
UNITED STATES DEPARTMENT OF LABOR

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Mechanization and Productivity of Labor in the Cigar Manufacturing Industry

Prepared by

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Letter of Transmittal

UNITED STATES DEPARTMENT OF LABOR,
BUREAU OF LABOR STATISTICS,
Washington, D. C., November 30, 1938.

THE SECRETARY OF LABOR:

I have the honor to transmit herewith a report on Mechanization and Productivity of Labor in the Cigar Manufacturing Industry, prepared under the direction of Boris Stern of the Bureau of Labor Statistics.

ISADOR LUBIN, *Commissioner.*

HON. FRANCES PERKINS,
Secretary of Labor.

PREFACE

The cigar-manufacturing industry presents an unusual case in the study of mechanization, since major changes in man-hour productivity in this industry over the last 20 years have been brought about principally by the mechanization of one process. Moreover, not all concerns have mechanized, a substantial number of establishments for one reason or another continuing to use the older, hand-labor, craftsmanship methods. In many factories today one may find and study manufacturing methods substantially the same as those in general use 20 and 30 years ago. For these reasons, the present survey, though designed principally to study the productivity of labor in the industry today, has been somewhat extended in scope to appraise changes brought about by the introduction of improved manufacturing methods in the last 20 or 30 years.

This report is one of a series on surveys of labor productivity in a group of industries made by the Bureau of Labor Statistics in cooperation with the National Research Project, Works Progress Administration, under the general direction of Boris Stern, of the Bureau of Labor Statistics. Field work was done during the latter half of the year 1936 and in the early months of 1937.

ISADOR LUBIN,
Commissioner of Labor Statistics.

SEPTEMBER 1938.

VII

Mechanization and Productivity in the Cigar Manufacturing Industry

Chapter I

Summary

The most important recent changes in the productivity of labor in the cigar-manufacturing industry have come from the introduction of ingenious power-driven machines which semiautomatically perform the cigar-making operation itself.

In the manufacture of long-filler cigars, use of four-operator cigar machines was found to reduce the amount of labor required in the fabrication department of a cigar factory about 62 percent as compared with the hand process. This is equivalent to a reduction of about 52 percent in the total amount of labor required in the plant as a whole.¹ In terms of production costs, this reduction in labor time is estimated to represent a difference in favor of the mechanized process of at least \$3.00 per thousand cigars on the basis of wage rates prevailing in 1936.

Long-filler cigar machines were first introduced in 1917, and since then have spread through a wide section of the industry. It is estimated that in 1936 they were used in making about three-quarters of all long-filler cigars, or about six-tenths of the total production of all cigars, long-filler and short-filler combined.

A different machine is used in the manufacture of short-filler cigars, the filler of which does not run the full length of the cigar as in the case of long-filler cigars, but consists instead of smaller scraps or cuttings. This machine requires two operators, compared with four for the long-filler machine. Adequate data covering the manufacture of short-filler cigars by hand are not available, and a direct comparison of productivity between hand and machine methods cannot be made. However, since the labor time required to make short-filler cigars by hand is approximately the same as that required to make long-filler cigars, it is clear that the labor-time savings made possible by mechanization of short-filler cigar manufacture are even greater than in the case of long-filler cigars.

¹ Figures refer to the manufacture of cigars retailing at 5 cents each unless otherwise stated.

Short-filler machines were introduced about the same time as long-filler machines. Data on which to base numerical estimates are not available, but it appears that the manufacture of short-filler cigars is now almost completely mechanized.

Not only has the manufacture of both long-filler and short-filler cigars become substantially mechanized, but there has also been a trend from the manufacture of long-filler to short-filler cigars. It is estimated that the proportion of total production represented by short-filler cigars increased from 11 percent in 1920 to about 27 percent in 1936. Reduced labor costs have probably been a large factor in this increase, since the amount of labor required to make short-filler cigars by machine is less than that required to make long-filler cigars by either machine or hand—about 25 percent less in the former case and about 64 percent less in the latter.

Aside from introduction of cigar-making machines, the only other significant changes in labor productivity in the industry have come from increased use of stripping machines, which aid in removing the midrib of tobacco leaf. Mechanization of the stripping operation has reduced the amount of labor required in cigar plants by probably not more than 15 percent. Stripping machines were available before 1900, but for many years did not find wide application. Today, however, their use appears nearly universal.

There have been other changes in manufacturing techniques in the last 2 or 3 decades—for instance, the development of conveyor systems and the introduction of cellophaning and banding machinery—but the net effects of these on average labor productivity or the organization of the industry have been slight.

The major changes wrought by mechanization are thus attributed almost entirely to one factor—cigar machines. Perhaps the most direct effect of mechanization has been a reduction in the size of the labor force required by the industry. It is estimated that an additional 27,000 workers would have been required to produce the number of cigars manufactured in 1935 except for the use of long-filler cigar machines alone. Inclusion of the effects of other mechanical improvements might swell the displacement to well over 30,000 workers.

Displacement because of improvements in manufacturing technique has been aggravated by a reduction in the total volume of production of cigars amounting to more than 36 percent between 1920 and 1936. On the other hand, the effects have been mitigated to a degree by a marked decrease in average hours of labor, which, however, has not been sufficient to balance disemployment caused by the other two factors. The industry employed 112,000 wage earners in 1921; by 1935 this number was reduced by half, to a total of 56,000 workers.

In addition, it is important to note that hand cigar makers have generally not been employed as cigar-machine operators. These have most commonly been recruited directly from the ranks of unskilled labor, many, if not most, having had no previous experience in the cigar industry. Installation of each machine then has usually caused the induction into the industry of a few new unskilled workers and the complete displacement of a greater number of skilled hand cigar makers. It is estimated that by 1935 about 44,000 such hand workers had been severed from the industry due to the use of long-filler cigar machines alone, and concurrently, that jobs had been provided for about 17,000 new workers, mostly unskilled, brought in to run the machines.

While the newly introduced workers have been, in the main, unskilled young women, those displaced have been principally in the upper age groups, and of both sexes. The displaced hand workers have been accustomed to indoor work of a specialized nature, and their acquired skills have been of little use in other industries or even elsewhere in the cigar industry. As a result, they have often found it extremely difficult to locate new employment, or to readjust themselves to changed employment conditions. Employment dislocations caused by mechanization have, therefore, frequently caused great hardship and distress among displaced workers.²

At the same time that gradual displacement of hand workers has changed the character of the industry from one employing largely skilled labor to one using principally unskilled or semiskilled workers, distribution of employment between the sexes has been changed. While many hand cigar makers are men, cigar-machine operators are almost exclusively women. As mechanization has spread through the industry, the proportion of males employed has steadily decreased.

In the pre-machine era, the skill of hand cigar makers commanded relatively high wages. However, mechanization and the decline in production after 1920 together glutted the market for this type of labor, with a constantly depressing effect on wage levels. The average annual wage of workers in the cigar industry remained about constant through the twenties, but declined sharply after 1929, reaching a level in 1935 of but \$598, or 27 percent below the average in 1921. The situation in the hand branch of the industry has been particularly acute, with manufacturers under constant pressure to reduce labor costs because of competition from more efficient mechanized units, and a large body of workers competing for a place in an industry which has shown a constantly shrinking demand for their services. An abnormal situation has resulted, whereby in many cases skilled workers in the hand branch of the industry receive less for their services than

² Creamer, Daniel, and Swackhamer, Gladys V.: Cigar Makers—After the Lay-Off. National Research Project, Report No. L-1, W. P. A., pp. 79-84. Philadelphia, December 1937.

partly skilled or unskilled workers in machine factories. All recent studies have found hand cigar makers—highly skilled workers—generally receiving smaller rates of pay than cigar-machine operators working on cigars in comparable price classes.

Mechanization has had other important effects on the industry. Whereas in 1921 only 30 percent of all cigars manufactured retailed at 5 cents or less apiece, by 1929 this proportion had risen to 55 percent, and by 1936 to 88 percent. This general price decline was forced by bitter competition between manufacturers for a share in the shrinking cigar market, in turn caused by consumers' increasing use of cigarettes. Lowered prices were made possible in large part by declining prices for the raw material of the industry, cigar leaf tobacco, but reductions in labor costs achieved through mechanization were also a factor.

The impact of mechanization is also to be found in changes in the number and type of factories making cigars. Before cigar machines were introduced, a large share of all cigars were produced in small factories. Such shops did not entail a large investment, and could dispose of their product on relatively even terms with larger plants. Mechanization, requiring a greater investment, and steady mass outlets to markets, changed this situation. Only large factories in general could meet these conditions, so the benefits of mechanization have accrued principally to such units. In the declining market and the bitter competitive situation following 1920 these benefits proved decisive. In 1921 there were 14,578 cigar manufacturing establishments; by 1936 this number was reduced to 5,292. However, during the same period, the number of establishments manufacturing 40 million or more cigars each per year increased from 11 to 27, and their collective proportion of the total output of the industry rose from 15.7 percent to 56.5 percent. It is evident that the smaller establishments have been forced to bear the brunt of the industry's decline.

Probably more than three-quarters of all long-filler cigars made today are produced on machines, and the manufacture of short-filler cigars appears mechanized to an even higher degree. Mechanization, therefore, has not much further to go. The question as to the rate at which mechanization will spread through the balance of the industry, or whether there will be further significant mechanization, cannot be definitely settled. Physically, there appears to be no barrier. The fields in which the use of machines would probably not prove economical, that is, the manufacture of expensive cigars where the highest quality of workmanship is required, and the filling of special orders for small lots or odd sizes, comprise a very small part of all cigar production.

Practically, the persistence of hand methods of manufacture on a significant scale seems to rest in two major factors. The selling appeal of the term "hand-made" is still important, and as long as some con-

sumers prefer cigars so styled, hand manufacturers will find a market for their product. The second factor is the size of the labor-cost differential normally in favor of mechanized methods of operation. Any influence tending to increase this differential, such as higher wage levels in the industry as a whole or especially in the hand branch, would accelerate the trend to mechanization.

Chapter II

Methods and Machines

The manufacture of cigars involves three major steps: Assembly and preparation of the leaf tobacco, actual fabrication, and further processes designed to assemble and pack the cigars in a form most suitable for marketing. However, in most cigar manufacturing plants of any size a more detailed departmental separation may be made, as follows:

Leaf preparation, stripping, cigar making, packing, cellophaning and banding, and box labeling.

Changes in manufacturing methods within any one of these departments ordinarily have little effect on operations in other departments. Moreover, there are for several of the departments different characteristic methods of operation. A variety of combinations of these characteristic departmental types of operations is found in different plants. It is therefore most convenient and expedient to consider cigar manufacturing as a series of relatively independent operations, each of which may be performed by different methods in different plants.

Leaf Preparation

Leaf tobacco does not move directly from the growers' fields to cigar factories. It must be stored in warehouses for a period of from 6 months to 3 years, during which time it cures and mellows, before it can properly enter manufacturing processes.

The tobacco, as it comes to the cigar factory, is packed tightly in boxes or bales. It is dry, brittle, and friable. The first step in the preparation department after the leaf is unpacked is, therefore, to moisten it to a degree sufficient to permit further handling. This process is known as "casing" or "conditioning."

The tobacco is usually packed in the form of "hands," a hand comprising a bundle of from 12 to 20 leaves tied together at the butt end. The hands are taken from the box and given a brisk shaking to separate the individual leaves. They may be sprayed, but more usually are dipped in a tub of cold water and set on a drain board to allow excess water to run off. They are then again packed in boxes, covered with burlap, and left for a day or two to permit the moisture to permeate the leaves evenly.

All types of leaf are not moistened to the same degree.¹ For instance, filler leaf receives less manipulation in later processes than binder or wrapper leaf; in many cases it enters the plant in a stripped condition, that is, with the hard midrib of the leaf removed, in contrast to other types which are most usually stripped in the cigar factory. