 47.0 | 46.9 | 46.8 | 49.5 | 49.1 | 48.6 | 50.9 | ..... | 45.8 | 44.8 | 46.1 | 50.7 | 46.0 | 44.2 | 46.6 | ..... |
| 3d period (10-50 hours): | | | | | | | | | | | | | | | | |
| Number of women in attendance | 742 | 328 | 389 | 25 | 261 | 205 | 54 | 2 | 402 | 110 | 276 | 16 | 79 | 13 | 59 | 7 |
| Average weekly hours worked | 42.5 | 42.3 | 42.4 | 45.0 | 44.1 | 43.6 | 45.8 | ..... | 41.4 | 40.5 | 41.7 | 43.2 | 42.3 | 37.5 | 42.5 | ..... |
| 4th period (10-60 hours): | | | | | | | | | | | | | | | | |
| Number of women in attendance | 856 | 395 | 437 | 24 | 292 | 235 | 55 | 2 | 478 | 147 | 316 | 15 | 86 | 13 | 66 | 7 |
| Average weekly hours worked | 47.9 | 48.3 | 47.5 | 46.8 | 50.0 | 50.3 | 49.1 | ..... | 46.2 | 45.6 | 46.6 | 43.9 | 49.8 | 43.6 | 50.5 | ..... |

and divorced, and 5 were single women. A higher proportion of women with children lost time than did women with no dependents. Similarly, women with children lost an hour and 40 minutes more per week under the 50-, 54-, and 60-hour schedules than all women without dependents, and a half hour more per week under the 48-hour schedule than did women workers with no dependents. Older dependents, apparently, did not make undue demands upon women workers as judged by the proportion of women who lost time.

When comparing average weekly hours of married women only, those with children did not average fewer hours when at work than those with no dependents. But a higher proportion of married women with children lost some time under the 9- or 10-hour day than did married women without children. There is no question that the 8-hour day 48-hour week was the most convenient schedule provided for married women with children. Not only did a much smaller proportion lose time, under that schedule, but the lost time was shorter. Thus, under the 8-hour day 48-hour week, married women with children worked 90 percent of the scheduled hours, as compared with 82 percent under the 10-hour day 50-hour week, and 85 percent under the 9-hour day 54-hour week.

*Race.*—From 9 to 14 percent of the women employed in different periods in the wing section assembly department were Negroes. Table VII indicates that there was very little difference between races in the proportion losing one week or more in any period. During the weeks in which they reported for work the proportion of white women who lost no time exceeded the proportion of Negro women who had no lost time. This came about through the loss of a half day or less by a larger proportion of Negro women.

### Plant Efforts to Reduce Absenteeism

In spite of company efforts to curtail lost time, it is obvious that it continued at a high rate. In June 1944, production was stabilized at 13 planes a day. For the first time it was possible to plan systematic production to achieve an even flow of work with a minimum of idle time. More workers could be assigned to one particular job, which pleased many women who disliked being shifted about. Supervisors had more time to keep in touch with individual worker's problems. More attention was given to evaluating attendance records before granting merit raises. Chronic absentees were more readily laid off. The constant influx of new workers, characteristic of an expanding production schedule, was no longer necessary.

At the time production was stabilized, a special plant-wide absenteeism drive started, and a trophy awarded each week to the department with best attendance. This competitive drive and the stabilization of production were credited with the reduction in absenteeism, as defined by the plant, by more than half, in the departments under study. As June 1944 was beyond the periods under study in this report, no measurement of these changes in lost time are included in this report.

Table VI. — Number of Women Losing Time and Their Ratio to Total Women Reported, and Average Hours Worked per Week During Weeks in Attendance, Under Different Scheduled Hours, by Marital Status and Dependents — Plant G

| Period studied and scheduled hours | Total women all statuses | | | | | Single | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Number having no dependents | Number having dependents | Number having dependents who are— | | Total | Number having no dependents | Number having dependents |
| | | | | Children | Other than children | | | |
| Total women reported | 1,230 | 646 | 584 | 506 | 78 | 395 | 338 | 57 |
| Percent | 100.0 | 52.5 | 47.5 | 41.1 | 6.4 | 32.1 | 27.5 | 4.6 |
| *Number of women losing time and their ratio to total women reported* | | | | | | | | |
| 1st period (8-48 hours): | | | | | | | | |
| Number of women losing time | 232 | 119 | 113 | 91 | 22 | 73 | 59 | 14 |
| Ratio to total women | 54.2 | 52.2 | 56.5 | 56.5 | 56.4 | 49.7 | 48.8 | 53.8 |
| 2d period (9-54 hours): | | | | | | | | |
| Number of women losing time | 582 | 305 | 277 | 247 | 30 | 178 | 163 | 15 |
| Ratio to total women | 70.5 | 69.5 | 71.6 | 73.1 | 61.2 | 64.0 | 66.8 | 44.1 |
| 3d period (10-50 hours): | | | | | | | | |
| Number of women losing time | 494 | 251 | 243 | 213 | 30 | 163 | 139 | 24 |
| Ratio to total women | 67.2 | 65.7 | 68.8 | 71.7 | 53.6 | 63.4 | 64.4 | 58.5 |
| 4th period (10-60 hours): | | | | | | | | |
| Number of women losing time | 756 | 373 | 383 | 327 | 56 | 246 | 207 | 39 |
| Ratio to total women | 89.0 | 86.5 | 91.6 | 92.4 | 87.5 | 85.4 | 85.2 | 86.7 |
| *Number of women in attendance and average hours worked per week during weeks in attendance* | | | | | | | | |
| 1st period (8-48 hours): | | | | | | | | |
| Number of women in attendance | 428 | 228 | 200 | 161 | 39 | 147 | 121 | 26 |
| Average weekly hours worked | 43.6 | 43.7 | 43.3 | 43.2 | 43.8 | 44.3 | 44.9 | 41.2 |
| 2d period (9-54 hours): | | | | | | | | |
| Number of women in attendance | 826 | 439 | 387 | 338 | 49 | 278 | 244 | 34 |
| Average weekly hours worked | 46.9 | 47.6 | 46.1 | 46.0 | 46.9 | 49.0 | 49.0 | 49.0 |
| 3d period (10-50 hours): | | | | | | | | |
| Number of women in attendance | 735 | 382 | 353 | 297 | 56 | 257 | 216 | 41 |
| Average weekly hours worked | 42.5 | 43.1 | 41.8 | 41.4 | 44.5 | 44.0 | 44.1 | 43.6 |
| 4th period (10-60 hours): | | | | | | | | |
| Number of women in attendance | 849 | 431 | 418 | 354 | 64 | 288 | 243 | 45 |
| Average weekly hours worked | 47.9 | 48.6 | 47.2 | 46.9 | 48.9 | 50.2 | 50.5 | 48.9 |

| Period studied and scheduled hours | Married | | | | | Widowed and divorced | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Number having no dependents | Number having dependents | Number having dependents who are— | | Total | Number having no dependents | Number having dependents | Number having dependents who are— | |
| | | | | Children | Other than children | | | | Children | Other than children |
| Total women reported | 719 | 277 | 442 | 415 | 27 | 116 | 31 | 85 | 81 | 4 |
| Percent | 58.5 | 22.5 | 35.9 | 33.7 | 2.2 | 9.4 | 2.5 | 6.9 | 6.6 | 0.3 |
| *Number of women losing time and their ratio to total women reported* | | | | | | | | | | |
| 1st period (8-48 hours): | | | | | | | | | | |
| Number of women losing time | 130 | 53 | 77 | 66 | 11 | 29 | 7 | 22 | 21 | 1 |
| Ratio to total women | 56.5 | 56.4 | 56.6 | 54.1 | 78.6 | 56.9 | 53.8 | 57.9 | 60.0 | ..... |
| 2d period (9-54 hours): | | | | | | | | | | |
| Number of women losing time | 340 | 126 | 214 | 199 | 15 | 64 | 16 | 48 | 46 | 2 |
| Ratio to total women | 73.9 | 72.8 | 74.6 | 73.4 | 93.8 | 72.7 | 72.7 | 72.7 | 74.2 | ..... |
| 3d period (10-50 hours): | | | | | | | | | | |
| Number of women losing time | 280 | 97 | 183 | 174 | 9 | 51 | 15 | 36 | 34 | 2 |
| Ratio to total women | 70.2 | 66.4 | 72.3 | 73.7 | 52.9 | 64.6 | 75.0 | 61.0 | 61.8 | ..... |
| 4th period (10-60 hours): | | | | | | | | | | |
| Number of women losing time | 430 | 149 | 281 | 264 | 17 | 80 | 17 | 63 | 60 | 3 |
| Ratio to total women | 90.5 | 88.7 | 91.5 | 92.0 | 85.0 | 93.0 | 85.0 | 95.5 | 96.8 | ..... |
| *Number of women in attendance and average hours worked per week during weeks in attendance* | | | | | | | | | | |
| 1st period (8-48 hours): | | | | | | | | | | |
| Number of women in attendance | 230 | 94 | 136 | 122 | 14 | 51 | 13 | 38 | 35 | 3 |
| Average weekly hours worked | 43.1 | 43.0 | 43.2 | 43.5 | 40.5 | 43.5 | 37.0 | 45.3 | 45.2 | ..... |
| 2d period (9-54 hours): | | | | | | | | | | |
| Number of women in attendance | 460 | 173 | 287 | 271 | 16 | 88 | 22 | 66 | 62 | 4 |
| Average weekly hours worked | 45.8 | 45.8 | 45.8 | 45.9 | 43.3 | 46.0 | 46.1 | 46.0 | 45.9 | ..... |
| 3d period (10-50 hours): | | | | | | | | | | |
| Number of women in attendance | 399 | 146 | 253 | 236 | 17 | 79 | 20 | 59 | 55 | 4 |
| Average weekly hours worked | 41.5 | 41.8 | 41.4 | 41.1 | 44.7 | 42.3 | 41.6 | 42.6 | 42.2 | ..... |
| 4th period (10-60 hours): | | | | | | | | | | |
| Number of women in attendance | 475 | 168 | 307 | 287 | 20 | 86 | 20 | 66 | 62 | 4 |
| Average weekly hours worked | 46.2 | 46.0 | 46.4 | 46.4 | 46.4 | 49.8 | 48.7 | 50.1 | 49.9 | ..... |

Table VII. — Analysis of Time Lost by Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Race — Plant G

| Period studied, scheduled hours, and race | Total number of women | Number working all or part of each week employed | Number who lost a week or more | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | Total number of women | Number with no time lost in weeks attended | Number of women whose average time lost per week in weeks attended was— ½ day or less | Over ½ day and including 1 day | Over 1 day | Average hours worked per week in weeks attended |
| 1st period (8-48 hours): | | | | | | | | | | | | | |
| Total women | 505 | 475 | 30 | 19 | 3 | 3 | 5 | 500 | 238 | 162 | 50 | 50 | 45.0 |
| Percent | 100.0 | 94.1 | 5.9 | 3.8 | 0.6 | 0.6 | 1.0 | 100.0 | 47.6 | 32.4 | 10.0 | 10.0 | ..... |
| White: Number | 433 | 410 | 23 | 15 | 3 | 2 | 3 | 430 | 206 | 136 | 43 | 45 | 44.8 |
| Percent | 100.0 | 94.7 | 5.3 | 3.5 | 0.7 | 0.5 | 0.7 | 100.0 | 47.9 | 31.6 | 10.0 | 10.5 | ..... |
| Negro: Number | 72 | 65 | 7 | 4 | ..... | 1 | 2 | 70 | 32 | 26 | 7 | 5 | 45.9 |
| Percent | 100.0 | 90.3 | 9.7 | 5.6 | ..... | 1.4 | 2.8 | 100.0 | 45.7 | 37.1 | 10.0 | 7.1 | ..... |
| 2d period (9-54 hours): | | | | | | | | | | | | | |
| Total women | 919 | 834 | 85 | 54 | 16 | 9 | 6 | 913 | 285 | 291 | 178 | 159 | 48.7 |
| Percent | 100.0 | 90.8 | 9.2 | 5.9 | 1.7 | 1.0 | 0.7 | 100.0 | 31.2 | 31.9 | 19.5 | 17.4 | ..... |
| White: Number | 835 | 757 | 78 | 50 | 13 | 9 | 6 | 829 | 266 | 256 | 163 | 144 | 48.6 |
| Percent | 100.0 | 90.7 | 9.3 | 6.0 | 1.6 | 1.1 | 0.7 | 100.0 | 32.1 | 30.9 | 19.7 | 17.4 | ..... |
| Negro: Number | 84 | 77 | 7 | 4 | 3 | ..... | ..... | 84 | 19 | 35 | 15 | 15 | 48.8 |
| Percent | 100.0 | 91.7 | 8.3 | 4.8 | 3.6 | ..... | ..... | 100.0 | 22.6 | 41.7 | 17.9 | 17.9 | ..... |
| 3d period (10-50 hours): | | | | | | | | | | | | | |
| Total women | 812 | 675 | 137 | 92 | 14 | 19 | 12 | 797 | 297 | 276 | 120 | 104 | 45.5 |
| Percent | 100.0 | 83.1 | 16.9 | 11.3 | 1.7 | 2.3 | 1.5 | 100.0 | 37.3 | 34.6 | 15.1 | 13.0 | ..... |
| White: Number | 719 | 598 | 121 | 83 | 12 | 16 | 10 | 707 | 270 | 240 | 105 | 92 | 45.6 |
| Percent | 100.0 | 83.2 | 16.8 | 11.5 | 1.7 | 2.2 | 1.4 | 100.0 | 38.2 | 33.9 | 14.9 | 13.0 | ..... |
| Negro: Number | 93 | 77 | 16 | 9 | 2 | 3 | 2 | 90 | 27 | 36 | 15 | 12 | 44.9 |
| Percent | 100.0 | 82.8 | 17.2 | 9.7 | 2.2 | 3.2 | 2.2 | 100.0 | 30.0 | 40.0 | 16.7 | 13.3 | ..... |
| 4th period (10-60 hours): | | | | | | | | | | | | | |
| Total women | 1,015 | 884 | 131 | 74 | 50 | 3 | 4 | 1,006 | 129 | 294 | 248 | 335 | 50.5 |
| Percent | 100.0 | 87.1 | 12.9 | 7.3 | 4.9 | 0.3 | 0.4 | 100.0 | 12.8 | 29.2 | 24.7 | 33.3 | ..... |
| White: Number | 864 | 752 | 112 | 64 | 43 | 2 | 3 | 857 | 118 | 257 | 212 | 270 | 50.8 |
| Percent | 100.0 | 87.0 | 13.0 | 7.4 | 5.0 | 0.2 | 0.3 | 100.0 | 13.8 | 30.0 | 24.7 | 31.5 | ..... |
| Negro: Number | 151 | 132 | 19 | 10 | 7 | 1 | 1 | 149 | 11 | 37 | 36 | 65 | 48.3 |
| Percent | 100.0 | 87.4 | 12.6 | 6.6 | 4.6 | 0.7 | 0.7 | 100.0 | 7.4 | 24.8 | 24.2 | 43.6 | ..... |

# LIGHT MACHINE OPERATORS, BENCH ASSEMBLERS, AND INSPECTORS — PLANTS H AND J

## INTRODUCTION

Plants H and J are located in New England manufacturing cities. Plant H manufactured roller, silent, and conveyor chains for use primarily on automobiles, tractors, engines, textile and other machinery, and conveyor lines. Plant J produced electrical equipment—cords, sockets, wall plates, and a wide variety of electrical connections—for airplanes, tanks, ships, antiaircraft guns, etc.

Although the products of Plant H were heavier than those of Plant J, the jobs performed by women in the departments studied were similar. The work in both plants included light machining of small parts on single-spindle drill presses, the use of foot and power presses, various types of assembly operations, and visual and gage inspection. All tasks were readily learned in a short time. They required coordination of eye and hand, finger dexterity, and speedy movement.

Some similarity also existed in the composition of the work force in the two plants. The proportion of women 35 years and over was large—42 percent of all women in one plant and 57 percent in the other. The proportion of girls under 20 years of age was limited to 7 and 10 percent, respectively. Both plants had a nucleus of foreign-born workers. One plant had employed 13 percent of the women studied 5 years or longer; in the second plant, 22 percent had this length of service.

With the increased demands for war production and a shortage of available new workers in the respective communities, both plants lengthened the workday and week. However, both plants having employed women for many years prior to the war, consideration was given the personal convenience of women workers. In Plant H, when the 8-hour day was extended to 9 hours, 3 hours on Saturday, all women who came late or left early were permitted to make up the lost time on Saturday, the plant staying open for their convenience. When hours were extended to 10 daily and 5 on Saturday, the company said it was "offering" the women 10 hours a day rather than compelling them to work these hours. No woman was counted as an absentee if she worked 8 hours a day and 40 a week, and after 8 hours an employee could leave the plant without a pass.

The schedule of 9 hours a day, 3 hours Saturday, and 48 hours a week was studied as a first period in Plant H, and the 10-hour day, 55-hour week was studied as a second. All women in the occupational groups selected were included in the study regardless of their length of employment. Inspectors, however, were included in only the attendance-analysis phase of the study because they were paid on an hourly basis and no production data were available for them.

Plant H employed part-time workers, chiefly as inspectors, but a few as power-press operators. Some of these were single and married women of all ages who, for personal reasons, could not work full time. Some worked elsewhere and helped out in these departments in their spare hours. Average hours worked per week by part-time inspectors ranged from 11.2 to 39. A few minors were also employed, chiefly on inspection work. Part-time

workers and the 16- and 17-year-old girls were not included in the detailed study, as the hours of neither corresponded to the schedules studied.

Plant J did not have a fixed schedule of hours for all workers in the department studied. Different occupational groups and individuals from time to time worked different hours, depending on the flow of work, and on adjustments made for the individual. (The majority of women in an occupational group usually worked a fixed schedule, but individual schedules could be arranged through the foreman.) Because there were such individual variations in hours in Plant J and not all workers changed schedules at the same time, it was necessary for the Bureau's agents to check the hour schedules of individual women and to select for study those women who had worked certain contrasting hour schedules over extended periods. The 6 weeks chosen as a first period for individual women were not necessarily the same weeks for all women, but were weeks in which a woman was scheduled to work 7½ or 7⅗ hours a day and 42½ or 43 hours a week; similarly the second 6-week period of a 9½-hour-day, 47½-hour-week schedule did not necessarily cover identical weeks. The 7½-42½-hour schedule resulted when a 24-minute lunch period under the 7⅗-43 schedule was lengthened to 30 minutes.

In the 42½-43-hour period women worked on a rotating-day-and-night-shift basis, working on the day shift one week and on the night shift the next. They were permitted to change off with other workers on the day or night shifts, if they could made the arrangement. In the second period, under the 9½-47½-hour schedule, there was only a day shift.

The procedure followed in the study of productive efficiency in Plant J differed from the procedure followed in any other plant. Only one 6-week period in the summer of 1944 was covered and comparisons made of the efficiency of women doing substantially the same type of work but working different hours, one group working under a 7½-42½-hour schedule and another on a 9½-47½-hour schedule. This was done because changes in piece rates prevented a comparative study of production in the periods studied for attendance. The women included in the study of productive efficiency were a select group who had been on the schedule under which they were studied for at least two months prior to the weeks studied.

