

Women Working at the Manufacture of Electrical Machinery, 1904:

Film and Text

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Abstract

The only significant early industrial films, before 1910, have been made available and show in detail the work conditions for women in heavy industry. These films show Westinghouse workers in 1904 fabricating parts for the rapidly growing electric industry. The literature of women workers from that time provides little insight to their conditions of work which were different from those of textile, garment, and cigar makers, which were better documented. The limited information on the background and work conditions of the workers is presented. The films clearly indicate the speed-up characteristics of the piece-work pay system and the physical discomfort of the workers.

Keywords: workers, women; film, industrial; Westinghouse Electric & Manufacturing; Pittsburgh; time period 1900-10.

1. Introduction

This paper describes women and their work in the electrical heavy industry at the beginning of the 20th century. The discovery of what appears to be the only existing industrial films from the period motivated this research. In the seventy odd minutes of these films that are now reconstructed, and on the web from the Library of Congress, about twenty focus on the working of women in electrical heavy industry. These **silent** films were made by the Biograph Company, a pioneer film maker, and shown in the 350

seat Westinghouse auditorium at the Louisiana Purchase Exposition in St. Louis. Half the films were presented each day, except on Sunday, from July 2 to December 1, 1904.

These presentations must have been rather popular as the **only** surviving Westinghouse document about them stated that an average of 813 people viewed the films daily with the peak day having an attendance of 3200.

Some of the films were taken at the East Pittsburgh plant of Westinghouse Electric and Manufacturing Company. Only these films show both men and women working at various tasks in the factory. For this paper, only those tasks showing large numbers of women working are analyzed. These films clearly show women performing heavy labor, contrary to some popular perceptions about women's work. Information about the role of women workers in the electrical industry was then investigated.

Sumner (1910), in *History of Women in Industry in the United States* describes the usual women's industries and then states that "Women have been employed in many other industries. The number engaged in the manufacture of electric apparatus and supplies increased from 72 in 1880 to 6,158 in 1900, and from 5.7 per cent of all the employees in 1880 to 15.1 per cent in 1900.... The manufacture of electric apparatus and supplies is, however, a new industry for both men and women, and consequently the women employed have not displaced men, unless it be considered that they have displaced potential men." Clearly women represented a small but growing proportion of electrical workers.

Another source of information is Elizabeth Beardsley Butler's *Women and the Trades*² a 1909 volume of the Pittsburgh Survey which reviews the life of working women. The large volume details the working lives of women in food production, cigar

making, needle trades, laundries, etc. for 295 pages of which only four pages are devoted to electrical appliances. These pages are the only source describing exactly what the 850 women employed at Westinghouse Electric and Manufacturing Company were doing.

Butler also describes some of the differences between men's work and women's work.

“Most of the women are employed at coil winding. The machine process is simple and easily learned, as each girl simply starts the machine and holds in her hands coil and tape, while the rapid revolutions of the wheels wind both together. The power action is so strong that the operator sways backward and forward and is often forced to exert considerable physical strength to keep the tape in place. In a Pittsburgh firm where women are employed only for hand taping, and the machine taping is done by men, the superintendent said that he would never allow women to operate machines, as the pull of the power demands too much strength in keeping the winding right. A different practice is followed at East Pittsburgh, and if any coil is wound imperfectly at these power machines, the girl operator is required to rewind it without pay..... There are eight small foot-power machines for white taping in the East Pittsburgh works, and in their use, too, the pull of the machine and of the coil shakes the whole body of the operator in her effort to keep the tape straight and firmly wound....All the actual assembling of transformers, the assembling and most of the winding of armatures, is done by men. There are some small armatures which are wound by women, the coils being held together by white tape and twisted into place, preparatory to finishing with wire bands. Even with small armatures this is stiff work.

In some cases women are employed to assemble small groups of coils for motors or other electrical appliances, but the main divisions of their work are the building of the cores of transformers and the winding of armatures and coils. It sometimes happens that men do the heavier winding, but they are never put on the same kind of work for which women are employed, unless there is a rush order and their help is needed temporarily. As the men coil winders are paid exactly double what the girls are paid, it would be a costly policy for the firm to permit the men ordinarily to undertake any of the girls' work.”

2. Description of Film Clips

The five short film clips selected for presentation show women checking in to prove their attendance and then working at a variety of tasks similar to what Elizabeth Butler has described. It is important to note that women were working at these tasks for a five and a half day workweek of fifty-five hours. In each of the films the women are shown working individually at a workstation, unlike the films of men working as teams.

A. Film 1. In the first clip, the women, (“girls” was the term in 1904) take brass time checks from a board to show that they are in attendance. This clip of about 200 women allows us to note their age and attire. They appear to be young and almost all are dressed in white blouses and long, dark skirts. A few are wearing dark blouses; they may be in mourning, which would be consistent with the high accidental death rate for the area and time. The clip was taken above the first floor as some can be seen descending a stairwell.

B. Film 2. The next clip of winding coils for heavy electrical machinery show the women standing and handling a heavy wire which is being insulated with tape as it is wound onto a form. The coil is of about five turns of wire and rectangular in shape, maybe eight by ten inches. Women use a hammer to shape the finished product.

C. Film 3. By contrast, when winding coils for light electrical devices, the women are seated on chairs without backs. The film shows many women; a photograph of the same activity from Butler’s book shows that there may have been over 200 women in the area performing the same tasks.

D. Film 4. Applying insulating tape to electrical coils for heavy electrical machinery provides a clear image of the coils that have been wound. This clip also provides a sense of the rapid pace of this piece work system.

E. Film 5. The final clip, assembling electrical armatures for various sizes of electrical machinery, shows the women seated and connecting the coils to the commutator. One aspect of the routine is to hammer the parts together.

These clips raise some questions which need more information to gain a better understanding of what is shown.

3. More Details about Plant Operations

A. State of the Art. Westinghouse in East Pittsburgh was the modern plant of the period. As shown, electric lamps were located over each work station. Two examples, in other film clips, are the electric cranes and the storage battery locomotives used to move the heavy equipment within the plants.

B. Supervision. As we see in the clips, supervision of the women at work was overwhelmingly by men. This is one indication of lack of upward mobility for the women often mentioned. We also see gender segregation in the workplace quite clearly. It is interesting that the photograph taken in 1934 of 231 retirees does not include any women. Women left these jobs before retirement!

C. Skill Level. The skill level required of the women was significant, as we see in the clips. However, it was different from that required of men, enforcing gender segregation and easily permitting wage discrimination.

D. Training. It seems that training was necessary since a variety of tasks were being performed and other instructional venues (i.e. trade schools) were not available. However, there is nothing in the literature describing the training of either women or men workers at that time. Butler believed that the tasks of the women were easily learned. This should be explored further as the work appears to require significant skill to produce an acceptable item.

E. Comparison with Men. One additional film clip shows men working to illustrate the difference in the tasks and the emphasis on teamwork rather than individual effort.

4. Background for the filmed activities

A. Products. The Westinghouse Electric and Manufacturing Company's products were at the cutting edge of the electrical industry. They were one of the leading suppliers of electric generators, alternating current generators, rotary converters needed to provide power for the street car systems, and various sizes of electric motors.

B. Demographics. The available literature of the period fails to provide detailed information about the demographics as regards age, marital status, race, and ethnicity. Some information from the same time indicates that women went to work at a young age and left at marriage. Census data show almost no blacks in the area, so the women were white. The Census also shows Irish, German, Italian, Polish, Slovak, and Jewish immigrants in the Pittsburgh area as well as first and second generation residents. Studies of other industries have identified certain ethnic employees. However, given the nature of the conditions at Westinghouse, the women were probably English speakers, probably daughters or sisters of employees. Immigrant mothers did not want their daughters to work there, according to Margaret Byington who described the immigrants in the steel mill town of Homestead³.

"A number were employed in the great Westinghouse Electric Works across the river; but the distance, the conditions under which some of the work is done, the speeding and low pay, and the doubtful reputation of some of the employes among Homestead mothers made them consider this employment undesirable."

C. Hours. In the early 1870s George Westinghouse had reduced the work week from 6 days to five and a half and this was still true in 1904. The 10 hour day was the norm, although overtime might be required from time to time. Paul Kellogg, the editor of the Pittsburgh Survey provides in Vol. 6 *Wage - Earning Pittsburgh*⁴ an indication of the hours worked, break and meal times, and some of the amenities occasionally available. However, he describes conditions about eight years after the films were made. By

current standards, working conditions were horrid.

“The noon hour is intended to allow time for the midday meal and for relaxation and rest from the fatigue of the morning. Many companies employing girls in their factories and stores in the city had a room with tables at which the girls could sit down and eat the lunch they had brought with them, the company providing hot coffee or tea free or at a nominal cost....

The Westinghouse Electric and Manufacturing Company several years ago set aside a space in one of its buildings for a lunch room for nearly 1,000 girls. The girls brought their own lunch, and coffee was furnished free by the company. Later, when there was a demand for more room in which to install some machinery, this room was crowded out and since then the girls had eaten their lunch sitting on the factory floor and leaning against their machines or the wall of the building, as the company did not even provide them with seats which had backs..... On the upper floor of the "Casino" at the Westinghouse Electric and Manufacturing Company there was a lunch counter for men, while on the ground floor were bowling alleys, billiard and pool rooms.

A few factories where women were employed contained rest rooms where an employe temporarily indisposed could lie down. These were usually adjuncts to the locker or dressing rooms, with washrooms either in or adjacent to them..... Folding cots in the women's wash rooms of the Westinghouse Electric and Manufacturing Company, the Armstrong Cork Company, and the Brace Brothers' Laundry were poor attempts to supply this need.

... the several large works of the Westinghouse interests seemed to have adopted a common policy in regard to wash rooms, of which they had a number in each plant. These were furnished with individual basins supplied with city water cold. They were kept in order by an attendant, who at noon and night just before "whistle blow" distributed roller towels (individual towels were used for the office force) and cake soap, collecting them afterward and putting them away.”

D. Wages. Butler⁵ describes in great detail how women were paid (hourly, weekly, piece work) and how much they earned on average. She also gives some insight into how the rates were determined. It seems clear that management cut the rates as the girls improved so that they could not continue to increase their earnings. Also, they might be transferred to another job if they became very proficient. It was rare for a woman to earn more than \$9 a week. Poor working conditions contributed to high levels of turnover.

“The girls are paid either by the piece or on a premium plan. Learners get \$.08 an hour (\$.78 for a nine and three-quarter hour day) for the first two weeks. They come one day and look on, but after that are given work to do. Premium girls are paid \$.10 an

hour, and are given, for example, twelve hours in which to do a specific piece of work. If they can finish it in six hours they are paid \$.15 an hour, or five hours extra, and are given something else to do in the six hours which they have left. Of course, the time is so calculated that few girls can do their work on a shorter time allowance. To gain speed at any one kind of work takes at least six weeks, but the girls are apt to be transferred frequently from one section to another, so that it is impossible for them to keep up a high rate of earnings. The fastest girls make \$1.47 a day, and if this amount is exceeded when a new article is given out, the rate is usually cut. Formerly the base rate was \$.12 an hour, and the girls were able to make \$2.00 a day. Two or three of the girls-old employes are still working at the old rate, but for the others, the rate has been cut to \$.10.

There are ... instances of cuts when a girl has earned more than \$1.47. In... (one) case, \$.013/4 was paid for winding a new coil, and one of the girls made 100 coils, or \$1.75 as a single day's pay. The other girls warned her, but she kept increasing her speed until she finally made 150 in a day, and kept this up for two weeks. The foreman urged her to make more and at length she reached a maximum of 250. Then the firm cut the rate. Now, in order to make her previous earnings of 1.47 a day, the girl has to make 200 of these same coils-exactly double the pace One girl who has been in the employ of the company for three years and is one of their best workers, tells me that her usual pay for two weeks is between \$17 and \$18. The most she ever made in two weeks was \$25, and that was made only by overtime at night and Sunday work. ... Premium workers are paid a time and a half for overtime, and piece workers \$.05 an hour extra....

Night and Sunday work, rate cutting, and the consequent high speeding tend to produce an atmosphere of nervous haste which results both in frequent changes in personnel, and among those who stay, in lowered vitality and overspent nervous force. I am told that not more than twenty-five out of all the women employed at the East Pittsburgh factory have been there as long four years. In addition to the nervous strain, there is a positive physical effort in much that is given them to do, a physical effort that some men in the trade have considered injurious; furthermore the women have no professional interest which would keep them at their task....The women do not consciously co-ordinate their work with that of the other departments of the factory, or see in it a significance beyond the mechanical execution of the task allotted. They are operators solely, cheaper than men, who are speeded to the limit of their strength, then dropped for a force of new and as yet untired recruits.”

5. Conclusion.

The most valuable textual summary of who the women were and how they were treated in industry comes from the Senate *Report on Condition of Woman and Child Wage-Earners in the United States Volume XVIII: Employment of Women and Children in Selected Industries*.⁶

White American women worked in the better jobs. They started when they were

young and single and did not stay for very long.

(Note that the term race in this excerpt refers to ethnicity) “The present volume deals with a group of between 50,000 and 60,000 female employees, found in 23 different manufacturing industries, and distributed throughout 17 States. They were a decidedly youthful group, practically half of those ... being under 20 years of age, and not quite a fourth being 25 or over. In the main they were single, but one-eighth of the group were married. Racially, Americans predominated, white Americans forming nearly one-third ... of the total number. The relative importance of the foreign races varied ... greatly from place to place There were no indications that American women and those of the older immigrant races were being ... driven out of the industries studied.... Occasionally there were evidences that certain occupations were passing into the hands of recent immigrants. Generally ..., these occupations involved work so disagreeable ... that American or Americanized workers were unwilling to do it, and it was left for the newcomers, who having physical strength and an urgent need of employment would take whatever they could get....”

Working conditions were difficult. It was often necessary to stand all day and to work at a rapid pace. Work was often repetitive and monotonous. Conditions depended on the desires of the employer.

“The risk of harm from injurious positions is much less apparent and much harder to be sure of than the risk from machinery. The commonest risk came from continuous standing. There was hardly an industry in which at least a portion of the female workers were not on their feet all day long, and in some it was the exception to find workers seated. ... cases were found in which work could have been done just as well seated, but custom or a belief that greater speed could be attained when standing kept the workers on their feet....

Very little evidence was found in this investigation of pace setting by machinery. In a few cases it was found, but far more often speed was secured by means of low piece-rate wages. A very high rate of speed was often shown where this system prevailed, but the data gathered were not sufficient to show whether it was so great as to produce exhaustion or harmful overfatigue.

In general the work done by these women was unskilled. The core makers, a small group (in the electrical industry), all required some skill and training. Some of the occupations carried on by women in watch and clock making called into play judgment, accuracy, and initiative, and so did a few occupations found in some of the metal-working industries. But ... the general character of the work done by these women... at best was only semiskilled, and for the most part was unskilled, mechanical, and monotonous to the highest degree.

On the whole the strongest impression left by the study of this group...is the absolutely haphazard ... character of the industrial world as known to them. In general they enter it without preliminary training, picking up what knowledge or deftness they need as they go along. Whether they work in clean, healthful, and comfortable

surroundings or in buildings which are an outrage upon health and decency depends largely upon the particular employer ...; in practically every industry both extremes were found. The length of the working hours; the ... amount of overtime; the extent to which machinery was used; the extent to which it was safeguarded when used; the subdivision of work and the ... degree to which the worker's field was narrowed down; the pace at which the work was carried on; provisions for light, ventilation, and comfort-these and many other points depend not upon the worker, not even upon the industry, but very largely upon the attitude of the individual employer....”

Earnings were very variable and not controllable by the worker to any meaningful extent. Workers were replaceable, so employers determined pay.

“And when it comes to the question of earnings, the lack of standardization seems to reach its height. In the main the women were wholly unorganized and seemed to have no idea in regard to wage beyond taking what they could get. The determining factor seemed... the individual employer's attitude upon the matter. In ... the same industry employers would be found who so graded their rates that the average employee would be able to earn fair wages...; employers who took foreign women because they could get them for lower wages than American women....With some employers the lowest wages a woman or girl could be induced to work for decided what she could get. In many cases there was an... intention to treat the employees justly ..., but nowhere was there any generally accepted standard of what constituted a fair or reasonable wage. What a woman could earn by a week's work seemed to depend fully as much upon extrinsic factors over which she had no possible control as upon her own ability or her own efforts.”

The film clips make vivid the literature of the period and provide insights to the people and conditions of employment far beyond that provided by text and still photographs.

Endnotes

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4. Kellogg, Paul, Wage - Earning Pittsburgh *The Pittsburgh Survey Vol. 6* Russell Sage Foundation, New York, 1914, pages 228-235.
5. Butler, Elizabeth B., Women and the Trades, Pittsburgh, 1907-1908 Vol. 1 of the Pittsburgh Survey Russell Sage Foundation, New York, 1909, pages 218-219.
6. Senate Document No. 645 61st Congress *2d Session* Volume XVIII: Employment of Women and Children in Selected Industries *Report on Condition of Woman and Child Wage-Earners in the United States in 19 Volumes* Washington, Government Printing Office, 1913, page 33.

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