A résumé of the periods studied in both Plant H and Plant J follows:

| *Period* | *Schedule* |
|---|---|
| **PLANT H** | |
| *1st period:* | |
| March–May 1943 (6 weeks) | 7 a.m.–5 p.m. (1-hour lunch period) |
| 9-hour day, 3-hour Saturday, 5½-day 48-hour week | Saturday—7 a.m.–10 a.m.<br>Plant open Saturday for make-up time |
| *2d period:* | |
| September–November 1943 (6 weeks) | 7 a.m.–6 p.m. (1-hour lunch period) |
| 10-hour day, 5-hour Saturday, 5½-day 55-hour week | Saturday—7 a.m.–12 noon |
| **PLANT J** | |
| *1st period:* [1] | |
| July–September 1944; March–May 1943 (6 weeks) | Day shift: 7 a.m.–3 p.m.<br>(24- or 30-minute lunch period) |
| 7½ or 7 3/5-hour day, 5-hour Saturday, 5½-day 42½- or 43- hour week | Saturday—7 a.m.–12 noon<br>Night shift: 3 p.m.–11 p.m.<br>(24- or 30-minute lunch period)<br>Saturday—12 noon–5 p.m. |

| | | |
|---|---|---|
| *2d period:*[1] | | |
| July–September 1944; October–November 1943 (6 weeks) | 7 a.m.–5 p.m. (30-minute lunch period) | |
| 9½-hour day, 5-day 47½-hour week | No night shift | |

[1] Six consecutive weeks were studied for each woman, but dates of periods varied.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD AND HOME RESPONSIBILITIES

Fewer than one-tenth of the women workers studied in Plants H and J were under 20 years of age. The remainder were fairly evenly distributed in the several age brackets above 20—25 to 35, 35 to 45, and 45 and older. Almost three-fourths of the women in Plant H were or had been married, less than half in Plant J.

With few exceptions women workers lived in households of their own or in their parents' homes. The majority of married women interviewed had all or major responsibility for the household duties; in a few families, duties were shared. Single women living with parents did not carry as heavy a load of household duties; they usually "helped" with household tasks and took care of their own clothes and room.

About half the women in Plant H who were or had been married had children under 14 years of age at home. Fifteen percent had 2 children, and 14 percent had 1 child, but some had as many as 6. During the mother's absence the children were usually cared for by the husband, who worked on a night shift, or by another relative. In a few instances, no adult was at home when children returned from school.

The usual comment made by women workers when Plant H shifted from a 9-hour to a 10-hour day by changing the closing hour from 5 to 6 p. m. was that this made the supper hour late. For married women the change meant difficulties with marketing, less time for housework at night, less time for leisure on Saturdays and Sundays. With the privilege of leaving, if necessary, after 8 hours of work, regardless of hours scheduled, some women did occasionally leave early to do their shopping. Others put major purchasing off until Saturday. Among single girls without household responsibilities, the feeling of continuous rush under the 10-hour-day schedule to get necessary personal matters attended to produced a general state of tiredness, so that they "did not feel like going out at night."

Plant J women, in the first period, worked five 7½-7⅗-hour days and a 5-hour Saturday, alternating day and night shift weekly. One week a woman worked from 7 a. m. to 3 p. m.; the next week, from 3 p. m. to 11 p. m. Saturday hours for the night shift were 12 noon to 5 p. m. In the second period the day was from 7 a. m. to 5 p. m.; there was no Saturday work and no night shift.

A young girl of 20 years living with her father, mother, and sister made this statement about the effect of the foregoing schedules in Plant J on family life:

> The 7½-hour rotating schedule was very inconvenient both for me and my household. First, it meant mother getting irregular meals every other week and caused disturbance in her sleeping hours, as well as mine, as I did not get home until 1:30 a.m. Under the 9½-hour schedule I can help with the ironing on Saturdays and get personal things done, so I can play over the week end.

Other young women objected to the night schedule because it prevented them from going out evenings with their friends. They liked having Satur-

day off, so that they could do all their personal work on that day and still have time for fun over the week end. The two additional hours of work a day seemed less burdensome to them than working Saturdays and alternating day and night shifts. While some young women seemed to have no difficulty in changing sleeping and eating hours every week, about half the women interviewed could not make the physical adjustment and reported that they were more tired than on a longer workday.

Married women reacted differently to the night shifts. A Mrs. D., keeping house for a husband and 17-year-old daughter, said:

> I liked working from 3 p.m. to 11 p.m. as I could get all my housework finished. I get up at 8:30, get breakfast, do the dishes, make the beds, do marketing, get everything ready for supper, and on washdays wash clothes. My daughter makes the supper for my husband when she gets home from school. It's easier for me than to get up at 5 a.m. when I must get to work at 7 a.m.

A young wife, who had a mother to assist her in the care of her baby and the house, when on the night shift went to bed at 12:30 a. m., got up at 6 a. m. to feed the baby, and then went back to bed again. But she liked the rotating shift, stating that:

> The night shift is better for doing the things I want to do in the daytime and gives me more time with the baby, while the day shift permits me to make some dates.

An older wife, who did the major part of her housework, reported:

> I found that the rotating shift on the 7 3/5-hour day was too hard on me. I had to get up early to get my husband off to work. I would come home at 11:30, tired but not sleepy. I couldn't get to sleep right away, but I had to get up at 5:30 a. m. Also I hated to work those 5 hours on Saturday afternoons. By the time I got my marketing done Saturday mornings, there was no time for housework. While I liked the 7½-hour day, I'd rather work 2 hours extra daily and have Saturday free.

### TIME OF RISING AND OF RETIRING

Working on the day shift, which began at 7 a. m., usually meant getting up from 5:15 to 6:30 a. m. for Plant J workers. Most of the women went to work by trolley or by bus, requiring an hour to an hour and a half for the round trip. A few had to spend 2 to 3 hours each day in travel. Those living within walking distance of the factory did not need more than 40 minutes for travel to and from the plant. For the larger number, the day away from home was 9 to 10 hours during the 7½-hour-day period. In this period, women workers went to bed from 9:15 to 11:30 p. m. Most of the women had an over-all day of 16 to 17 hours.

When working on the night shift, time of rising varied from 5:30 a. m. to 12 noon, and time of retiring was usually 12:30 a. m. The night shift meant a shorter over-all day for many workers, as they reported a day of under 16 hours.

When these women went on a 9½-hour factory schedule, there was no change in the time of rising. For many there was no change in the retiring hour; the 2 additional hours spent at the factory were 2 hours taken away from work or recreation at home. Others went to bed earlier, as they were tired, and still others stayed up a half hour or an hour longer than during the shorter workday. The result was that as many had an over-all day of 17 to 18 hours as had a day of 16 to 17 hours.

In Plant H the beginning hour was 7 a. m. in both periods studied, the closing hour was 5 p. m. under the 9-hour day and 6 p. m. under the 10-hour day. Women arose at the same hour in both periods—between 5 and 6:15. Half the women lived within walking distance of the plant and needed from 10 minutes to 1¼ hours to get to and from work. Those traveling by

bus required 1 to 1¾ hours for the round trip. The larger number reached home at 5:30 or 5:45 p. m. in the first period, and at 6:30 p. m. or later under the 10-hour schedule. Sixty percent of the women were away from home 10 to 11 hours under the 9-hour day. Under the 10-hour day this time away from home was increased to 11 or 12 hours for 55 percent of the women and to 12 or 13 hours for 45 percent of the women. The same variations in retiring hours occurred among these women as among Plant J workers: some went to bed at the same time, regardless of the workday; others went to bed earlier under the 10-hour day; and some went to bed later. The larger group had an over-all day of 16 to 17 hours under each hour schedule, while 35 percent had a day of less than 16 hours under the 10-hour schedule as compared with 19 percent who had a day of less than 16 hours under the 9-hour-work schedule. The over-all day for 38 percent under the 9-hour day, and 25 percent under the 10-hour day was 17 hours or more.

## WORKERS' PREFERRED FACTORY HOURS

### Preferred Hours

When asked what hours they preferred to work, 40 percent of the women interviewed from Plant H preferred a 5-day week, although differing as to whether it was to be a 9-hour day or a day of 8 hours or less. Among those wishing a 5½-day week, half wanted a 9-hour day and a third a longer day. Overtime was paid for Saturday work only when 40 hours had been worked during the 5 previous days. Altogether, 50 percent wanted a 9-hour day, 13 percent a 10-hour day, and about 25 percent an 8- or 8½- and 8- or 9-hour day. With respect to weekly hours, 40 percent wanted 45 or fewer, 40 percent wanted 48 to 50 hours, and 20 percent wanted 53 or 55 hours.

Women wanting the 5½-day week stated that at the present rate of pay they "must work overtime to meet the needs of the family," even though they would "prefer the 5-day week;" or, "while husband is in service, I'll work long hours to save;" or, "I prefer to work the 55-hour week because of the overtime, to save for the time when there will not be work." Others believed they would prefer to lose the overtime pay, for they would feel better and have more time with their families on an 8-hour day.

The group of women studied in Plant J were women who had chosen to work the 7½- or 7⅗-hour day in the first period and the 9½-hour day in the second period. When asked the hours they preferred, almost half gave preference to the 9½-hour day for 5 days a week, in part because the shorter workday schedule also involved a weekly rotating shift liked by only one girl interviewed, in part because the 9½-hour schedule eliminated Saturday work and meant overtime pay for 7½ instead of 2½ or 3 hours. Of those interviewed, a fourth preferred an 8- or 8½-hour day and 40-, 42½-, or 45-hour week. The 7½-hour day with 5-hour Saturday was preferred by a fifth of the women workers, whereas some wished fewer hours than 40 per week.

### Gross Earnings in Relation to Hours

As just stated, some women in Plant H worked a 5 1/2-day week, or a week of more than 40 hours, because they wanted or needed the amounts earned at the overtime rate of time and one-half. Plant H did not pay overtime until women had worked 40 hours. Under the 9-hour day and 48-hour week, women pieceworkers in the departments studied earned an average of $27.75 per week for the 44.7 hours actually worked. In the 10-hour day

55-hour-week period, they averaged earnings of $31.88 per week for 47.6 hours worked.

Almost half of the selected group studied in Plant J preferred the 9 1/2-hour day 47 1/2-hour week to a shorter schedule. When the longer schedule was in effect, women averaged 42.9 hours of work and earned $35.72 a week. Under the shorter 7 1/2-hour day, the hours worked were 38.4 per week and the earnings averaged $32.80.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

#### Attendance

As already stated, the group studied for attendance data in Plant H was larger than that studied for productive efficiency because inspectors included in the attendance group were paid on a time-work basis and could not therefore be included in an analysis of efficiency based on piecework earnings. All women in each occupational group, except part-time workers and minors who did not work the scheduled hours of the department, are included in the attendance analysis.

When Plant H changed from an 8- to a 9-hour-day schedule with a 3-hour Saturday, all women who came late or left early on any day during the week could make up this lost time on Saturday, as the plant remained open throughout the day. The company permitted this arrangement mainly because of the women's transportation difficulties and home demands. The inspectors availed themselves of the privilege to an extent that permitted them to make up a fourth of the entire time lost in the 9-48-hour period studied. Even so, among these time workers there was a loss of almost 10 hours per 100 possible man-hours of work during a 6-week period under the 9-48-hour schedule, attributable in part to the loss of 1, 2, or 3 weeks by 10 percent of the time workers and the average loss by 20 percent of over a half day per week in the weeks they did work. As a consequence, the average length of absences not made up was 14.7 hours in duration under the 9-48-hour schedule. Pieceworkers, too, made up an average of about 4 hours in the 9-48-hour period by working additional time on 3 out of 6 Saturdays. Even so, lost time not made up equaled 7.6 hours per 100 possible man-hours of work, and absences averaged about 8 hours in duration and 3 per woman.

When the departments covered in Plant H went on a 10-hour day 55-hour week, women were not permitted to make up time on Saturday. However, if they worked 8 hours a day and 40 a week, they were not counted absent. The over-all time lost by time workers increased to 15.8 hours per 100 possible man-hours. Almost all time workers (96.5 percent) lost time, as compared to 63 percent in the 48-hour period when hours could be made up. The proportion of pieceworkers absent increased similarly from 75 in the 48-hour period to 93 percent in the 55-hour period and the hours lost increased to 18.7 out of every 100 possible man-hours of work. The number of absences increased materially for both time and pieceworkers, chiefly because the 10-hour schedule was not compulsory, and many women never worked more than a 9-hour day, but also because there was a material increase in bona fide absences during weeks worked that averaged more than a whole day per week and that averaged more than a half day. How-

ever, the large number of 1-hour losses brought the average length of absence down to less than 4 hours, as compared with the average 10-hour length of absences under the 9-48-hour schedule. The firm's policy, when it established a 10-hour day 55-hour week, of not counting a woman absent if she worked an 8-40-hour week, resulted in a 48-hour week actually being worked by women in the departments studied during the weeks each woman was at work.

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, for Time Workers and Piece Workers — Plants H and J

| Period studied and scheduled hours (piece workers and time workers) | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| **PLANT H** | | | | | | |
| 1st period (9-48 hours)..... | 121 | [1] 84 | 69.4 | 3.0 | 10.4 | 8.7 |
| Piece workers ..... | 64 | 48 | 75.0 | 3.3 | 7.9 | 7.6 |
| Time workers ..... | 57 | 36 | 63.2 | 2.6 | 14.7 | 9.9 |
| 2d period (10-55 hours)..... | 128 | 121 | 94.5 | 14.7 | 3.7 | 17.4 |
| Piece workers ..... | 71 | 66 | 93.0 | 15.4 | 3.9 | 18.7 |
| Time workers ..... | 57 | 55 | 96.5 | 13.9 | 3.5 | 15.8 |
| **PLANT J** | | | | | | |
| 1st period (piece workers) (7½-42½; 7 3/5-43 hours) | 88 | 81 | 92.0 | 6.0 | 5.3 | 11.3 |
| 2d period (piece workers) (9½-47½ hours) ..... | 67 | 67 | 100.0 | 8.6 | 4.3 | 13.0 |

[1] Women who made up all absences by working Saturdays are not included.

Plant J had a liberal policy of permitting hour adjustments for the individual convenience of women workers. However, women chosen for study in the first period were regularly scheduled to work 7 1/2 or 7 3/5 hours daily and 5 hours on Saturday and a 42 1/2- or 43-hour week. In the second period women who were scheduled to work a 9 1/2-hour day 47 1/2-hour week were studied. In spite of the permissible adjustment of hours and the short weekly hours scheduled, almost all women lost time in both periods. In the 42 1/2-hour week period, 11.3 hours were lost per 100 man-hours of work; in the 47 1/2-hour period, 13 hours per 100 possible man-hours were lost. Only relatively small proportions of women lost a week or more of time during each of two periods studied, but also only a few lost no time during the weeks worked. For over half the women, absences per week averaged 1/2 day or less during each period. Nevertheless, the number of absences averaged 6 per woman in the 42 1/2-hour period, and 8.6 per woman in the 47 1/2-hour period. The weekly average of hours worked was 38.4 in the 42 1/2-hour period and 42.9 in the 47 1/2-hour period during weeks worked, that is, about 10 percent of scheduled hours were lost, even though arranged to suit the convenience of the individual worker.

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Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), for Time Workers and Piece Workers — Plants H and J

| Period studied and scheduled hours (piece workers and time workers) | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 5 weeks | 6 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| **PLANT H** | | | | | | | | | | | | | | |
| 1st period (9-48 hours): | | | | | | | | | | | | | | |
| Number | 121 | 111 | 10 | 6 | 2 | 2 | ..... | ..... | 121 | 39 | 49 | 23 | 10 | 44.9 |
| Percent | 100.0 | 91.7 | 8.3 | 5.0 | 1.7 | 1.7 | ..... | ..... | 100.0 | 32.2 | 40.5 | 19.0 | 8.3 | ..... |
| Piece workers: | | | | | | | | | | | | | | |
| Number | 64 | 60 | 4 | 4 | ..... | ..... | ..... | ..... | 64 | 17 | 26 | 16 | 5 | 44.7 |
| Percent | 100.0 | 93.8 | 6.3 | 6.3 | ..... | ..... | ..... | ..... | 100.0 | 26.6 | 40.6 | 25.0 | 7.8 | ..... |
| Time workers: | | | | | | | | | | | | | | |
| Number | 57 | 51 | 6 | 2 | 2 | 2 | ..... | ..... | 57 | 22 | 23 | 7 | 5 | 45.2 |
| Percent | 100.0 | 89.5 | 10.5 | 3.5 | 3.5 | 3.5 | ..... | ..... | 100.0 | 38.6 | 40.4 | 12.3 | 8.8 | ..... |
| 2d period (10-55 hours): | | | | | | | | | | | | | | |
| Number | 128 | 106 | 22 | 12 | 7 | 1 | 1 | 1 | [1] 127 | 7 | 48 | 42 | 30 | 48.0 |
| Percent | 100.0 | 82.8 | 17.2 | 9.4 | 5.5 | 0.8 | 0.8 | 0.8 | 100.0 | 5.5 | 37.8 | 33.1 | 23.6 | ..... |
| Piece workers: | | | | | | | | | | | | | | |
| Number | 71 | 56 | 15 | 9 | 4 | 1 | 1 | ..... | 71 | 5 | 24 | 23 | 19 | 47.6 |
| Percent | 100.0 | 78.9 | 21.1 | 12.7 | 5.6 | 1.4 | 1.4 | ..... | 100.0 | 7.0 | 33.8 | 32.4 | 26.8 | ..... |
| Time workers: | | | | | | | | | | | | | | |
| Number | 57 | 50 | 7 | 3 | 3 | ..... | ..... | 1 | [1] 56 | 2 | 24 | 19 | 11 | 48.6 |
| Percent | 100.0 | 87.7 | 12.3 | 5.3 | 5.3 | ..... | ..... | 1.8 | 100.0 | 3.6 | 42.9 | 33.9 | 19.6 | ..... |
| **PLANT J** | | | | | | | | | | | | | | |
| 1st period (7½-42½; 7 3/5-43 hours): | | | | | | | | | | | | | | |
| Number (piece workers) | 88 | 83 | 5 | 1 | 3 | 1 | ..... | ..... | 88 | 8 | 45 | 18 | 17 | 38.4 |
| Percent | 100.0 | 94.3 | 5.7 | 1.1 | 3.4 | 1.1 | ..... | ..... | 100.0 | 9.1 | 51.1 | 20.5 | 19.3 | ..... |
| 2d period (9½-47½ hours): | | | | | | | | | | | | | | |
| Number (piece workers) | 67 | 57 | 10 | 7 | 1 | 2 | ..... | ..... | 67 | 1 | 36 | 22 | 8 | 42.9 |
| Percent | 100.0 | 85.1 | 14.9 | 10.4 | 1.5 | 3.0 | ..... | ..... | 100.0 | 1.5 | 53.7 | 32.8 | 11.9 | ..... |

[1] Total is less than total number of women studied because one woman was absent all 6 weeks studied in the period.

### Tardiness

In reviewing all time counted by the firms as tardiness, it would appear the longer workday in Plant H increased the lateness, in number of women affected, in number of times incurred, and in number of minutes late. For under the 10-hour schedule over half the women were late, as compared with one-third under the 9-hour schedule. The average number of latenesses increased from 2.4 to 4.5 and their length from 10 minutes to 16 minutes per person.

In Plant J, where hours were arranged for workers' convenience, 75 percent of the women studied in the first period, as compared with 70 percent in the second period, were late at some time. Even under the 7 1/2- or 7 3/5-hour day in the first period, these women averaged 7 latenesses per woman, the latenesses averaging 12 minutes. Under the 9½-hour-day schedule they averaged, per woman, almost 12 latenesses of an average duration of 14 minutes. Apparently, when allowed some freedom in time of arrival even though hours are fixed for the majority, the inclination is toward greater irregularity in time of arrival than when held to a starting time set for all.

A special analysis was made of the steadier workers—those in the groups studied who came to work every week in the two periods studied. In Plant H, almost 25 percent lost no time in the 9-48-hour period, and 60 percent lost an average of half day or less. In the 10-55-hour period only 6 percent lost no time whatsoever and 36 percent lost 1/2 day or less, 38 percent lost 1/2 to 1 day, and 19 percent lost over 1 day.

In Plant J the increase of 2 hours in daily hours brought with it a decided increase in the proportion who were out over 1/2 day to one day a week, but a slight decrease in the proportion losing a half day or less.

### Pay Day in Relation to Attendance

The relation of pay day to absenteeism was analyzed in Plant H. Pay day was on Friday. Saturday, in the first period, was a 3-hour day with lost time make-up privileges, and in the second period was a 5-hour day. About one-third of the time workers did not appear on one or more Saturdays in the first period and about one-fourth missed a Saturday in the second period. Saturdays lost were 6 percent of all possible Saturdays in each period and accounted for 4 percent of all time lost by time workers in either period.

In both periods piece workers were absent more frequently on Saturday than time workers, 42 and 36 percent missing a Saturday in the first and second periods, respectively; not only were more women absent, but they were absent 11 to 13 percent of the possible Saturdays in each period. However, this Saturday absence of piece workers accounted for but 9 percent of all their lost time in the first period and 6 1/2 percent in the second period.

### Causes of Lost Time

The reasons for absences were recorded by Plant H only during the second period but were available for both periods in Plant J. Of time lost in Plant H under the 55-hour schedule 61 percent was reported as due to personal illness, 13 percent to other personal reasons, and 11 percent was occasioned by visiting service relatives.

Calls at the medical department in Plant H indicated colds as the chief nonindustrial ailment treated in the first period. Individual statements of women workers disclosed cases of grippe, colitis, "back pain," "splitting headache," "too tired to get up." Among personal reasons for absences were: "I had to take the children to the dentist or to the doctor." "I was

married and had a 2 weeks' honeymoon from work." The majority of women interviewed said they worked unless they were sick. However, the following are typical reasons for absenteeism under the 10-hour day:

> Health would not stand up under the 10-hour day.
>
> I leave early, as there would be no one to care for the children if I did not get home by 5:45 p.m.
>
> My husband wants hot meals, so I must shop on my way home and shops close at 6 p.m.
>
> I worked 10 hours a day until I got married. Now I need that extra hour at home.

Calls at the medical department in Plant H indicated that cuts, and getting foreign bodies into the hands and eyes were the chief accidents. There was little difference, however, between the number of accidents in the first and in the second period studied.

Minor differences existed as between causes of absence in Plant J under the 7 1/2- and under the 9 1/2-hour day. However, the numbers involved who gave accidents or family illness as reasons is too small to relate to the hours worked. It must be remembered that the short hours came during a period of rotating shift, that is, women worked from 7 a. m. to 3 p. m. for one week and from 3 p. m. to 11 p. m. the following week. Only 1 woman interviewed preferred this rotation. Some objected to it because the transportation was difficult at night, others because they had difficulty adjusting their hours to those of the people with whom they went out. Many said they could not make the weekly change easily because they felt exhausted through sleeping different hours, because of changing mealtimes, lack of recreation, neglect of home duties.

**Table III. — Causes of Lost Time Under Different Scheduled Hours — Plants H and J**

| Causes of lost time | Plant H [1] | | Plant J | | | |
|---|---|---|---|---|---|---|
| | 2d period (10-55 hours) | | 1st period (7½-42½, or 7 3/5 - 43 hours) | | 2d period (9½-47½ hours) | |
| | Women losing time | Total hours lost | Women losing time | Total hours lost | Women losing time | Total hours lost |
| | Number | Percent | Number | Percent | Number | Percent |
| Total women losing time | 121 | ..... | 81 | ..... | 67 | ..... |
| Total reporting causes | [2] 73 | 100.0 | [2] 61 | 100.0 | [2] 53 | 100.0 |
| Personal: | | | | | | |
| Illness | 39 | 61.2 | 22 | 35.8 | 20 | 36.3 |
| Other | 15 | 12.9 | 35 | 54.9 | 32 | 40.5 |
| Family: | | | | | | |
| Illness | 2 | 1.3 | ..... | ..... | 1 | 11.4 |
| Home duties | 3 | 5.9 | ..... | ..... | ..... | ..... |
| Visiting service relatives | 5 | 10.5 | ..... | ..... | ..... | ..... |
| Moving | 1 | 2.4 | ..... | ..... | ..... | ..... |
| Industrial accident | 1 | 4.1 | ..... | ..... | 2 | 4.7 |
| Lateness (over 15 minutes) | 30 | 1.7 | 35 | 9.3 | 30 | 7.1 |

[1] No data available for first period.
[2] Details add to more than total because some women report more than one cause of absence.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

In the departments studied in both H and J Plants, women worked on light machining operations, bench assembly, and visual and gage inspection. Each experienced worker had her own job, but was also called on to do other tasks to ensure an even flow of production.

The majority of Plant H women included in the study operated drill presses, kick presses, and power presses, or worked as bench assemblers or inspectors. A few operated other types of machines, such as hand milling machines, small hand screw machines, tapping machines, semiautomatic riveting machines, and semiautomatic punch presses. The machine operations required eye, hand, and foot coordination. Bench assembly called for knowledge of a variety of chain assembly patterns and considerable finger dexterity and speed. Both visual and gage inspection required close observation and alertness.

Most of the Plant H women worked on small parts and subassemblies weighing not more than 2 ounces, although a few parts weighed up to 14 ounces. Women assembling completed chain lengths worked with heavier parts, most chains weighing 2 to 3 pounds, a few up to 5 pounds. However, the only lifting was occasioned by coiling and placing a completed chain length on a wooden tray at the end of the workbench. The actual inspection of completed chain lengths, that varied in weight from 1 1/4 pounds to 10 pounds, was done by sliding them along sheet-metal tables.

The connectors made in the department studied in Plant J were used for making a great variety of war equipment. Almost all the workers in the department were women who did the light machining, subassembly, final assembly, and inspection involved in making the completed connectors. The jobs were mainly light hand operations, bench assembly, visual and gage inspection, and light machining operations on drill presses, foot presses, and small bench devices or fixtures.

Hand operations included sorting bakelite inserts coming from the plastic molding department; removing flash from inserts with a curved-blade knife; tinning ends of pins and contacts in pots of molten tin; subassembly and final assembly of connectors, greasing threads on connectors prior to packing, and visual and gage inspection. Light machine operations involved use of single spindle drill presses, to drill, countersink, chamfer, spot drill, and flash small metal parts, bakelite inserts, pins, and contacts. Small-sized foot presses were used to cut, blank, and form bakelite and metal parts. Small hand-operated bench fixtures were used to size, insert, and properly locate small parts, to test the tension of metal contacts, and so forth.

All jobs were individually paced, and the women worked at a moderate speed without tension or pressure. All the jobs were simple and for the most part could be performed in a very routine, repetitive fashion. Machining operations required mainly eye, hand, and foot coordination. Hand operations required mainly finger dexterity. Inspection required finger dexterity and mental alertness. All the work was very light, as completed connectors only weighed from 1/4 ounce to 4 ounces. All stock and parts were carried to and from workers by stock boys. The majority of workers were seated, and those who did stand were usually provided with seats for occasional use. The workers were allowed to come and go pretty much as they chose, as long as there was no serious infraction of company regulations. There was a general air of informality in the shop, some women cooking coffee on hot plates, radios playing, and considerable conversation going on.

### Performance on the Job

Both Plants H and J operated the light machine and bench-assembly departments studied on an individual incentive or piecework basis, and average hourly piecework earnings are used as a measure of efficiency in these plants. Both plants paid a guaranteed minimum rate to new workers, to pieceworkers who did not average as much as the minimum, and to pieceworkers temporarily placed on an hourly rated job. The guaranteed minimum in Plant J was 50 cents an hour, in Plant H, 45 and 50 cents in the first period and 55 cents in the second. Plant H paid time allowances to workers when piecework was interrupted by setting up a new job, machine breakdown, defective parts, bad stock, failure of power, and so forth. Plant J allowed workers no waiting time; instead, when a machine broke down, or when there was a material shortage, the worker was shifted to another job. These time allowance payments in Plant H have been added to piecework earnings for purposes of discussing effiiciency, as the time was included in productive hours. However, in both plants overtime payments and any "make-up" to bring piecework earnings to the guaranteed minimum have been deducted.

It will be recalled that these plants attempted to adjust hours to women workers' convenience. Plant H permitted Saturday make-up time in the 9-48-hour period, and made no record of absence in the 10-55-hour period if a woman worked an 8-hour day and 40-hour week. Plant J allowed individual schedules of hours of which the 7½-42½ and 9½-47½ schedules were studied. Under these arrangements workers in Plant H varied their weekly hours worked by only 3 hours—or from 44.9 to 48 in weeks worked —when the schedule called for a difference of 7 hours; and in Plant J the actual difference was a matter of 4½ hours a week—the difference between 38.4 and 42.9 hours. Obviously comparisons of production under widely different hours of work per week were not possible.

### Performance on the Job — Plant H

The majority of women in Plant H worked on foot presses, power presses, and drill presses, as inspectors, as bench assemblers building chains by hand, in racks, and lacing chains by hand on work tables. All these workers were paid on an individual incentive basis, except inspectors who were paid by the hour. Inspectors, therefore, were included only in the attendance analysis and are not included in the discussions of efficiency.

The standard base rate used in setting piece rates on machine operations was 52.8 cents; on bench assembly 45 cents. Higher earnings of machine operators would be due to this difference in base rates rather than to a difference in efficiency, and the two occupational groups are therefore shown separately in table IV.

The influence of experience on output is shown in table IV. Although the small numbers of workers reported in some categories at times permit individual differences in production speed to obliterate the experience curve, it is obvious that the guaranteed minimum rates of 45 and 50 cents in the first period and 55 cents in the second period were not generally attained until 6 months of work experience had been gained.

Reviewing the production record of experienced machine operators alone, as measured by piecework earnings, there appears to be little difference in output as between the 48-hour and the 55-hour schedule. Total hours worked were increased by only 3.3, from 45.7 under the first to 49 under the second schedule, 44.8 and 48 of which, respectively, were on piecework. This slight increase had no noticeable influence on the individual efficiency

of experienced machine operators, who reported that they knew just how much they had to do on different jobs to make the amount they considered their usual earnings; if they could not make out, it often was because "the stock was bad."

The machine operators with 6 weeks' to 6 months' experience had a decrease in average hourly earnings from 52.1 cents under the 48-hour schedule to 42.9 cents under the 55-hour schedule. Total actual hours worked increased only 3.1 hours, from 44.2 to 47.3, and hours on piecework actually decreased from 39.8 to 38.3.

Many women expected to earn a fixed amount which ranged from 55 cents an hour to $1 an hour. Their ideas are reflected to some extent in actual performance as shown by piecework earnings. For example, in the experienced group of 5 women who worked on both machine operations and bench assembly during the same weeks in the first period, the individual range in piece earnings was from 47 to 81.9 cents. In the 10-hour-schedule period these 5 and 2 other women who were on both types of work had earnings ranging from 56.6 to 92.5 cents an hour. The increase in average earnings from 66.3 to 71.6 cents for this small group is a matter of individual performance rather than one of hours worked, for there was a difference of only 1 hour in actual hours worked.

Because some women did not work the 10-hour day in the second period but remained on the 9-hour day, they had no comment to offer concerning the relative difference in their performance. About 3/4 of those who did work both a 10-hour day and a 9-hour day reported no difference in their efficiency even though they were more tired under the 10-hour schedule. One woman said it was the additional overtime pay that made them think they produced as much per hour on the 10- as on the 9-hour day. Plant production statistics, as well as the individual women's statements, indicate that under a voluntary schedule in which only a few women worked 10 hours regularly, there was too little difference in over-all weekly hours to effect any appreciable change in individual efficiency.

#### Performance on the Job — Plant J

All jobs studied in Plant J were on an individual piecework basis. There were many revisions in piece rates during 1943 and the first half of 1944. The temporary rates, set on new jobs in accordance with established policy, were later adjusted as manufacturing methods were fully developed and operators attained normal speed. By June 1944 practically all operations were believed to be properly timed so that the average operator could earn 60 cents an hour—the standard base used in setting piece rates—on any operation. Since piecework earnings were to be used as a measure in the comparative study of production, the foregoing adjustment of piece rates made it necessary to study a period other than the one studied for attendance. It was decided to take a 6-week period in the summer of 1944 and to compare the production records of women doing substantially the same type of work at the same time but working different schedules—either 7½-42½ hours or 9½-47½ hours. Plant J is the only one in which the two schedules compared for productive efficiency fell in the same period.

The experienced workers averaged 38.4 hours under the 42½-hour schedule and 42.8 under the 47½-hour schedule, or 90 percent of the possible man-hours under each schedule. Hours spent on piecework were 37.5 under 42½ hours and 39.3 under 47½, a difference of just 1.8 hours. This resulted in slightly lower average hourly earnings for those working

Table IV. — Individual Efficiency by Length of Experience in Occupation, Under Different Scheduled Hours, by Occupation — Plants H and J

| Occupation, period studied, and scheduled hours | Total | | | | Length of time in occupation: 1 year or more | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) |
| **PLANT H** | | | | | | | | |
| Machine operators: | | | | | | | | |
| 1st period (9-48 hours) | 48 | 44.6 | 41.0 | 58.5 | 18 | 45.7 | 44.8 | 76.8 |
| 2d period (10-55 hours) | 52 | 47.6 | 42.6 | 58.0 | 20 | 49.0 | 48.0 | 77.3 |
| Bench assemblers: | | | | | | | | |
| 1st period (9-48 hours) | 8 | 44.3 | 40.5 | 46.5 | 5 | 44.4 | 43.0 | 55.5 |
| 2d period (10-55 hours) | 7 | 51.2 | 41.1 | 48.5 | 3 | 52.2 | 50.8 | 64.0 |
| Machine operators and bench assemblers: | | | | | | | | |
| 1st period (9-48 hours) | 7 | 44.6 | 42.0 | 60.0 | 5 | 44.6 | 43.8 | 66.3 |
| 2d period (10-55 hours) | 10 | 45.7 | 44.3 | 72.0 | 7 | 45.6 | 45.2 | 71.6 |
| **PLANT J[1]** | | | | | | | | |
| Machine operators, assemblers, and inspectors: | | | | | | | | |
| 1st group (7½-42½ hours) | 48 | 37.1 | 36.1 | 84.2 | 33 | 38.4 | 37.5 | 84.5 |
| 2d group (9½-47½ hours) | 43 | 42.8 | 39.5 | 80.1 | 34 | 42.8 | 39.3 | 80.1 |

| Occupation, period studied, and scheduled hours | Length of time in occupation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 months, less than 1 year | | | | 6 weeks, less than 6 months | | | | Less than 6 weeks | | | |
| | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) |
| **PLANT H** | | | | | | | | | | | | |
| Machine operators: | | | | | | | | | | | | |
| 1st period (9-48 hours) | 3 | 44.7 | 43.6 | 49.8 | 18 | 44.2 | 39.8 | 52.1 | 9 | 43.3 | 34.9 | 37.6 |
| 2d period (10-55 hours) | 5 | 45.2 | 43.4 | 62.5 | 17 | 47.3 | 38.3 | 42.9 | 10 | 46.4 | 38.8 | 43.1 |
| Bench assemblers: | | | | | | | | | | | | |
| 1st period (9-48 hours) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 44.2 | 36.3 | 31.4 |
| 2d period (10-55 hours) | ..... | ..... | ..... | ..... | 2 | 50.1 | 48.6 | 40.2 | 2 | 50.8 | 19.0 | 33.5 |
| Machine operators and bench assemblers: | | | | | | | | | | | | |
| 1st period (9-48 hours) | ..... | ..... | ..... | ..... | 2 | 44.8 | 37.3 | 44.4 | ..... | ..... | ..... | ..... |
| 2d period (10-55 hours) | 2 | 46.2 | 41.5 | 75.9 | 1 | 45.3 | 43.7 | 66.8 | ..... | ..... | ..... | ..... |
| **PLANT J[1]** | | | | | | | | | | | | |
| Machine operators, assemblers, and inspectors: | | | | | | | | | | | | |
| 1st group (7½-42½ hours) | 9 | 35.5 | 34.6 | 84.6 | 6 | 32.4 | 31.0 | 82.0 | ..... | ..... | ..... | ..... |
| 2d group (9½-47½ hours) | 3 | 41.6 | 40.1 | 82.3 | 6 | 43.2 | 40.3 | 79.1 | ..... | ..... | ..... | ..... |

[1] In Plant J, one period was studied for production data contrasting two groups of women doing substantially the same type of work but working different scheduled hours.

Table V. — Summary of Possible Man-hours, Total Man-hours Worked, Total Man-hours Worked on Incentive Jobs, Efficiency, and Total Production, Based on Totals for All Women Studied, Under Different Scheduled Hours, by Occupation — Plants H and J

| Occupation, period studied, and scheduled hours | Index numbers of— | | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of women | Scheduled hours | Possible man-hours | Total man-hours worked | Total man-hours worked on incentive jobs | Efficiency (average hourly production) | Total production |
| **PLANT H** | | | | | | | |
| Machine operators and assemblers: | | | | | | | |
| 1st period (9-48 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period (10-55 hours) | 109.5 | 114.6 | 127.0 | 112.8 | 111.1 | 103.4 | 115.0 |
| **PLANT J** | | | | | | | |
| Machine operators, assemblers, and inspectors: | | | | | | | |
| 1st group [1] (7½-42½ hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d group (9½-47½ hours) | 89.6 | 111.8 | 100.1 | 99.5 | 94.6 | 95.1 | 90.0 |

[1] In Plant J, one period was studied for production data, contrasting two groups of women doing substantially the same type of work but working different scheduled hours.

9½ hours, their average being 80.1 cents as compared with 84.5 cents for the 7½-hour workers.

Taking the group as a whole and disregarding the factor of experience, hourly production was somewhat less among those working the 9 1/2-hour day whose average hourly earnings dropped from 84.2 to 80.1 cents, as shown in table IV. Actual hours worked in the 42 1/2- and 47 1/2-hour periods were 37.1 and 42.8, respectively, of which 36.1 and 39.5, respectively, were on piecework.

When women were questioned concerning the reasons for differences in their earnings, the majority believed that being shifted from job to job slowed down their speed. An analysis of production records of individual women showed this contention had a factual basis. In the opinion of the women, the hours they actually worked were not related to their efficiency.

> We run short of work and must take the odd jobs. Our lack of work is because the molding machine breaks down, or purchased pins and contacts do not arrive on time, or some machine needs repairing. Then, you are put on a job at which you are slow, and your earnings fall that day. The jobs are quickly learned, but you have to get the "knack" to make speed.

Table IV would indicate that jobs in Plant J, which were light, were quickly learned. Some women with less than 6 months' experience could earn more per hour than others with long experience.

### Performance on the Job — Summary

In its effort to augment production, Plant H increased the scheduled hours in the departments studied by 14.6 percent and the numbers of women employed by 9 1/2 percent, thus making possible a 27-percent increase in man-hours of work in the second period. This increase failed to materialize, however. Instead of achieving the scheduled 55-hour week in the second period, the women pieceworkers averaged 47.6 hours. The increase in total man-hours worked barely exceeded the increase in numbers of women employed. Through a slight increase in efficiency, total production was increased by 15 percent in the second period.

Although located in an area where an acute labor shortage existed, the plant, by its policy of setting higher hour schedules but making no further demands upon women if they worked 8 hours a day and 40 a week, maintained excellent morale among the workers and retained a nucleus of highly experienced workers. The standard of individual efficiency maintained by these workers unquestionably assisted new workers in gaining speed—much more so than would have been possible under excessive turn-over.

One group studied for productive efficiency in Plant J worked a 7½-42½-hour schedule and the other group worked a 9½- 47½-hour schedule representing an increase of 11.8 percent in scheduled hours. This increase was offset by the slightly smaller number of women in the second group, so that the possible man-hours of the 2 groups were actually the same. The longer-day group made the poorer showing—in the number of hours actually worked, in efficiency, and in total production.

# HARDWARE PACKERS — PLANT K

## INTRODUCTION

Although specific war product items had been added to production, Plant K continued to manufacture standard builders' hardware, not only for regular commercial uses but for the Army and Navy, producing some 8,000 items of different sizes and finishes. Located in a highly industrialized New England area where sources of new labor supply were limited, it had only the local community to draw upon for new workers and took minors and part-time workers to help meet the wartime load. However, it had developed a stable group of women workers, employed for many years, who remained through the war. More than half the women in the departments studied had been employed for 5 years or more, while seven-eighths had been there for 1 year or more.

The occupation chosen for study in this New England plant was the hand operation of packing in the light-hardware-, bulk-, and screw-wrapping departments. While there were thousands of different items, each requiring specific attention in order to be packed correctly, no difference in the character of the operations occurred during the war period.

Minors and part-time workers were excluded from all phases of the study. All other women employed in the departments covered were included in the study except that a few elderly women paid on a time basis had to be excluded from the efficiency analysis.

The packing departments had been on a 48-hour week (five 9-hour days, 3 hours on Saturday) from January 1942 to March 1943, when a 50-hour week was put into effect by requiring 5 hours work on Saturday. Two months later, by adding an hour onto each of the other five days, a 55-hour week was instituted.

The two smaller departments—bulk packing and screw-wrapping—remained on this schedule. The large, light-hardware-packing department, however, in the summer of 1943 was allowed a 9-hour Friday (pay day) so that the women could be off an hour early to shop, and in May 1944 went back to the old 9-hour day, 50-hour week.

Two separate sets of periods were therefore selected for study. A 50-hour-week period as a first, and a 55-hour-week period as a second, were chosen for the bulk-packing and screw-wrapping departments. For the major, light-hardware-packing department a period in which the 54-hour week was in effect was chosen as the first, and one in which the shorter 50-hour week was in effect as the second.

During the periods studied the hour schedules were as follows:

| *Period* | *Schedule* |
|---|---|
| *Light hardware packing department* | |
| *1st period:* | |
| March–May 1944 (6 weeks)<br>10 hours Monday-Thursday, 9 hours Friday, 5 hours Saturday, 5½-day 54-hour week | 7 a.m.–6 p.m. or 5 p.m.<br>(1-hour lunch period)<br>Saturday—7 a.m.–12 noon |
| *2d period:* | |
| September–October 1944 (6 weeks)<br>9-hour day, 5-hour Saturday, 5½-day 50-hour week | 7 a.m.–5 p.m.<br>(1-hour lunch period)<br>Saturday—7 a.m.–12 noon |

*Bulk-packing and screw-wrapping departments*

| | |
|---|---|
| *1st period:* | |
| March–May 1943 (6 weeks) | 7 a.m.–5 p.m. |
| 9-hour day, 5-hour Saturday, 5½-day 50-hour week | (1-hour lunch period) Saturday—7 a.m.–12 noon |
| *2d period:* | |
| October–December 1943 (6 weeks) | 7 a.m.–6 p.m. |
| 10-hour day, 5-hour Saturday, 5½-day 55-hour week | (1-hour lunch period) Saturday—7 a.m.–12 noon |

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

Even though about two-thirds of the women packers in Plant K were single, the majority lived as members of family households. Only a very few women packers were under 20 years of age; one-fifth were 45 years and older, over a fifth from 35 years of age to 45 years, and over a third from 25 years to 35 years of age.

### THE HOUSEHOLD

Because so many of the single women were mature women, their families were usually composed of elderly fathers or mothers or both, sometimes with brothers or sisters living at home. While the families ranged in size from 2 to 5 persons, the usual family of these single women was made up of 3 members, the worker herself and her father and mother, or herself, father or mother, and a brother or sister. Single women living by themselves also maintained a home even though no one shared the household.

The families of the married women were no larger in size, the range here being from 2 to 6 members and the 2-person household occurring most frequently. The typical 2-person household was a wife-husband, wife-son, or wife-mother household. Children were usually the additional members in households of 3 or more.

### HOME RESPONSIBILITIES

The group of mature single women and married women may be considered as one in reviewing household duties, for almost all had some household responsibility. About half did the major part of the work or took general responsibility for seeing that it was done. The other half did some work but did not take general responsibility. There were few young children in the workers' families. A shift of home responsibilities, in the periods under study, was due primarily to changes in the composition of the family rather than to ability to push duties onto other family members when hours of work were lengthened.

The hour of additional work under the 10-hour schedule occurred at the end of the day, since work in the factory began at 7 in the morning in both periods. This brought the women home one hour later for supper. Said a widow living with her mother, father, and son of high school age:

> On the 9-hour day I work till 5. That means I get home at 5:30. I can shop on the way home. I get an early supper. My mother is an invalid. So it means a lot to have that extra hour. On the 10-hour day, the shops were closed when I got out of work at 6 p.m. Supper and everything else was an hour or more late.

A single woman of 30 reported:

> When I got home at 5:20, I could have my supper ready by the time my father got home. When my father and I both worked till 6 o'clock, he had to wait for supper.

Another woman living with her mother said:

> On the 10-hour day I worked till 6 o'clock, so had no chance to shop. That meant I either had to go without lunch or eat a sketchy lunch and buy my groceries at noon. Now on the 9-hour day I do my shopping between 5 and 6 p.m. which is much more convenient... If I went to the movies when I worked 10 hours, I would go to sleep. On the 9-hour day I take out an occasional day and have supper downtown, go to an early show, and am home by 10 o'clock.

### TIME OF RISING AND OF RETIRING

To reach the plant at 7 o'clock these women had to get up from 4:45 a. m. to 6:15 a. m., about a fourth rising before 6 a. m. The larger number walked to work, the distances being relatively short. The time away from home did not exceed 11 hours for most of these women in the 9-hour period and was increased an hour in the 10-hour period. Under the 9-hour schedule, about as many retired at 10 or 10:15 p. m. as retired at 11 or 11:15 p. m. Under the 10-hour schedule the time of retiring was not later for the majority; in fact, there was a tendency among older women to go to bed earlier after a longer workday.

In both periods the over-all hours of the workers' day were from 16 to 17 for over half the women. Only for a few did the longer workday result in 18 hours or more of activity.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

As has been stated, the majority of women packers were mature women with family responsibilities. As their earnings were not large, overtime pay was an important factor for many in their consideration of hours. A single woman of 35 years, who turned over half her take-home earnings to her family of 5, said:

> If it were not for the overtime, I would prefer an 8-hour day with half day on Saturday. On the 9-hour day I am still home early enough to go out in the evening. I can do shopping between 5 and 6 p.m. If I gave up my 9-hour day and worked only 8 hours, it would make about $6.30 difference in my weekly pay. I couldn't get along.

About three-fourths preferred a 5-day or 5 1/2-day week. Forty-seven in every 100 said they would like to work 9 hours a day. Only 9 in every 100 preferred a 10-hour day. Those liking a 6-day week wanted a day of 7 or 8 hours.

Concentration of preference was as follows:

8-hour day, 48-hour week—19 in every 100 women
9-hour day, 45-hour week—19 in every 100 women
9-hour day, 50-hour week—28 in every 100 women

### GROSS EARNINGS IN RELATION TO HOURS

While workers were paid on a piece-rate basis, a guaranteed minimum base rate was paid those whose production was inadequate for payment on the piece-rate basis. This base rate also applied to jobs paid on a time basis. A "scrap premium" was paid for finding defective parts while packing. Overtime was paid for daily hours over 8 or weekly hours over 40.

Make-up pay, overtime pay, day-work earnings, and "scrap premiums" were subtracted from total earnings to arrive at the average hourly piece-work earnings which were used in this plant to analyze individual efficiency and production. Gross earnings, however, influence the women workers'

preferences for specified hour schedules. When working on a schedule of a 9-hour day and 50-hour week, but actually averaging 45.7 hours during weeks worked, gross earnings per week were $32.11. When working under the 10-hour-day, 54- or 55-hour-week schedule but actually averaging 49.4 hours, gross earnings were $36.02. Considering the light-hardware-packing department separately, gross earnings under the 10-hour and under the 9-hour schedules were $35.84 and $33.44 a week respectively—a difference of $2.40.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

In the light-hardware-packing department, as noted in the introduction, women worked 4 days of 10 hours, 9 hours on Friday and 5 hours on Saturday, or a week of 54 hours, in the first period under study. In the second period 9 hours were worked on 5 days and the 5-hour Saturday continued, making a 50-hour week. The bulk-packing and screw-wrapping departments made the opposite shift, that is, their hours were 50 per week in the first period and 55 per week in the second period with 5 days at 10 hours and 5 hours on Saturday. Minors employed for both full and part time could not work longer than a 9-hour day, 48-hour week and were therefore eliminated from the attendance tables. As their elimination reduced the screw-wrapping and bulk-hardware-packing department personnel to so few women that individual idiosyncrasies were not obliterated in the statistics, the data on attendance in these departments have been tabulated by combining the records of their 50-hour period with the 50-hour period in the light-hardware-packing department, and their 55-hour period with the 54-hour period of the larger department.

The 80 women packing under the 10-hour-day 54- or 55-hour-week schedules lost 11 hours per 100 possible man-hours of work. Nine-tenths of the women account for this total time lost. The average number of absences was over 5, and the average duration per absence was 6.7 hours. However, about 14 percent of the women lost 1 week or more of work during the 6 weeks studied. When the hours were reduced to 9-50, the time lost dropped 3 points to 8.2 hours per 100 man-hours of possible work. The average number of absences decreased from 5.5 to 3.6 per person. The

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours — Plant K

| Period studied and scheduled hours | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period [1] (10-54 or 55 hours) .... | 80 | 72 | 90.0 | 5.5 | 6.7 | 11.1 |
| 2d period [2] (9-50 hours) ..... | 78 | 69 | 88.5 | 3.6 | 7.1 | 8.2 |

[1] 55-hour schedule occurred in second period for bulk-packing and screw-wrapping departments.
[2] 50-hour schedule occurred in first period for bulk-packing and screw-wrapping departments.

Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended) — Plant K

| Period studied and scheduled hours | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| 1st period [1] (10-54 or 55 hours): | | | | | | | | | | | | | |
| Number | 80 | 69 | 11 | 8 | 1 | 1 | 1 | 80 | 10 | 40 | 18 | 12 | 49.4 |
| Percent | 100.0 | 86.2 | 13.8 | 10.0 | 1.3 | 1.3 | 1.3 | 100.0 | 12.5 | 50.0 | 22.5 | 15.0 | ..... |
| 2d period [2] (9-50 hours): | | | | | | | | | | | | | |
| Number | 78 | 75 | 3 | 2 | ..... | ..... | 1 | 78 | 8 | 38 | 21 | 11 | 45.7 |
| Percent | 100.0 | 96.2 | 3.8 | 2.6 | ..... | ..... | 1.3 | 100.0 | 10.3 | 48.7 | 26.9 | 14.1 | ..... |

[1] 55-hour schedule occurred in second period for the 16 women in bulk-packing and screw-wrapping departments.
[2] 50-hour schedule occurred in first period for the 18 women in bulk-packing and screw-wrapping departments.

average hours per absence increased slightly from 6.7 to 7.1. There were fewer long absences, though about a half of the women continued to lose one-half day or less a week.

The average length of the week worked by women packers in the weeks when they were in actual attendance under the 10-hour-day 54- or 55-hour-week schedule was 49.4 hours. Under the 9-50-hour schedule hours averaged 45.7 per week.

The decrease in time lost in the shorter hour-schedule period was more accentuated when only the light-hardware-packing department is reviewed. Here the hours lost per 100 possible man-hours of work dropped from about 12 to 7 1/2 as the hours dropped from 54 to 50 per week. During the weeks worked this department averaged 49 hours of work in the first period and 46 in the second. When a control group of women who worked every week in each period are considered, the average hours worked are raised each period by approximately 1 1/2 hours over the general average for the period. But even among this group average hours were only 50.6 in the 54-hour period and 47.4 in the 50-hour period.

Pay day occurred on Friday, for which reason the light-hardware-packing department worked a 9-hour Friday during the period when 10 hours were in effect for the first 4 working days of the week. In this department only 10 percent of the possible Saturday hours were lost in this period. When the workday became a 9-hour day 5 days a week, the Saturday time lost increased to 15.7 percent of possible Saturday time. But, even so, time out on Saturday accounted for about a fifth of all lost time in the 50-hour week and for about a tenth in the 54-hour week.

In the other two departments that operated on a 55-hour schedule rather than a 54-hour one, only 6.7 of possible Saturday hours were lost and this accounted for 7.2 percent of the total lost time. Under the 50-hour schedule 11.3 percent of possible Saturday hours were lost, accounting for 10.7 of the total time lost.

No record was kept by the firm on causes of absence. While medical service and facilities were available to workers, few women packers avail themselves of them. An occasional lacerated finger or foreign body in the eye took the woman to the first-aid room. There is little record of calls for nonindustrial illness.

Women interviewed in their homes, were asked the reasons for specific absences. The following replies indicate some of the causes of lost time:

> My mother-in-law with whom I live is quite old. She is not well. The days she is bad I stay home. My son has asthma. I have quite a bit of trouble with him at night. When I have been up with him several hours, it is about time to get up when I go to sleep, so I don't get up to go to work.
>
> My doctor is in the next town. So I have to take a half day off when I go to see him.
>
> Only absence I had was when I had my teeth pulled and, yes, when my son came home on furlough.
>
> I did spring house cleaning Wednesday through Saturday. I took several Saturdays off for shopping.
>
> Generally, when I am absent, it is because of sickness. I am absent a day or so a month.
>
> Mother died and I was out 2 weeks. Sometimes I stay out because I just get tired. Sometimes I am sick or a member of the family is sick.

On the whole, the women interviewed were definite in stating that they did not stay away from work unless they were sick or a member of the family was ill.

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Lateness was penalized at the rate of one-tenth of an hour for each lateness of 1 to 6 minutes. The workday began at 7 o'clock in both periods. At noon there was an hour lunch period during which some of the women went home to lunch. During the weeks studied in both the 54-55-hour and 50-hour periods from 49 to 55 out of every 100 women were late. The average number of days of lateness per woman was 2 in the 54-55-hour period and 3 in the 50-hour period. These figures may reflect the fact that in the 50-hour period a higher proportion of women actually worked some part of the days and weeks studied, so that there was a greater possibility for lateness. The lateness, whether in the morning or at noon, was 10 to 12 minutes in the light-hardware-packing department and 10 to 27 minutes in the other 2 departments. It accounted for but a fraction of the total time lost during either period studied .

## PRODUCTIVE EFFICIENCY

### Nature of the Job

The women workers whose performance was studied in Plant K were engaged in the hand operation of packing builders' hardware. The light-hardware-packing department was the largest of the three studied, and the majority of women worked on conveyor lines and a few at benches. When orders were large, the packing was done on the conveyor line, each packed box being slid down a chute to a moving belt that carried the boxes to "end-girls" who weighed, stacked, labeled, and stenciled the boxes. When orders were small, packing was done at tables, the packers doing the labeling, taping, and stacking, in addition to the packing. Parts were packed singly, in pairs, by the dozen or half dozen, or in sets. When packing items consisting of many parts, the packing was sometimes done by a team of 2 or 3 workers. The average items packed in this department weighed 2 or 3 pounds, 6 pounds being the maximum. Speed was important on this job. Consequently women had to have finger dexterity and to be ambidextrous, working quickly and well with both hands at the same time.

In a second department bulkier items were packed in large cardboard boxes, wooden boxes, and barrels. Men performed all the bulk packing in big wooden boxes and barrels. Women did all of the lighter packing; although some boxes packed by them weighed as much as 12 pounds, the average box weighed 8 pounds. Truckers brought materials to and from the women so they did no heavy lifting. The women packed at benches and on one short conveyor line. All workers in this department stood because large items are packed faster and better when standing, but stools were available. Sturdier women were employed in this department because of the heavier work requiring more arm and hand dexterity than finger dexterity.

A third and smaller group were employed chiefly in wrapping screws in tissue paper. The work was very light, monotonous, highly repetitive with almost no variation. Two to four screws were picked up in each hand and placed in position on a small square of tissue paper, heads alternately to left and right, to form a square package, and the tissue paper folded under. At the rapid rate of one package every 5 to 15 seconds, the greatest eye and hand coordination and finger dexterity was required.

Although the kinds of packaging were numerous and conveyor lines sometimes averaged four job changes a day, all the work was monotonous. Because of the coordination required to insure speedy performance, foremen reported 6 to 8 months as necessary before the light-hardware packers

needed no "make-up" to bring their earnings to the guaranteed minimum. Screw wrapping and bulk packing required 3 to 4 months to learn, according to overseers.

### Method of Wage Payment on the Job

Packers were paid on an individual piece-rate basis with a guaranteed minimum of 50 cents an hour, except that the few conveyor-line packers in the bulk-packing department were paid on a group-output basis, and the 2 to 4 "end girls" doing the labeling, stenciling, weighing, taping, and so forth, at the end of each light-hardware-conveyor line were paid on the basis of the total output of the line. The standard base rate in establishing piece-rate prices was the same for all jobs except that of the "end girls" who had a 3-cent higher standard base rate. On special, short, packing jobs, payment was frequently made on an hourly basis.

There was no waiting time except for conveyor-line packers, who had short waits when a new packing job was being set up or when they were shifted to another conveyor-line. They were given a change allowance for this time, paid at the same standard base rate used in setting piece rates. If defective parts were found while packing, a scrap premium was paid the finder.

### Performance on the Job

Piecework earnings of individuals were used as the measurement of individual production in Plant K. From statements made by management and workers, every effort was made by management to set equitable rates on the many different types of packing. When there were repeated complaints regarding the rates on a particular job, the job was retimed and, if warranted, a new rate established. The facts that women liked or disliked varying types of jobs and that there was no consensus concerning the jobs which paid best would indicate that management succeeded both in timing jobs equitably and in distributing disliked jobs among many rather than concentrating them among a few.

Each day the women turned in job tickets listing the work done and the following day timekeepers gave them a slip stating how much they had earned. This system did not permit holding back tickets on good production days to submit on poor production days to bring up the record.

Only adult women on piecework production were, as stated earlier, included in the study of productive efficiency; minors who worked no more than 48 hours, part-time workers, and a few elderly workers paid on a time basis were excluded. All other women in the occupations studied were included. Any moneys paid pieceworkers on an hourly basis, scrap premiums, and make-up payments to bring earnings to the guaranteed minimum are omitted from the piecework-earning figures used to measure efficiency.

### Performance on the Job — Light-Hardware Packing Department

The pieceworkers in the light-hardware-packing department included in the study actually worked 49.2 hours in the 10-54-hour period and 45.8 hours in the 9-50-hour period. (See section on Attendance Record.) However, many worked the full 10 hours a day or 9 hours a day during most of the days on which they reported for work. Consequently, while a comparison of their production records cannot be considered a comparison of the 54-hour and a 50-hour workweek, they may be considered a comparison of a 10-hour versus a 9-hour workday.

While on the job, these light-hardware packers lost almost 3 hours per week in each period while waiting for a job set-up or while on work paid by the hour rather than by the piece. During the 46.2 hours on piecework in the 10-hour period, they averaged 61.6 cents per hour; during the 43 hours on piecework in the 9-hour period they averaged 63.4 cents per hour. Further examination of table III reveals the influence of experience on these group production figures. With less than 6 weeks' experience, piecework earnings averaged less than 40 cents an hour. At the 6 months' point they exceeded 50 cents. Not until a year's experience was attained did they exceed 60 cents an hour. Consequently higher earnings under the shorter hour schedule can be attributed, at least in part, to a smaller proportion of inexperienced workers in this group than worked under the longer-hour schedule.

The experienced women on light-hardware packing actually made about the same, 69-70 cents, under both the 10-54-hour schedule and 9-50-hour schedule. Their total weekly hours did not exceed 50 nor their piecework hours 46.2 per week in either period. They had "goals" they attempted to achieve each week, usually expressed in terms of hourly earnings. The majority interviewed expected to earn 65 to 75 cents an hour. A few placed their goal just below 81 cents an hour, considered by some women to be the plant maximum. These women stated that they believed the job rate would be cut if they went over this amount on any job. However, it was the exceptional woman rather than the majority who earned as high as 81 cents an hour, and it is doubtful that production was curtailed to any extent by the prevailing idea of a limitation on earnings.

Efficiency under the 10-54-hour and under the 9-50-hour schedule of a stable group of women was compared. (The group was composed of those who had worked in each week of each period studied.) Those with a year or more experience in the light-packing department averaged 71.3 cents per hour under the 10-54-hour schedule when on piecework 48.5 hours and in the plant 51.2 hours per week. They averaged 72.9 cents per hour under the 9-50-hour schedule when on piecework 44 hours and in the department 47.9 hours.

#### Performance on the Job — Bulk-Packing and Screw-Wrapping Departments

The bulk-packing and screw-wrapping departments employed only 16 adult women in the periods studied. Much time was on special packing jobs paid by the hour, away from piecework, in both periods—most noticeably so under the shorter hour period; opportunity for increasing earnings was therefore less than under the longer hour schedule. The group as a whole worked 44.9 and 51 hours in the 9-50- and 10-55-hour periods, respectively. The hours on piecework were only 34 and 45.9, respectively, or 75 percent and 90 percent of the total hours worked. This increase in proportion of piecework hours resulted in a slight increase in earnings of 1 1/3 cents per hour under the longer-hour schedule. The experienced women also increased their earnings, from 61.7 cents to 66.2 cents, but again there was an increase in the proportion of hours on piecework, from 78 percent of total hours worked under 50 hours to 85 percent under 55 hours.

The more stable women in the bulk-packing and screw-wrapping departments, that is, those who had worked on piecework every week studied, earned 62 cents when on piecework 38.1 hours out of a total of 47.7 hours under the 9-50-hour schedule; they earned 65.3 cents when on piecework 47.7 out of a total of 52.2 hours under the 10-55-hour schedule. But again,

## Table III. — Individual Efficiency by Length of Experience in Occupation, Under Different Scheduled Hours, by Occupation — Plant K

| Occupation, period studied, and scheduled hours | Length of time in occupation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | | | | 1 year or more | | | |
| | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) |
| Light packing: | | | | | | | | |
| 1st period (10-54 hours) | 49 | 49.2 | 46.2 | 61.6 | 34 | 50.0 | 46.2 | 69.6 |
| 2d period (9-50 hours) | 46 | 45.8 | 43.0 | 63.4 | 36 | 46.6 | 43.2 | 69.0 |
| Bulk packing and screw wrapping: | | | | | | | | |
| 1st period (9-50 hours) | 16 | 44.9 | 34.0 | 58.6 | 10 | 47.2 | 36.7 | 61.7 |
| 2d period (10-55 hours) | 16 | 51.0 | 45.9 | 59.9 | 9 | 52.5 | 44.7 | 66.2 |

| Occupation, period studied, and scheduled hours | Length of time in occupation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 months, less than 1 year | | | | 6 weeks, less than 6 months | | | | Less than 6 weeks | | | |
| | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) |
| Light packing: | | | | | | | | | | | | |
| 1st period (10-54 hours) | 2 | 50.9 | 45.9 | 53.2 | 4 | 47.7 | 46.6 | 51.4 | 9 | 46.3 | 46.3 | 37.6 |
| 2d period (9-50 hours) | 4 | 44.5 | 43.1 | 56.6 | 5 | 41.0 | 41.0 | 35.3 | 1 | 45.0 | 45.0 | 31.0 |
| Bulk packing and screw wrapping: | | | | | | | | | | | | |
| 1st period (9-50 hours) | ..... | ..... | ..... | ..... | 4 | 46.7 | 33.6 | 55.0 | 2 | 29.5 | 20.9 | 50.0 |
| 2d period (10-55 hours) | 4 | 45.6 | 42.9 | 48.3 | 2 | 53.1 | 52.7 | 59.6 | 1 | 55.0 | 55.0 | 49.2 |

for them as for the group as a whole, there was an increase in the proportion of time on piecework under the longer hours.

With only a few exceptions women workers believed they worked more efficiently on the 9-hour day when they worked until 5 p. m. than on the 10-hour day when they worked until 6. Quite generally it was stated that they were more noticeably tired on a 10-hour day. This tiredness set in "from Thursday on" for most women. The time of day at which tiredness was felt varied with the individual. A few stated that it was hard to get going in the morning but the majority said they got tired in the afternoon—some from 2 to 4 p. m., but most at 5.

### Performance on the Job — Summary

Minors, part-time workers, and the workers paid an hourly rate were eliminated from tables on production of the group as a whole just as was done in reviewing individual efficiencies. Considering pieceworkers only, at the time scheduled hours of light-hardware packers were decreased by 4 hours a week, from 54 to 50, the number of workers also decreased, so that the possible man-hours were 85.5 percent of possible hours in the 10-54-hour period. The man-hours actually worked were 87.4 percent of those possible in the earlier period, however. While hours on piecework dropped to 87.8, the average efficiency increased to 106.1, owing to fewer inexperienced women. This increased efficiency made up in part for the decreased man-hours of work, so that total output remained in line in spite of the decrease in numbers of women employed.

In the bulk-packing and screw-wrapping departments the possible man-hours increased in proportion to the increase in scheduled hours from 9-50 per week to 10-55 per week, the number of workers remaining the same. The hours on piecework increased materially, 32 percent. With a maintenance of individual efficiency, total production gained in proportion to the increase in piecework hours.

The loss or gain in over-all production in the 2 periods is due obviously to the decrease in numbers employed or to the increased time on piecework in the respective departments under study.

Table IV. — Summary of Possible Man-hours, Total Man-hours Worked, Total Man-hours Worked on Incentive Jobs, Efficiency, and Total Production, Based on Totals for All Women Studied, Under Different Scheduled Hours, by Occupation — Plant K

| Occupation, period studied, and scheduled hours | Index numbers of— | | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of women | Scheduled hours | Possible man-hours | Total man-hours worked | Total man-hours worked on incentive jobs | Efficiency (average hourly production) | Total production |
| Light packing: | | | | | | | |
| 1st period (10-54 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period (9-50 hours) | 93.9 | 92.6 | 85.5 | 87.4 | 87.8 | 106.1 | 93.2 |
| Bulk packing and screw wrapping: | | | | | | | |
| 1st period (9-50 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period (10-55 hours) | 100.0 | 110.0 | 116.5 | 115.6 | 131.8 | 101.3 | 133.7 |

# HOSIERY MILL OPERATORS (LOOPERS, SEAMERS, AND TRANSFER TOP KNITTERS) — PLANTS L AND M

## INTRODUCTION

The appeal of munitions plants for women workers created shortages of labor in factories producing mainly for civilian consumption that had always employed many women. Such industries as the hosiery industry developed bottlenecks in occupations for which women were not easily recruited or quickly trained. In both northern and southern hosiery mills looping was such an occupation. Still a highly monotonous hand task requiring excellent eyesight, nimble fingers, and speed, beginners at it did not attain proficiency until after many months.

In 1942 and 1943 the two hosiery mills included in this study first began to request their loopers to work more than the previously scheduled 40 hours a week. Plant L, a full-fashioned-hosiery mill in the North, first added an hour to the 8-hour day for 4 days and sometimes, when the looping department was behind in its production schedule, requested even longer hours on all 5 days a week.

Weeks in which loopers had a schedule of 9 hours for 5 days were finally chosen as a second period for study to contrast with the period in which an 8-40-hour schedule was in effect.

Plant M, a seamless hosiery mill in the South, gradually increased weekly hours from 40 to 48, and then to 50. Later women were urged to work the State legal limit of 10 1/2 hours a day and 57 hours a week, but they were permitted to adjust their daily schedule to suit their own convenience. As the plant was open at night, women could work at any time. Loopers were not counted absent if they had worked 40 hours during the week and were paid a 2-percent attendance bonus if they worked 48 or more. Examination of the pay roll showed individual women often effected a weekly pattern of hours worked even though there may have been no daily pattern of hours. No pattern of hours was discernible for the department as a whole after hours were increased to over 50. Consequently, experienced women who had a 56- to 57-hour weekly pattern and others who had developed a 52- to 55-hour weekly pattern were selected for study. These women had also worked an 8-40-hour schedule in 1942 and a 50-hour schedule in 1943. Under the 50-hour schedule daily hours varied, but the most usual pattern of hours was 4 days of 8 hours and 2 days of 9 hours. A few women did work 5 days of 9 hours and 5 hours Saturday, but this schedule was less common. The majority included in the study had worked the 50-hour schedule as well as the later 52-55-hour or 56-57-hour schedule. A few included had worked only the 40- and the 50-hour schedules.

For purposes of further comparisons, a woman-employing occupation in addition to looping was chosen in each plant. In Plant L, the full-fashioned-hosiery mill in the North, seamers were studied under a 40-hour schedule in 1942 and under a 46-hour schedule of 9 1/2 hours on 4 days and 8 hours on Friday in 1944. In Plant M, the seamless-hosiery mill in the South, transfer top knitters were studied under an 8-40-hour week and 8-48-hour week. A summary of the groups, periods, and hours studied in each plant follows.

| *Period* | *Schedule* |
|---|---|
| **PLANT L (NORTHERN PLANT)** | |
| *Loopers* | |
| *1st period:* | |
| February–March 1943 (6 weeks)<br>8-hour day, 5-day 40-hour week | 7:30 a.m.–4:15 p.m.<br>(45-minute lunch period) |
| *2d period:* | |
| September–October 1944 (6 weeks)<br>9-hour day, 5-day 45-hour week | 7:30 a.m.–5 p.m.<br>(30-minute lunch period) |
| *Seamers* | |
| *1st period:* | |
| August–October 1942 (6 weeks)<br>8-hour day, 5-day 40-hour week | 7:30 a.m.–4:15 p.m.<br>(45-minute lunch period) |
| *2d period:* | |
| March–April 1944 (6 weeks)<br>9½ hours on 4 days, 8 on 1 day, 5-day 46-hour week | 7:30 a.m.–5:30 p.m.<br>(30-minute lunch period) |
| **PLANT M (SOUTHERN PLANT)** | |
| *Loopers* | |
| *1st period:* | |
| January–February 1942 (5 weeks)<br>8-hour day, 5-day 40-hour week | 7 a.m.–3:30 p.m.<br>(30-minute lunch period) |
| *2d period:* | |
| March–April 1943 (5 weeks)<br>8 hours on 4 days, 9 hours on 2 days, 6-day 50-hour week | 7 a.m.–3:30 or 4:30 p.m.<br>(30-minute lunch period) |
| *3d period:*[1] | |
| October 1943–May 1944[2] (5 weeks)<br>52-55-hour week | Daily hours varying—maximum of 10½ daily |
| *4th period:*[1] | |
| October 1943–May 1944[2] (5 weeks)<br>56-57-hour week | Daily hours varying—maximum of 10½ daily |
| *Transfer top knitters* | |
| *1st period:* | |
| January–March 1942[2] (5 weeks)<br>8-hour day, 5-day 40-hour week | Day shift: 6:30 a.m.–3 p.m.<br>(30-minute lunch period)<br>Night shift: 3 p.m.–11:30 p.m.<br>(30-minute lunch period) |
| *2d period:* | |
| January–February 1943[2] (5 weeks)<br>8-hour day, 6-day 48-hour week | Day shift: 6:30 a.m.–3 p.m.<br>(30-minute lunch period)<br>Night shift: 3 p.m.–11:30 p.m.<br>(30-minute lunch period) |

[1] 4th period is combined with 3d period in most tables.
[2] Dates of period are for majority of workers studied. Consecutive weeks were selected for each woman but dates of weeks studied varied for individuals.

No woman in Plant M was included in the study unless she had reached a level of production considered her norm, hence data are for a selected group of women who had attained proficiency in their work. The study of this plant is primarily one of production of individual, experienced women under their chosen hour schedules, rather than one of attendance and production, under fixed hour schedules, of a variously experienced group of women, such as was made in other plants.

Plant L was a union shop, and many conditions of work were set by union agreement. For example, employees were classified as learners, probationary workers, substandard workers, spare workers, and experienced workers. Women in the first three classifications could not work in excess of 40 hours a week. When a learner or a probationary worker, who was a newly hired experienced worker, was able to maintain the departmental average of production and required no make-up to reach the minimum wage allowance, she was allowed to work the hours of experienced workers in

the department. Substandard workers, or those who consistently were unable to maintain the department average of production, were not permitted to work more than 40 hours. A "spare" worker was an experienced part-time worker who did not work a definite schedule. She could not have a permanent position or be assigned a machine but filled in wherever and whenever there was need. In the first period studied there were only 3 women in the looping department and 7 in the seaming department who fell in any of these categories and in the second period 17 in the looping department and 19 in the seaming department. These women were not included in attendance tables because of the restrictions placed on their hours, but they are included in the production tables.

Plant M, a nonunion plant, employed many learners and placed machines in homes of women whose household duties would not permit them to work at the plant. No learners or home workers were included in the study of Plant M.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

### THE HOUSEHOLD AND HOME RESPONSIBILITIES

Very few of the women studied in Plants L and M were under 25 years of age. Over four-fifths were 30 years of age or older. Both plants employed women over 50 years of age. The majority of women had been employed 5 years or more, and many 10 years or more, which accounts, in part, for the hour-schedule privileges accorded these women by plant management.

About two-thirds or more of the women were or had been married and most of them, as did many single women, lived in family groups. Some women maintained separate housekeeping rooms, but only a few roomed and boarded out. Relatively few had children under 14 years of age. The usual household was made up of husband and wife alone or husband and wife with children 14 or more years of age or with a parent or other older relative. One-half of the Plant L women studied had the full responsibility for their households and did the major part of the housework, and this was true of one-fifth of the women studied in the southern plant. Southern households had more adults than northern ones, and housework could be more easily shared among them. However, the proportion of single women who took care of their own room and laundry and only helped with other household tasks was larger in the northern than in the southern plant.

Examples of home duties in different types of families illuminate the demands upon women workers.

#### Northern Households

Mrs. J., a wife 40 years of age, whose daughter-in-law was living with her and her husband, described her day as follows:

> I always get up at 5:45 to make my husband's lunch and get his breakfast. After breakfast I dash off to be at the factory at 7 o'clock. Under the 9½-hour day I tried to slip out at noon to do my food shopping because the stores were closed at night. My husband got home at 4:15 and would have to wait until I got home at 5:45 and got his supper. Some nights he was mad.

Another mother had the help of her 16-year-old daughter in the second period.

> My daughter had the supper on the table when I got home at 6 o'clock, and she did all the shopping. When I got home at 4:45, she set the table and I did the cooking. In both periods I sent the men's shirts and flatwork out to be laundered; my daughter did her own laundry and I did mine.

Husbands of many workers arrived home before their wives in this section. The lateness of the evening meal, resulting from the longer factory hours of the working wife was the subject of many complaints. One woman said she had a big house to care for, but what caused her to leave the plant under the 9½-hour day was the difficulty in getting her husband's dinner. Under the 8-hour day she got home by 4:45 p. m. and had dinner ready when he got home. Under the 9 1/2-hour day they reached home together. "My husband likes his meals on time, so he persuaded me to quit work."

Some women solved the late meal problem by cooking the meal the night before it was to be served; a very few families solved it by eating out.

### Southern Households

Mrs. D.'s household was made up of herself, her daughter with two young children, her daughter-in-law, and a disabled nephew 19 years of age. A son and a son-in-law were in the armed services and sent allotments home. All Mrs. D.'s earnings went to household expenses. She took the general responsibility for the household and also did marketing, cooking, cleaning, and laundry work, and tried to sew and mend the children's clothes. Her day was from 5 a. m. to 10 p. m. regardless of whether she worked 8 or 10 hours at the factory.

> I could do my work at home when I worked 40 hours a week. Working longer hours you let a lot of work at home go.

Mrs. M. lived with her husband and two daughters aged 15 and 18. She did all the household work, including mending. When she worked 10 1/2 hours at the plant she

> only had time to get something to eat and go to bed. Then I had to do all my housework Saturdays and Sundays. I didn't feel like doing anything... I was late sometimes because I didn't feel like getting up, and I just slept. I made up my time when I got to the mill; if I meant to work 9 or 10 hours I worked till I got my 9 or 10 hours in.

A transfer knitter who had worked both the 40- and 48-hour week said:

> When I have Saturday free, I clean the kitchen and bathroom, wash and iron. Then I wax the floors, go to the grocery store, and pay my bills. When I work Saturdays I just pay my bills the best I can during the week. I have to use Sunday for my housecleaning. I get up and go to Sunday school and church and then do my housework Sunday afternoon. Then I don't have any day of rest at all.

The northern women complained that longer hours "increased shopping problems." "The week end is sacrificed to housework." "Home sewing and reading newspapers had to be given up because my eyes did not hold out." "I seldom went out at night when I worked longer hours," was stated repeatedly. Lack of recreation was also commented on by the southern women, but the freedom to come to work as they pleased and a commissary at the plant took care of the shopping problem.

## WORKERS' OVER-ALL DAY

In the northern city most of the women workers reached the factory by trolley, the round trip requiring an hour for many, although a longer time was needed by others. In the southern city half of the women interviewed walked to work, as the plant was within 30 minutes from their homes. The others came by bus, their round trip requiring from 1 to 2 1/2 hours each day.

The time away from home for most of the Plant L women was 9 to 10 hours under the 8-hour schedule, increasing to 10 and 11 hours for loopers and 11 to 12 hours for seamers as their respective hours were extended to

9 and 9 1/2. Under the 8-40-hour schedule in Plant M some reported an over-all day of 9 to 10 hours and others 10 to 11 hours, the variations being due to differences in the distances they lived from the plant. Under the 50-hour schedule, 11 to 12 hours away from home were the most common. As more women began to work 10 1/2 hours a day, the over-all day increased to as high as 13 to 14 hours away from home.

Southern women interviewed rose early, 4:30 and 5 a. m. being the usual hour reported under each working schedule. There was much variation in retiring hour in each period. However, the larger number in each period had a 16- to 17-hour day. The proportion reporting days of 17 to 19 hours increased as the length of their working day increased.

While some northern women arose as early as southern women, 5:45 to 6 a. m. were their more usual rising hours. Among them too, the bedtime hour varied. A very noticeable group went to bed earlier under the 9 1/2-hour day than under the 8-hour day because of weariness, but the majority kept the same retiring hour. Under the 8-hour day a third had a 17- to 18-hour day, 42 percent a 16- to 17-hour day, while one-fourth had less than a 16-hour day. When hours were 9 or 9 1/2 per working day, only one-fourth stayed up to make the day one of 17 or 18 hours, one-third had a 16-17-hour day, and 42 percent less than a 16-hour over-all day.

## WORKERS' PREFERRED FACTORY HOURS

### PREFERRED HOURS

Without exception, every woman from Plant L interviewed preferred the 5-day week. Almost three-fourths preferred an 8-hour day, the rest desiring from 6 to 7¼ hours. No one desired a 9-hour day. The 8-hour day, 40-hour week has been traditional in the full-fashioned hosiery industry. Wartime shifts to longer hours were not regarded as desirable practice by loopers and seamers employed in this northern plant.

Thirty-seven percent of the Plant M women interviewed preferred a 5-day week, 37 percent a 5½-day week, and 26 percent the 6-day week. Forty percent wanted an 8-hour day; 33 percent preferred various combinations of 9- and 9½-hour days, with 7½- and 8-hour Saturdays; and 22 percent asked for a 10- or 10½-hour day. Weekly hours desired ranged from 40, voted by 30 percent of the women interviewed, to 57, voted by 11 percent. The reasons for these differences in preference were financial. Some women had working husbands whose earnings were supplemented by their own. In other households the husband was not present or was not a regular worker. In addition to children of their own 14 or more years of age, nieces and nephews, there were fathers and mothers and in-laws to support. These women workers usually used all their earnings for family household expenses.

In the words of one looper:

> The chief reason I prefer the longer day is that I earn enough to keep myself and to keep my 15-year-old daughter in school. If it were not for that, I would prefer an 8-hour day.

An efficient looper said:

> The overtime affects my attendance because our pay is almost double when we work those overtime hours. If I worked just 40 hours a week, I would make about $35. If I work 55 hours, I get $55. It's the overtime pay and bonuses that causes the girls to want longer hours.

Said a knitter:

> When I know I am going to get overtime, I am going to get to work even if I have to let my housework go. It may mean that dress, or a little more money for something you have been planning for, that you can't get without overtime pay.

Had longer hours not been a matter of financial necessity, 63 percent would have preferred a 40-hour workweek, and 26 percent a 45-hour week.

### GROSS EARNINGS IN RELATION TO HOURS

In this connection gross earnings under different hour schedules in the southern plant (Plant M) are important. When experienced loopers worked the 8-hour day 40-hour week, their gross earnings averaged $17.20 a week. When hours were increased to 50, which brought 10 additional hours at the overtime rate of time and one-half, they earned $25.57. When asked to work up to 57 hours, those choosing to work 52 to 55 hours earned $30.87, and those working 56 to 57 hours earned $33.25. Among experienced transfer knitters the change increased their average earnings from $17.59 under the 40-hour week to $25.13 under the 48-hour week.

Under the 8-40-hour schedule in the northern plant (Plant L) the experienced loopers averaged $26.37 a week, and seamers averaged $28.14. In the second period loopers received 5 hours' and seamers 6 hours' overtime at time and one-half under their respective 45- and 46-hour schedules. The loopers averaged $31.20 a week in the second period and the seamers $33.89. Only about one-seventh of those interviewed said that they tried to come to work 9 or 9½ hours because they needed the increased pay that overtime gave. The others said overtime pay did not influence their attendance.

The higher earnings possible in the northern plant under the 40-hour week, as compared to the southern plant unquestionably influenced the work schedule preferences expressed by these hosiery workers.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD — PLANT L

Under the 5-day schedule of 8 hours, experienced loopers and seamers in Plant L lost 8.5 hours per 100 possible man-hours of work. Absences were incurred by almost two-thirds of the women, who averaged 2.3 absences of 13.9 hours each. Under the 9- or 9½-hour schedule, hours lost were almost double, being 16.1 per 100 possible man-hours of work. The number of women who incurred absences increased, and the number of absences per woman increased to 4. The length of absence decreased somewhat.

Under the 9- and 9½-hour schedules more women had losses of 1 week or more and more women averaged over a day out each week during the weeks they reported for work than under the 8-hour schedule. The number of women who lost no time in weeks they reported for work decreased from 38.5 percent in the first 40-hour-week period to 17.4 percent in the second 45- and 46-hour-week period.

Loopers lost fewer hours than seamers in both periods. Loopers' time lost increased from 7.6 to 11.4 hours per 100 possible man-hours as scheduled hours were increased from 40 to 45 per week, and seamers' time lost increased from 9.1 to 18.7 hours as their hours advanced from 40 to 46 per week. In both occupations a larger proportion of women lost time and

a larger proportion had long-term absences of a week or more as hours increased.

In the 40-hour period all the loopers and seamers studied averaged 37.8 hours during weeks they reported for work, under the 45-hour schedule for loopers and 46-hour schedule for seamers, they averaged 41.3 hours during weeks attended.

Of a "control" group of more stable women who were at work sometime in every week in both periods, almost 50 percent lost no time in the first period, while only 20 percent lost no time in the second period. In both periods, most of their absences averaged one day or less.

When women were interviewed in their homes concerning lost time, they indicated full awareness that they were taking off more time under the longer hour schedule. About half the women gave as the reason that they were tired and needed time to rest, while an equal number attributed their absences to colds, headaches, or other forms of illness. Only a few reported that they took time off to catch up on housework or for personal business.

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Occupation — Plant L

| Period studied, scheduled hours, and occupation | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period (8-40 hours) | 222 | 141 | 63 5 | 2.3 | 13.9 | 8.5 |
| 2d period (9-45; 9½-46 hours) | 180 | 151 | 83.9 | 4.0 | 12.8 | 16.1 |
| Loopers: | | | | | | |
| 1st period (8-40 hours) | 84 | 47 | 56.0 | 2 1 | 15.1 | 7.6 |
| 2d period (9-45 hours) | 66 | 53 | 80.3 | 4.3 | 8.6 | 11.4 |
| Seamers: | | | | | | |
| 1st period (8-40 hours) | 138 | 94 | 68.1 | 2.4 | 13.3 | 9.1 |
| 2d period (9½-46 hours) | 114 | 98 | 86.0 | 3.9 | 15.3 | 18.7 |

## ATTENDANCE RECORD — PLANT M

The loopers and knitters chosen for study in Plant M were women who had attained their level or norm of efficiency prior to any period included in the study and who had worked contrasting schedules of hours for at least 5 weeks in the periods reviewed. In other factories either all women employed in specific occupations, or women employed a minimum number of weeks in the period studied, were considered, irrespective of their level of efficiency. Comparison, therefore, cannot be made of the attendance record of this limited group of women in Plant M with that of other plants. Because weeks, as well as persons, were specially selected, there is little lost time of a week or more among loopers or transfer knitters in Plant M in the period studied.

During weeks worked under the 8-40-hour schedule, less than a third of the loopers had some lost time. Lost time averaged but 7/10 of an hour a week for the group; that is to say, this selected group worked 39.3 hours out of a possible 40. Under the 50-hour schedule of usually four 8-hour days and two 9-hour days, 85 percent lost some time, which averaged 2 1/2 hours per week. The average hours worked under the 50-hour schedule were 47.5 per week.

Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Occupation — Plant L

| Period studied, scheduled hours, and occupation | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | 4 weeks | 5 weeks | 6 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was— | | | Average hours worked per week in weeks attended |
| | | | | | | | | | | | | ½ day or less | Over ½ day and including 1 day | Over 1 day | |
| 1st period (8-40 hours): | | | | | | | | | | | | | | | |
| Number | 222 | 196 | 26 | 17 | 5 | 2 | ..... | 1 | 1 | [1]221 | 85 | 98 | 29 | 9 | 37.8 |
| Percent | 100.0 | 88.3 | 11.7 | 7.7 | 2.3 | 0.9 | ..... | 0.4 | 0.4 | 100.0 | 38.5 | 44.3 | 13.1 | 4.1 | ..... |
| 2d period (9-45; 9½-46 hours): | | | | | | | | | | | | | | | |
| Number | 180 | 140 | 40 | 19 | 10 | 3 | 3 | 3 | 2 | [1]178 | 31 | 90 | 32 | 25 | 41.3 |
| Percent | 100.0 | 77.8 | 22.2 | 10.5 | 5.5 | 1.7 | 1.7 | 1.7 | 1.1 | 100.0 | 17.4 | 50.6 | 18.0 | 14.0 | ..... |
| Loopers: | | | | | | | | | | | | | | | |
| 1st period (8-40 hours): | | | | | | | | | | | | | | | |
| Number | 84 | 78 | 6 | 3 | ..... | 2 | ..... | ..... | 1 | [1]83 | 37 | 32 | 13 | 1 | 38.1 |
| Percent | 100.0 | 92.9 | 7.1 | 3.6 | ..... | 2.4 | ..... | ..... | 1.2 | 100.0 | 44.6 | 38.6 | 15.7 | 1.2 | ..... |
| 2d period (9-45 hours): | | | | | | | | | | | | | | | |
| Number | 66 | 56 | 10 | 5 | 3 | ..... | 1 | 1 | ..... | 66 | 14 | 35 | 14 | 3 | 42.0 |
| Percent | 100.0 | 84.8 | 15.2 | 7.6 | 4.5 | ..... | 1.5 | 1.5 | ..... | 100.0 | 21.2 | 53.0 | 21.2 | 4.5 | ..... |
| Seamers: | | | | | | | | | | | | | | | |
| 1st period (8-40 hours): | | | | | | | | | | | | | | | |
| Number | 138 | 118 | 20 | 14 | 5 | ..... | ..... | 1 | ..... | 138 | 48 | 66 | 16 | 8 | 37.7 |
| Percent | 100.0 | 85.5 | 14.5 | 10.1 | 3.6 | ..... | ..... | 0.7 | ..... | 100.0 | 34.8 | 47.8 | 11.6 | 5.8 | ..... |
| 2d period (9½-46 hours): | | | | | | | | | | | | | | | |
| Number | 114 | 84 | 30 | 14 | 7 | 3 | 2 | 2 | 2 | [1]112 | 17 | 55 | 18 | 22 | 40.8 |
| Percent | 100.0 | 73.7 | 26.3 | 12.3 | 6.1 | 2.6 | 1.8 | 1.8 | 1.8 | 100.0 | 15.2 | 49.1 | 16.1 | 19.6 | ..... |

[1] Totals are less than total number of women studied because some women were absent all 6 weeks studied in a period.

Transfer top knitters were on 2 shifts. When the workweek was advanced to 48, an 8-hour Saturday was added. The selected group studied averaged 38.4 hours under the 40-hour schedule and 46.6 hours under the 48-hour schedule. This experienced group studied had a better attendance record than the department as a whole. Over-all figures revealed that the total of 54 transfer knitters employed under the 40-hour schedule in the 5 weeks studied averaged 36.8 hours. The total of 77 employed under the 48-hour schedule averaged 44.2 hours during the 5 weeks studied.

Table III. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Occupation — Plant M

| Period studied, scheduled hours, and occupation | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100-possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period | 47 | 20 | 42.6 | 1.7 | 7.3 | 2.7 |
| Transfer top knitters (8-40 hours) | 18 | 11 | 61.1 | 1.5 | 9.1 | 4.1 |
| Loopers (8-40 hours) | 29 | 9 | 31.0 | 2.0 | 5.7 | 1.8 |
| 2d period | 76 | 60 | 78.9 | 3.5 | 4.7 | 5.3 |
| Transfer top knitters (8-48 hours) | 16 | 9 | 56.3 | 2.0 | 6.1 | 2.8 |
| Loopers (8- and 9-50 hours) | 60 | 51 | 85.0 | 3.7 | 4.6 | 5.9 |

When management advised loopers that they could work a maximum of 10 1/2 hours a day and 57 hours a week, choosing any combination of daily hours, the response of experienced loopers, as shown on table IV, is revealing. Out of a possible total of 1,440 man-days, these women worked all but 23. The days missed were chiefly Saturdays, and when the women did work Saturdays, almost half worked less than 8 hours.

On Monday, the largest proportion worked 9 hours. On Tuesday, Wednesday, and Thursday, more than half worked 10 or 10 1/2 hours. By Friday a number had dropped back to the 9- or 9 1/2-hour schedule and more worked 8 1/2 hours or fewer hours than on any earlier day of the week. During the 5 weeks included in the study, therefore, 25.3 percent of the man-days had been 9-hour days, 21.8 percent 10 1/2-hour days, 17 percent 10-hour days, 14.7 percent 8-hour days.

Unquestionably, by permitting loopers to work any time from 6:30 or 7 a. m. to 11:30 p. m., the plant did succeed in increasing the total hours worked by the experienced women studied. The women workers' own statements about the adjustments made are interesting. Typical was:

> If I have to go to town say on Monday morning to see about something, I will go in to the mill at 12:30 and work my 9 hours. I usually do what I have to do early in the week, and that gives me a chance to make up the hours I lose before the end of the week. This makes it nice for us and I try to keep up my work on account of their being nice to me.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

Though one mill produced women's full-fashioned rayon hose and the other seamless hose such as men's socks, children's hose, and misses' anklets of cotton, rayon and wool, the operation of looping in both plants was

Table IV. — Distribution of the Hours 48 Loopers Worked Each Day of the Week When Permitted to Work up to 10½ Hours per Day and 57½ Hours per Week — Plant M

| Hours worked per day | Total man-days | | Number of man-days by specified hours worked on— | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Monday | | Tuesday | | Wednesday | | Thursday | | Friday | | Saturday | |
| | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent |
| Total possible man-days | 1,440 | 100.0 | 240 | 100.0 | 240 | 100.0 | 240 | 100.0 | 240 | 100.0 | 240 | 100.0 | 240 | 100.0 |
| Man-days not worked | 23 | 1.6 | 5 | 2.0 | ..... | ..... | 2 | .9 | 2 | .9 | 1 | .4 | 13 | 5.4 |
| Total man-days worked | 1,417 | 98.4 | 235 | 98.0 | 240 | 100.0 | 238 | 99.1 | 238 | 99.1 | 239 | 99.6 | 227 | 94.6 |
| Total man-days worked | 1,417 | 100.0 | 235 | 100.0 | 240 | 100.0 | 238 | 100.0 | 238 | 100.0 | 239 | 100.0 | 227 | 100.0 |
| Less than 8 hours | 136 | 9.6 | 11 | 4.7 | 5 | 2.1 | 3 | 1.3 | 3 | 1.3 | 4 | 1.7 | 110 | 48.5 |
| 8 hours | 208 | 14.7 | 28 | 11.9 | 7 | 2.9 | 13 | 5.5 | 11 | 4.6 | 36 | 15.1 | 113 | 49.8 |
| 8½ hours | 21 | 1.5 | 2 | .9 | 3 | 1.3 | 3 | 1.3 | 2 | .8 | 7 | 2.9 | 4 | 1.7 |
| 9 hours | 358 | 25.3 | 79 | 33.6 | 67 | 27.9 | 71 | 29.8 | 70 | 29.4 | 71 | 29.7 | ..... | ..... |
| 9½ hours | 144 | 10.2 | 26 | 11.1 | 26 | 10.8 | 27 | 11.3 | 30 | 12.6 | 35 | 14.6 | ..... | ..... |
| 10 hours | 241 | 17.0 | 35 | 14.9 | 51 | 21.3 | 54 | 22.7 | 52 | 21.8 | 49 | 20.5 | ..... | ..... |
| 10½ hours | 309 | 21.8 | 54 | 23.0 | 81 | 33.8 | 67 | 28.1 | 70 | 29.4 | 37 | 15.5 | ..... | ..... |

similar. Both used the same make of modern machine for looping. The dial was 18 inches in diameter. The points onto which toes and heels had to be looped numbered 26 to 32 points per inch for full-fashioned hose and 11 to 20 points per inch for seamless hose.

The looper was seated so that her eyes were level with or a little above the level of the dial and from 6 to 12 inches away. She selected the open toe of a knitted hose, set a row of stitches on the dial points, and then set the corresponding stitches of the other side of the toe on top of the first row of stitches. (The open heel was hung on the dial in the same manner.) The machine operated continuously and the actual closing of the toe and heel was automatic. Looped hose were removed from the right of the machine and samples were examined by the looper for flaws and dropped stitches. Machines were set to suit the pace of the individual woman, and a complete cycle of operations for one hose took only a fraction of a minute to 2 1/4 minutes, depending on the type of hose.

Looping involves considerable eyestrain, constant attention being required to see that each stitch is set on the proper point and that no stitches are dropped. Experienced loopers develop a sense of touch in guiding the stitches onto the points with their fingers, but eyestrain is only partially relieved thereby. As a looper gets older, eyeglasses usually become essential. Beginners complain of the muscular pain resulting from having to hold their arms and hands at shoulder level for so many hours, but later the muscles of some women become accustomed to this position. Both plants placed emphasis on providing comfortable seating arrangements, as loopers sit all day. Workers oil their machines and change spools of yarn on their machines, but these tasks occur only occasionally and do not relieve the monotony of the work.

In Plant L the occupation of seaming was also studied. Seamers stitch the bottom of the foot and back of the leg of full-fashioned hose on a Union Special Sewing Machine. The hose is fed to the machine so that the selvages are caught in an unpuckered seam and so that each point, such as top line of heel, first and last of leg narrowings, each picot, welt, or stripe, is matched. Workers sit at their machines. The right foot controls the power of the machine and must be coordinated with the hands as they feed the selvages into the guide. Continuous attention is required to keep the matching points together and the edge of hose level with the guide, to avoid too heavy seams, puckers, or drop outs. A definite rhythm is developed by each worker as coordination and speed are combined. All workers either stop or slow down as the matching points of the heel are reached, when the welt is reached, and when the inside selvages must be seamed. Some workers do not stop while seaming the leg, while others stop or slow down at each matching point. The cycle of operations is very short; one hose is seamed in approximately 30 to 37 seconds.

Transfer knitters on seamless hose transfer the stitches of the ribbed tops of socks onto the needles of a circular knitting machine and operate the machine which automatically knits the remainder of the hose. A loose-coarse line which has been knit into the ribbed top is followed as each stitch is hung on the quill (or point) of a transfer ring, after which the excess yarn is unravelled. The transfer ring is removed from its holding device, placed in position over the needles of the knitting machine, and the stitches are pulled onto these needles. After the transfer ring is removed, the machine is started and operates automatically. Another transfer ring is prepared while the machines are running and this ring is loaded into the

next machine that stops. An operator tends from 3 to 6 machines, depending on her speed and the type of sock being knit. The work load is so planned that all machines except the one being loaded are operating. In this way the machine running time is kept at a maximum, and the operator has no waiting time.

The women stand at their work, moving from one machine to the next. However, stools are provided for occasional use. Because there are different tasks to be done, transfer knitting does not require the unremitting attention looping does, although good eyesight and finger dexterity are necessary.

### Working Conditions on the Job

Excellent lighting is necessary for the successful performance of looping, transfer knitting, and seaming. Looping machines in both plants had individual lights for each operator. The looping department in Plant L had no overhead ceiling lights; workers sitting near the windows had the benefit of daylight, but those in the middle of the room sometimes complained that the lighting was inadequate. The seaming department had overhead lighting, in addition to the light from the windows; but women here complained of shadows and glare. The looping department in Plant M had excellent overhead lighting and glass brick walls on each side of the room which afforded much natural light; the transfer knitting room had overhead fluorescent lighting, and, on three sides, windows with Venetian blinds to eliminate glare when the sunlight was too bright.

In the knitting department in Plant M and in the looping department in Plant L there was a considerable amount of lint from ravellings in the air. The looping department in Plant M was air-conditioned. The usual difference of opinion regarding ventilation was expressed in other departments studied in both plants, depending on whether the worker sat close to the window or in the middle of the workroom.

Modern looping machines are noiseless and vibrationless. Sound-proofing in the looping department in Plant M made the workroom exceptionally quiet. There was noticeable vibration and considerable noise from the fast-moving sewing machines in the seaming department in Plant L and from the knitting machines in the transfer knitting department in Plant M.

As has been stated, both plants made every effort to adjust seating to the comfort of the individual loopers and seamers.

### Performance on the Job — Plant L

Both loopers and seamers in Plant L worked on an individual piecework basis, and average hourly piecework earnings are used as a measure of efficiency. Basic rates had been established. As changes in style, yarn, mesh, picots, and so forth, occurred, resulting in differences in production rates, a few cents or a fraction of a cent were added to or subtracted from the basic piece rate. When a new style of hose was introduced, for which no piece rate had been set, a 90-percent style-development rate was paid; that is, the operator got 90 percent of her regular average hourly earnings. The women's actual output on this new style was then taken into consideration when management and labor established new piece rates. Every 6 months rates were computed for each woman on the basis of her average hourly earnings over a normal 5-week period within the 6-month period, these rates becoming effective March 1 and September 1 of each year. Experienced workers were guaranteed 80 percent of their average hourly earnings. Day workers or new, experienced workers were guaranteed the department average. The minimum guaranteed rate for all beginners was 40 cents an hour.

In the periods under study in Plant L a new type of full-fashioned hose construction was introduced called "back-rack," or "round heel." The leg and foot were knit in one operation with a round heel requiring no looping. The looper had only the toe to loop and the seamers could sew one continuous seam from the tip of the toe to the top of the leg without stopping to skip over the looped heel. Records were kept of loopers' and seamers' output on back-rack as compared with the conventional type of hose. These records were used to set such piece rates on back-rack operations as would leave earnings unaffected by the type of hose worked on.

Even so, many of the loopers and seamers preferred to work on back-rack because they felt they could earn more on this work. Consequently, a check was made of production and earnings on back-rack jobs as compared with jobs on conventional hose in the two periods studied. There was a slight increase in the amount of back-rack work in the second period. In terms of total piecework earnings of loopers, work on back-rack amounted to only 4 percent in the 8-40-hour period and 12 percent in the 9-45-hour period. However, it was found that those handling some back-rack actually earned less in the second period when there was an increase in the amount of back-rack. Thus it would appear that back-rack rates yielded no more than the rates for conventional hose looping.

Among seamers, earnings from back-rack formed 6 percent of total earnings in the first period and 12 percent of total earnings in the second period. Those seamers who actually worked on back-rack increased their earnings from 75 cents in the first period to 77.7 cents in the second period. However, as table V shows, this was the same slight increase in earnings shown for the group as a whole, whether they worked on back-rack or not.

Table V, under "Group B," gives piece-rate earnings and hours of work for all workers in each department studied, including learners, probationers, substandard workers, and a few experienced "spares" who did not work in excess of 40 hours because not permitted to under union regulations, or because they did not wish to do so. As already stated, in the first period there were only 3 women in the looping department and 7 in the seaming department who fell in any of these categories, in the second period 17 and 19 respectively. Because of the increase in number of workers in these categories in the second (9-45-hour) period, and because they could work only 40 hours, table V also presents, under "Group A," data for all workers except the foregoing.

All loopers (Group B) averaged hourly piecework earnings in the second period of 64.9 cents; eliminating learners, probationers, and so forth, raised the loopers' average to 70.6 cents. Among seamers, eliminating learners, probationers, and so forth, had less effect: the increase was only from 76.7 cents to 77.5 cents.

The increase in hours had no effect on the efficiency of this experienced group of loopers. Loopers with a year or more of experience averaged practically the same hourly earnings, 70 cents, when they worked 38 hours and when they worked 42 hours under the 8-40- and 9-45-hour schedules respectively. A "control group" of stable loopers, who worked some time in each week studied, averaging 38.5 and 42 hours under the 40- and 45-hour schedules respectively, also showed practically the same earnings—approximately 70 cents—in both periods.

The efficiency of experienced seamers, on the other hand, was slightly increased under a longer hour schedule. Seamers with experience of a year or more increased their earnings from 75 cents per hour when they averaged

Table V. — Individual Efficiency by Length of Experience in Occupation, Under Different Scheduled Hours, by Occupation — Plant L

| Occupation, period studied, and scheduled hours | Total | | | | Length of time in occupation [1] | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1 year or more | | | |
| | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) |
| Loopers: | | | | | | | | |
| 1st period (8-40 hours) | 86 | 38.1 | 37.3 | 69.5 | 84 | 38.1 | 37.3 | 69.9 |
| 2d period: [2] | | | | | | | | |
| A Group (9-45 hours) | 65 | 41.9 | 41.4 | 70.6 | 65 | 41.9 | 41.4 | 70.6 |
| B Group (9-45; 8-40 hours, etc.) | 82 | 40.7 | 40.2 | 64.9 | 72 | 41.2 | 40.7 | 70.0 |
| Seamers: | | | | | | | | |
| 1st period (8-40 hours) | 138 | 37.5 | 37.3 | 74.9 | 138 | 37.5 | 37.3 | 74.9 |
| 2d period: [3] | | | | | | | | |
| A Group (9½-46 hours) | 107 | 40.5 | 40.5 | 77.5 | 107 | 40.5 | 40.5 | 77.5 |
| B Group (9½-46; 8-40 hours, etc.) | 126 | 39.7 | 39.7 | 76.7 | 122 | 39.7 | 39.7 | 77.2 |

| Occupation, period studied, and scheduled hours | Length of time in occupation [1] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 months, less than 1 year | | | | 6 weeks, less than 6 months | | | | Less than 6 weeks | | | |
| | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) | Number of women studied | Average weekly hours worked | Average weekly hours on piece-work | Efficiency (average hourly piece-work earnings, in cents) |
| Loopers: | | | | | | | | | | | | |
| 1st period (8-40 hours) | 2 | 36.0 | 36.0 | 52.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d period: [2] | | | | | | | | | | | | |
| A Group (9-45 hours) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| B Group (9-45; 8-40 hours, etc.) | ..... | ..... | ..... | ..... | 3 | 34.8 | 34.8 | 61.4 | 7 | 37.7 | 37.7 | 13.9 |
| Seamers: | | | | | | | | | | | | |
| 1st period (8-40 hours) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d period: [3] | | | | | | | | | | | | |
| A Group (9½-46 hours) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| B Group (9½-46; 8-40 hours, etc.) | ..... | ..... | ..... | ..... | 4 | 36.9 | 36.9 | 63.0 | ..... | ..... | ..... | ..... |

[1] Length of experience includes experience in this occupation in other plants in addition to experience in this plant.
[2] A Group: Composed entirely of experienced women working a 9-45-hour schedule. B Group: All women in department, including 17 learners, probationers, substandard, and part-time workers—all on a shorter schedule than 45 hours.
[3] A Group: Composed entirely of experienced women working a 9½-46-hour schedule. B Group: All women in the department, including 19 learners, probationers, substandard, and part-time workers—all on a shorter schedule than 46 hours.

37.5 hours in the 40-hour period to 77.5 cents per hour when averaging 40.5 hours in the 9½-46-hour period. The more stable seamers, who worked at least part of each week in each period studied, increased their earnings from 75.5 cents when they averaged 38.5 hours in the first period to 78.5 cents when they averaged 42.5 hours in the second period.

These showings are interesting in view of the fact that three-fourths of the women interviewed were positive that they earned more per hour on an 8-hour day than on a 9- or 9½-hour day. While many women did not work the longer day every day, the 9- or 9½-hour day was the prevailing day in the second period when their efficiency, as expressed in average hourly piecework earnings, was the same or slightly higher than in the first period.

When considering performance on the job of all loopers and seamers together (see table VI), it is to be noted, first, that there was a decrease in numbers employed in the second period which affected both departments. Further, the proportion of the women not permitted to work over 40 hours because of their status as probationary workers, learners, and so forth, was greater in the latter period. The result was that whereas, theoretically, a change from a 40-hour to a 45-hour and a 46-hour schedule represents increases of 12.5 and of 15 percent, respectively, in actual fact there was an average increase in scheduled hours of only 10.8 percent. Absences in the second period reduced man-hours actually worked to the point where they were only 93 percent of those worked in the first period.

The slight increase in seamers' efficiency did not compensate for the decrease in loopers' efficiency, resulting in part from the greater proportion of learners and substandard workers employed in the second period. The total production as measured by piecework earnings was reduced by 5 points. This over-all loss in production was most noticeable in the looping department, where there was a drop of 10 points.

### Performance on the Job — Plant M

Plant M operated the looping and transfer knitting department on an incentive wage basis. Time required to loop different styles, sizes, color combinations, and patterns of seamless hose had been determined through time studies and standards set for all. The efficiency rate was computed by dividing the number of standard production hours achieved by the actual number of hours worked. In this plant there was no work paid on a time basis and there was no waiting time, so that the number of hours worked were always identical with the number of hours on incentive work. A record was kept of imperfect socks, and loopers were paid for perfect work only. A 10-percent bonus was paid to those with an efficiency of 95 percent or better and with not more than 1 percent mends or imperfect socks. In the summer of 1942 this efficiency bonus was increased to 11 percent but required efficiency was also changed to 100 percent with 1 percent or less of mends or imperfect socks. Over the periods studied the guaranteed minimum rate of 36 cents had been increased to 40 cents, and a gradual increase in basic piece rates had taken place: from 36 cents to 42 cents for transfer knitters, and from 36 cents to 44 cents and 46 cents for loopers.

As already stated, the loopers and knitters chosen for study were those who had attained their general level or norm of efficiency and had worked at least 5 weeks under each of at least two contrasting hour schedules studied.

All but one of the loopers studied had at least 2 years' experience on looping, and the majority had 5 years' or more experience. Comparison is,

**Table VI. — Summary of Possible Man-hours, Total Man-hours Worked, Total Man-hours Worked on Incentive Jobs, Efficiency, and Total Production, Based on Totals for All Women Studied, Under Different Scheduled Hours, by Occupation — Plant L**

| Period studied, scheduled hours, and occupation | Index numbers of— | | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of women | Scheduled hours | Possible man-hours | Total man-hours worked | Total man-hours worked on incentive jobs | Efficiency (average hourly production) | Total production |
| Total: | | | | | | | |
| 1st period (8-40 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period: | | | | | | | |
| A Group (9-45; 9-46½ hours) [1] | 76.8 | 114.0 | 89.0 | 81.6 | 82.7 | 103.7 | 85.7 |
| B Group (9-45; 9-46½; 8-40 hours, etc.) [2] | 92.9 | 110.8 | 101.0 | 92.9 | 94.2 | 101.1 | 95.2 |
| Loopers: | | | | | | | |
| 1st period (8-40 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period: | | | | | | | |
| A Group (9-45 hours) [1] | 75.6 | 112.5 | 83.2 | 78.7 | 79.2 | 101.6 | 80.5 |
| B Group (9-45; 8-40 hours, etc.) [2] | 95.3 | 109.3 | 97.3 | 91.9 | 92.7 | 96.7 | 89.6 |
| Seamers: | | | | | | | |
| 1st period (8-40 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period: | | | | | | | |
| A Group (9½-46 hours) [1] | 77.5 | 115.0 | 92.7 | 83.5 | 85.0 | 104.5 | 88.8 |
| B Group (9½-46; 8-40 hours, etc.) [2] | 91.3 | 111.8 | 103.4 | 93.6 | 95.2 | 103.6 | 98.6 |

[1] A Group: Includes experienced women only who worked the department schedule of hours in the second period—9½-46 hours for seamers and 9-45 hours for loopers.

[2] B Group: Includes all women in the department, including learners, substandard, probationary, and special-hour women—all on a 40-hour schedule—and "spares" or part-time workers who worked irregular schedules.

therefore, one of performance of fully experienced women under different hours of work on an operation requiring constant attention, excellent eyesight, and deft, speedy fingers. Analysis of production records first of all shows wide differences in looping ability among experienced loopers, regardless of hours worked.

The highest efficiency was attained by a 35-year-old woman with many years' experience. She achieved as high as 185 percent efficiency when actually working 55 hours a week under a 55-hour schedule, while her average efficiency during the 5 weeks of 55 hours studied was 183. When she was on a 50-hour schedule, her efficiency range was 176 to 181, and she actually worked 50 hours in each week except one. This woman said:

> I am in the habit of getting off about 9 dozen an hour and more. I do work close to the clock. By that I mean I can tell whether I am losing or gaining in my work and can speed up or slow down accordingly.

The looper with lowest efficiency was in the same age bracket and had the same extensive experience. For the 5-week period studied under a 50-hour schedule, she averaged 48.4 hours of work and achieved an average efficiency of 66.8. Under a 57-hour schedule she averaged 56.8 hours of work and 52.8 efficiency.

Wide ranges in individual efficiency were typical under each hour schedule studied as can be seen in the summary below. When the individual efficiencies for the group as a whole were averaged, there was only slight variation from one period to another, which would seem to indicate that hours worked had little influence on the production of this experienced group of workers.

| Occupation, period studied, and scheduled hours | Number of women studied | Average possible man-hours per week [1] | Average weekly hours worked | Average efficiency rating | Range in efficiency ratings |
|---|---|---|---|---|---|
| Loopers: | | | | | |
| 1st period (8-40 hours) | 29 | 40.0 | 39.3 | 108.7 | 82-140 |
| 2d period (8- and 9-50 hours) | 60 | 50.0 | 47.5 | 110.8 | 67-178 |
| 3d period (52-55 hours) | 23 | 53.5 | 52.0 | 112.9 | 75-183 |
| 4th period (56-57 hours) | 25 | 56.8 | 55.1 | 110.0 | 53-143 |
| Transfer top knitters: | | | | | |
| 1st period (8-40 hours) | 18 | 40.0 | 38.4 | 122.8 | 100-148 |
| 2d period (8-48 hours) | 16 | 48.0 | 46.6 | 122.8 | 94-161 |

[1] Possible man-hours per week had to be averaged for the 3d and 4th period loopers because they were not all on the same schedule of hours.

Because of the wide ranges in individual efficiency and the influence of extremes on averages when numbers concerned are small, a comparison is made of the efficiencies of "identical" women in table VII.

There were 26 "identical" women loopers who worked in the first and second periods, and all but 2 increased their efficiency when the scheduled hours shifted from 40 to 50 a week and not only was 10 hours of overtime paid at time and a half but a 2-percent attendance bonus was given for 48 hours or more a week. With the added incentive of overtime rates, these women could apparently produce at a higher rate under 50 hours than they did under 40.

There were 45 identical women who worked under the 50-hour schedule and also under either the 52-55- or 56-57-hour schedule. These women averaged 47.7 hours under the 50-hour schedule and 53.8 under the 52-57-hour schedule. With this increase in hours, 24 had an increase in efficiency and

21 a decrease. The difference, whether an increase or decrease, was usually only a few points.

There were 13 women who worked under 3 hours' schedules, i.e., under both the 40-hour and 50-hour schedules and under either the 52-55-hour or 56-57-hour schedule. Here again the shift from 40 hours to 50 hours with the stimulus of overtime resulted in a general increase in efficiency. But the lengthening of the workweek to the 52.9 hours actually worked under the 52-57-hour schedule resulted in a decrease in productive efficiency for 10 of the 13 women.

There were 16 identical women who had worked under the 40-hour schedule and under the 52-57-hour schedule. Eleven showed an increase in efficiency under the longer hours, but this was partially due to the fact that they had gained a year or two more of experience between the two periods.

The amount of imperfect looping did not increase with the increase in hours. It remained below 1 percent for almost all loopers.

There were 15 experienced knitters who worked in both periods studied and they worked 38.3 hours under the 40-hour schedule and 46.5 hours under the 48-hour schedule. Again there was a wide range in individual efficiencies in each period—a considerably wider range in the second than in the first period—but for the entire group studied there was little difference between average efficiency in the first and second periods. Almost half the knitters' efficiency decreased in the second period and over-all efficiency dropped slightly. There was also a slight increase in imperfect work in the second period.

To determine the results on over-all production of the policy of encouraging long hours by permitting varying work schedules, granting an attendance bonus if at least 48 hours were worked, and granting a bonus if a specific degree of productive efficiency were attained, comparisons were made of performance on the job of all loopers together and all transfer knitters together, including both experienced and inexperienced workers, and including also home workers among the loopers.

Data for loopers cover three 5-week periods: one when the department was on a 40-hour schedule, one when a number of the women were working a 50-hour schedule, and one when hours up to 10½ a day and 57 a week were permitted. Data for transfer top knitters cover a 5-week period when a 40-hour schedule prevailed and 5 weeks when a 48-hour schedule prevailed. The loopers include:

181 who in the 40-hour period actually worked an average of 39 hours;
177 who in the 50-hour period actually worked an average of 38.1 hours;
155 who in the 57-hour period actually worked an average of 43.3 hours.

Using the 40-hour period as index-base 100 (see table VIII) from the first to the third period, a 15-percent decrease in numbers employed was accompanied by but a 5-percent decrease in total man-hours worked. As with the selected group of identical loopers, average efficiency increased from the 40-hour period to the 50-hour period and decreased slightly in the longer-day period. With the 9 1/2-percent efficiency increase in the 57-hour period over the 40-hour period, total production was increased by 4 percent. In the 50-hour period, however, the larger number employed plus slightly higher efficiency resulted in a total production increase of 5.6 percent.

In the 40-hour period 54 transfer top knitters were employed, in the 48-hour period, 77, making an increase in transfer knitters of 42.6 percent.

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**Table VII. — Comparison of Individual Efficiencies of Groups Composed of the Same Women, Under Different Scheduled Hours, by Occupation — Plant M**

| Occupation, period studied, scheduled hours | Average weekly hours worked [1] | Number of women in group | Average efficiency rating | Range in efficiency ratings | Number of women with — | | |
|---|---|---|---|---|---|---|---|
| | | | | | Same efficiency rating | Increased efficiency rating | Decreased efficiency rating |
| Loopers: | | | | | | | |
| 1st period (40 hours) | 39.2 | 26 | 107.2 | 82-140 | | | |
| 2d period (50 hours) | 47.8 | | 113.1 | 85-151 | 1 | 24 | 1 |
| 1st period (40 hours) | 39.6 | 16 | 108.4 | 82-129 | | | |
| 3d and 4th periods [2] (52-57 hours) | 52.4 | | 113.6 | 75-144 | 1 | 11 | 4 |
| 2d period (50 hours) | 47.7 | 45 | 109.4 | 67-178 | | | |
| 3d and 4th periods [2] (52-57 hours) | 53.8 | | 110.2 | 53-183 | | 24 | 21 |
| 1st period (40 hours) | 39.6 | 13 | 105.2 | 82-126 | | | |
| 2d period (50 hours) | 48.5 | | 112.1 | 85-133 | 1 | 12 | |
| 3d and 4th periods [2] (52-57 hours) | 52.9 | | 109.6 | 75-137 | | 3 | 10 |
| Transfer top knitters: | | | | | | | |
| 1st period (40 hours) | 38.3 | 15 | 123.5 | 100-148 | | | |
| 2d period (48 hours) | 46.5 | | 122.7 | 94-161 | 1 | 7 | 7 |

[1] These women never had waiting time, day-work jobs, etc., so that all hours worked were on an incentive work basis.
[2] This group combines those working the 52-55-hour schedule in the 3d period and those working the 56-57-hour schedule in the 4th period. There was no fixed pattern of daily hours for loopers.

This increase, plus the increase in hours actually worked, brought about an increase in production of 67.5 percent in spite of a slight decrease in over-all efficiency.

Table VIII. — Summary of Total Man-hours Worked, Total Man-hours Worked on Incentive Jobs, Efficiency, and Total Production, Based on Totals for Entire Looping Department and Transfer Top Knitting Department,[1] Under Different Scheduled Hours, by Department[2] — Plant M

| Department, period studied, and scheduled hours | Index numbers of — | | | | |
|---|---|---|---|---|---|
| | Number of women | Total man-hours worked | Total man-hours worked on incentive jobs[3] | Efficiency (average hourly production) | Total production |
| Looping department: | | | | | |
| 1st period (8-40 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period (8- and 9-50 hours) | 97.8 | 95.6 | 95.6 | 110.5 | 105.6 |
| 3d period (10½-57 hours permitted) | 85.6 | 95.1 | 95.1 | 109.5 | 103.9 |
| Transfer top knitting department: | | | | | |
| 1st period (8-40 hours) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2d period (8-48 hours) | 142.6 | 171.1 | 171.1 | 98.3 | 167.5 |

[1] All other tables include only select group of experienced workers studied.
[2] Indexes for scheduled hours and possible man-hours not shown because of individualized nature of work schedules.
[3] Man-hours on incentive jobs same as total man-hours because no work was ever done on an hourly basis.

# POWER SEWING-MACHINE OPERATORS — PLANT N

## INTRODUCTION

The desirability of studying women's performance on a well-established women's occupation led to the investigation of power sewing-machine operations in a corset factory. This factory had been making foundation garments for over 50 years and had always employed women. In the summer of 1942 it was granted Government war contracts for parachutes, canopies, packs, harnesses, and tents. As materials for its regular products were too limited to operate the foundation-garment department at full capacity, some power-machine operators were shifted to the war production department, where higher earnings were possible.

In the first period chosen for study, April and May 1942, all women were employed 8 hours, 5 days a week in the foundation-garment department. There was no parachute production at this time. In the second period, January and February 1943, this department and the new parachute department operated on an 8-hour day for 6 days a week. The women selected for study were 1) those who had operated power sewing machines in the corset department during at least one of the two periods studied and who had been employed a minimum of 4 weeks in the course of the two periods studied, and 2) a group of women who were in the corset department in the first period and the parachute department in the second period. In the first period 122 women were studied, in the second, 104.

A résumé of hours worked in each period follows:

| *Period* | *Schedule* |
|---|---|
| *Corset department* | |
| *1st period:* | |
| April–May 1942 (6 weeks) | 8 a.m.–4:45 p.m. |
| 8-hour day, 5-day 40-hour week | (45-minute lunch period) |
| *2d period:* | |
| January–February 1943 (6 weeks) | 8 a.m.–4:30 p.m. |
| 8-hour day, 6-day 48-hour week | (30-minute lunch period) |
| *Parachute department* | |
| *2d period:* | |
| January–February 1943 (6 weeks) | Day shift: 7 a.m.–3:30 p.m. |
| 8-hour day, 6-day 48-hour week | (30-minute lunch period) |

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' HOME LIFE

The power sewing-machine operators included in the study were practically all over 20 years of age. Half were 20 and under 30 years, 30 percent 30 but under 45 years, and 17 1/2 percent were 45 years of age and older. Almost half had worked with the firm for 5 years or longer. About half were married and half were single.

While several widows roomed and boarded out, all others interviewed lived in a family household. These households varied in the number of their members from 2 persons to 5 persons. Half the married women interviewed did all or the major part of their housework and half shared the work with other adult members. As none interviewed had children under 14 years, child care was not a problem. Single women interviewed had neither all nor general responsibility for homes, but they did their own laundry and helped with other duties.

Even though duties are shared, they may be very arduous. For example, one 25-year-old girl had a bedridden tubercular mother and a young sister who had just given up factory work because she, too, had the disease. The brother went into service, and the father died of pneumonia just before the second period studied. When there was no Saturday work, the worker interviewed did the washing for five and cleaned the house on Saturday. When the factory schedule called for Saturday work, she did the family washing Monday night after work, and the ironing Wednesday and Thursday nights. Sunday mornings were used for cleaning. She shared marketing with her sick sister who also did the cooking. When the worker was interviewed, she was taking leave of absence to nurse her bedridden mother. She was expecting to get the service allotment from her brother shortly, and hoped to hire someone to care for her mother while she was at work.

Another young worker and her sister who lived with their parents shared the housework. They took turns marketing. Under the 48-hour schedule, the factory worker did the house-cleaning either on Saturday or at night. Her sister did the laundry. The mother, who was not well, was still able to prepare dinner.

In the corset department the workday began at 8 a. m. in both periods. Consequently, increased working hours brought no change in the time of rising. This time ranged from 5 a. m. to 6:45 a. m. Women interviewed all used the trolley or bus to reach the factory. Transportation consumed 1 1/2 hours or more for many. Factory closing time was changed from 4:45 p. m. in the first period to 4:30 p. m. in the second by shortening the lunch period 15 minutes. The workday away from home was 10 to 11 hours for the majority of women.

Because Saturday was a factory day under the 48-hour schedule, many women did their laundry or cleaning in the evening. This advanced the retiring hours for some. In the 40-hour period almost half had an over-all day of 17 hours or longer, in the 48-hour period almost three-fifths had an over-all day of 17 hours or more. Time of retiring varied from 9:30 p. m. to 12:30 a. m.

Over two-thirds of the power sewing-machine operators preferred the 40-hour week, or 5 days of 8 hours. The few who did not mind the Saturday work were without household duties to perform.

## EFFECT OF DIFFERENT HOUR SCHEDULES ON WORKERS' FACTORY PERFORMANCE

### ATTENDANCE RECORD

Attendance records of 122 sewing-machine operators in the corset department during 6 weeks under the 8-hour day 40-hour week were studied. When causes of lost time were investigated, it was found that 50 women had lost 1,040 hours because of lack of work in the 40-hour period. This lost time is not shown on the attendance tables but does appear on table III which analyzes the causes of absence.

Under the 40-hour schedule 6.3 hours were lost per possible 100 man-hours of work. This time was lost by 70 percent of the operatives who, in the 6-week period, averaged 3 absences of almost 6 hours each. Under the 8-48-hour schedule, time lost increased by almost 2 hours to 8.2 hours per 100 possible man-hours. During this period the corset department lost more hours than the younger workers in the parachute department—9.2 as

against 7.2 hours per 100 possible man-hours. The number of women who incurred absences also increased from 70 percent in the 40-hour period to 90 percent in the 48-hour period. The number of absences per woman and the length of these absences also increased.

Table I. — Percent of Women Losing Time Under Different Scheduled Hours, Average Number and Length of Their Absences, and Hours Lost by Total Number of Women Studied per 100 Possible Man-hours, by Department — Plant N

| Period studied, scheduled hours, and department | Total number of women studied | Women losing time | | | | Hours lost by total number of women per 100 possible man-hours of work |
|---|---|---|---|---|---|---|
| | | Number | Percent | Average number of absences | Average hours per absence | |
| 1st period (8-40 hours) (corset department) | 122 | 86 | 70.5 | 3.3 | 5.9 | 6.3 |
| 2d period (8-48 hours) | 104 | 94 | 90.4 | 4.0 | 6.6 | 8.2 |
| Corset department | 57 | 52 | 91.2 | 4.0 | 7.2 | 9.2 |
| Parachute department | 47 | 42 | 89.4 | 4.0 | 5.8 | 7.2 |

In the 40-hour period about one-third of the operatives lost no time. Their number was cut to one-tenth in the 48-hour period. The number of absences of over 1/2 day increased. Almost half the women were absent on a Saturday during the 6-week period, which meant 10 1/2 percent of the possible Saturdays were lost. Saturday absence accounted for 21 percent of all time lost in the 48-hour period.

Thursday was pay day in both periods. The hours lost on Friday were but 4.4 percent of the total Friday hours in the 40-hour period and 1.8 percent in the 48-hour period. Obviously, the pay day on Thursday did not lead to extended absenteeism on Friday.

When the 40-hour schedule was in effect, the average hours worked by operatives during the weeks they reported for work were 36.7. During this period, however, lack of work accounted for 1.4 of the 3.3 hours lost, so that potential hours worked were 38.1. In the 48-hour period the actual hours worked during weeks the women reported for work were 44.6, there being few "no work" hours in this period.

Lateness increased in the second period. More women were late and the number of times they were tardy increased, but the average length of the lateness decreased.

## CAUSES OF LOST TIME

Table III shows that the most important cause of lost time in the first period was lack of materials. In the second period, when many of the operatives had gone to the parachute department, leaving a reduced staff in the corset department, the "no work" time was of minor consequence.

In both periods the number of absences for personal reasons exceed those due to illness. Reports from the visiting industrial nurse, who spent an hour a day in the plant, revealed that very few women went to her for consultation during the weeks studied.

Reports to the State Workmen's Compensation Commission showed accidents for which compensation was claimed. During the two periods studied, 15 women had filed claims for accidents; 10 ran needles into their fingers, 3 cut their fingers with scissors or on machines, 1 ran a screw driver into her finger, and 1 hurt her arm on the lunchroom radiator.

**Table II. — Analysis of Time Lost By Women Workers Under Different Scheduled Hours — Long-term Absences (whole weeks lost) and Short-term Absences (time lost within weeks attended), by Department — Plant N**

| Period studied, scheduled hours, and department | Total number of women studied | Number working all or part of each week employed | Number who lost a week or more | | | | Attendance record of women within weeks of partial or full attendance | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | 1 week | 2 weeks | 3 weeks | Total number of women | Number with no lost time in weeks attended | Number of women whose average time lost per week in weeks attended was — ½ day or less | Over ½ day and including 1 day | Over 1 day | Average hours worked per week in weeks attended |
| 1st period (corset department) (8-40 hours): | | | | | | | | | | | | |
| Number | 122 | 115 | 7 | 5 | 1 | 1 | 122 | 38 | 67 | 10 | 7 | [1] 36.7 |
| Percent | 100.0 | 94.3 | 5.7 | 4.1 | 0.8 | 0.8 | 100.0 | 31.1 | 54.9 | 8.2 | 5.7 | ..... |
| 2d period (8-48 hours): | | | | | | | | | | | | |
| Number | 104 | 98 | 6 | 4 | 1 | 1 | 104 | 11 | 59 | 21 | 13 | 44.6 |
| Percent | 100.0 | 94.2 | 5.8 | 3.8 | 1.0 | 1.0 | 6.4 | 10.6 | 56.7 | 20.2 | 12.5 | ..... |
| Corset department: | | | | | | | | | | | | |
| Number | 57 | 53 | 4 | 2 | 1 | 1 | 57 | 6 | 31 | 10 | 10 | 44.3 |
| Percent | 100.0 | 93.0 | 7.0 | 3.5 | 1.8 | 1.8 | 100.0 | 10.5 | 54.4 | 17.5 | 17.5 | ..... |
| Parachute department: | | | | | | | | | | | | |
| Number | 47 | 45 | 2 | 2 | ..... | ..... | 47 | 5 | 28 | 11 | 3 | 44.8 |
| Percent | 100.0 | 95.7 | 4.3 | 4.3 | ..... | ..... | 100.0 | 10.6 | 59.6 | 23.4 | 6.4 | ..... |

[1] 1.4 of the 3.3 hours lost resulted from lack of work.

Table III. — Causes of Lost Time Under Different Scheduled Hours — Plant N

| Causes of lost time | 1st period (8-40 hours) | | | | 2d period (8-48 hours) | | | |
|---|---|---|---|---|---|---|---|---|
| | Women losing time — Number | Absences | | Total hours lost — Percent | Women losing time — Number | Absences | | Total hours lost — Percent |
| | | Number | Percent | | | Number | Percent | |
| Total women losing time..... | 104 | 495 | | | 94 | 372 | | |
| Total reporting causes ..... | [1] 96 | 455 | 100.0 | 100.0 | [1] 67 | 182 | 100.0 | 100.0 |
| Personal illness ..... | 40 | 64 | 14.1 | 30.1 | 17 | 23 | 12.6 | 31.8 |
| Personal reasons ..... | 52 | 122 | 26.8 | 26.1 | 20 | 43 | 23.6 | 56.6 |
| Company—No work ..... | 50 | 207 | 45.5 | 42.3 | 6 | 9 | 4.9 | 6.6 |
| Lateness (over 15 minutes) ..... | 29 | 62 | 13.6 | 1.5 | 49 | 107 | 58.8 | 5.0 |

[1] Details add to more than total because some women report more than one cause of absence.

## PRODUCTIVE EFFICIENCY

### Nature of the Job

The groups studied were power-machine operators in the corset department and parachute department. The sewing machines used varied from single-needle to 5-needle machines with different types of attachments.

The women sat on straight-back chairs, leaning forward in one position most of the day. Close attention was required in both the corset department, where the runs of stitching were short, and in the parachute department, where there were long continuous seams.

### Performance on the Job

Power sewing-machine operations were paid at piece rates, with a guaranteed hourly minimum of 40 cents or higher. In normal times the firm manufactured 375 different styles of corsets, each style involving from 16 to 50 operations. A rate was set for each dozen of any one operation on any given style. The original rates were set over 40 years ago and were based on the skill required for each operation. Over the years these rates were changed. They were increased or decreased according to economic conditions; they were adjusted to meet machine changes; they were changed on a certain style or group of styles as the individual operator or group of operators involved said they "could not make out at the set prices," and in later years rates were adjusted through bargaining with the trade union. Time studies have been made only since the advent of the union in 1941 and have been confined mainly to disputed rates. A scientific study of all operations to smooth out the rate discrepancies that had accumulated through the years was contemplated for the postwar period.

Between the two periods studied, a general increase in rates was granted. It was selective in nature; the jobs at which the operators were averaging the lowest amounts were increased the most, and vice versa. For example, the lowest paid task in June 1942 was zig-zag finishing the raw ends of straps; it had been paid at rates netting an average of 53 cents an hour and was raised to 58 cents, an increase of 9.4 percent. The highest paid task was stitching talons and hooks and eyes which had yielded 94 cents an hour; it was raised to 96 1/2 cents an hour, an increase of 2.7 percent. The piece rates on all other jobs were increased by amounts within this range.

To use piece-rate earnings to compare productivity in the first period with productivity in the second period would necessitate applying each rate increase effected between the two periods to the job or jobs the women had done each day of the 6 weeks of the second period. Before such detailed calculations were attempted, other conditions reported by management as existing in the plant during each of the two periods were considered:

1. The younger, faster operatives were transferred to the parachute department in the second period. This left the older, slower, and less efficient operators in the corset department.—Comparisons of output would have to be made, therefore, on an individual basis, selecting a special group for study and then making the necessary adjustments in piecework earnings in the second period.

2. Owing to lack of materials, the styles of foundation garments produced in the second period were fewer than those in the first period. Few, if any, new styles were created.—Thus the operators were on the same work over longer stretches than in the first period and did not have to lose speed adjusting to continuous style changes.—This would tend to invalidate comparisons.

3. Further, work was not steady in the first period. The fewer women available for the corset department in the second period made it possible to feed work to them without delay—another factor confusing a comparison.

4. The fact that "ersatz" material was being used in the second period and garments were not up to prewar standard was reflected in the tendency of operators not to be as meticulous about their work as had been normal in the first period. Quality of workmanship was sacrificed to quantity.—This would further invalidate comparisons.

5. The fact that overtime pay in the second period was based on the average hourly earnings of the week acted as a spur to increase output and thus increase overtime pay. The fact that earnings as a whole were considerably higher than normal, as a result of the higher rates, longer hours, and overtime pay, made workers feel that they ought to "make hay while the sun shines" and "take advantage of the situation while it lasted."—Both these factors would tend to invalidate comparison of productivity in the two periods.

Statements made by women operatives interviewed in their homes were in agreement with the foregoing judgments of management: "During the first period my work was more varied. The company was very particular about the work. Inspection was very strict. During the 48-hour period this was relaxed. Anything went as long as it was sewed together." "During the 40-hour period I averaged work on 5 or 6 styles a day, sometimes with 2 or 3 operations on the same garment. During the 48-hour period I had the same work every day and became faster and more proficient at it."

With women workers and company in agreement on the many factors responsible for increased production in the second period—factors which were not amenable to computation—an attempt to compare productive efficiency in the two periods by comparing piecework earnings was abandoned.

## REFERENCE LIST OF OTHER PUBLICATIONS

New York State Department of Labor. Division of Women in Industry and Minimum Wage. Hours of Work in Relation to Health and Efficiency. Albany, N. Y., August 1941. 97 pp. (Mimeographed.)

This report reviews the most important studies made on the subject up to that time and includes a comprehensive bibliography. The following list, therefore, is only of reports published since.

Brown, J. Douglas and Baker, Helen. Optimum Hours of Work in War Production. Princeton, N. J., Princeton University, Industrial Relations Section, Department of Economics and Social Institutions, March 1942. 25 pp.

A brief report of a survey of opinions of production executives concerning optimum hours of work. Includes a bibliography.

Chamber of Commerce of the United States. Department of Manufacture. The Ten-Hour Workday in Factories. Washington, August 1943. 8 pp. (Mimeographed.)

Questionnaires (form given) were sent to 479 metal manufacturing companies in regard to shifts worked. A summary is presented of the 116 replies received.

Committee on Work in Industry of the National Research Council. Fatigue of Workers: Its Relation to Industrial Production. New York, Reinhold Publishing Corporation, 1941. 165 pp.

Discusses effects of working conditions in factories. Considers several studies—working at high altitudes, the influence of temperature (especially heat); also the well-known Western Electric Co. experiment.

Florence, P. Sargant. A Scientific Labour Policy for Industrial Plants. International Labour Review 43:260-298, March 1941. London, Washington.

A summary of experience during World War I and later and an evaluation of problems.

Great Britain. Annual Reports of the Chief Inspector of Factories, for the 5 years 1940 to 1944. London, H. M. Stationery Office.

Contains section on scheduled hours and hours actually worked in relation to production.

.....Industrial Health Research Board. Medical Research Council. Emergency Report No. 2. Hours of Work, Lost Time and Labour Wastage. London, H. M. Stationery Office, 1942. 26 pp.

Summary of results from a survey of factories to discover the relationship between hours of work and productivity.

..... ..... ..... Emergency Report No. 3. The Personal Factor in Accidents. London, H. M. Stationery Office, 1942. 20 pp.

Discusses general factors, including hours of work, affecting accident rates.

..... ..... ..... Emergency Report No. 4. A Study of Absenteeism Among Women, *by* S. Wyatt and others. London, H. M. Stationery Office, 1943. 12 pp.

A report of a study of the amount and distribution of absenteeism among women at two Royal Ordnance Factories.

..... ..... ..... Emergency Report No. 5. A Study of Variations in Output, *by* S. Wyatt and others. London, H. M. Stationery Office, 1944. 16 pp.

A plant study of the effect of reducing working hours on output and attendance.

..... ..... ..... Report No. 86. A Study of Certified Sickness Absence Among Women in Industry, *by* S. Wyatt and others. London, H. M. Stationery Office, 1945. 34 pp.

A study of plant records, relating age, marital status, and type of work to sickness absence.

..... ..... ..... Report No. 88. A Study of Women on War Work in Four Factories, *by* S. Wyatt and others. London, H. M. Stationery Office, 1945. 44 pp.

Extension of Report No. 86. Covers factors other than illness. Based on interviews with groups of women, half of whom had had the greatest and half the least sickness absence. Their attitudes were ascertained on factory environment, personnel, wage payment, pace of work, etc.

..... ..... ..... Conditions for Industrial Health and Efficiency. Pamphlet No. 2. Absence from Work; Prevention of Fatigue. London, H. M. Stationery Office, 1944. 20 pp.

Treated as separate but related subjects. Analyses of records of some 60 factories, large and small. Lists of references are given.

New York State Department of Labor. Absenteeism in War Plants. Industrial Bulletin 22: 303-308, August 1943.

A survey by Division of Women in Industry and Minimum Wage. Absence rates are given from 15 New York war plants during May 1943.

..... Division of Women in Industry and Minimum Wage. Wartime Working Hours. Albany, N. Y., February 1943. 11 pp. (Mimeographed.)

A supplement to the report mentioned at the beginning of this list, presenting new information growing out of the first year of war production. Good bibliography.

Sayers, R. R. Findings from Major Studies of Fatigue. Proceedings of Sixth Annual Meeting of Industrial Hygiene Foundation of America, Inc., Pittsburgh, Pa., Nov. 12-13, 1941. pp. 66–99.

Conclusions reached from investigations and experiments concerning different phases of fatigue, especially in relation to hours of work, efficiency, health, and accidents. Includes a bibliography.

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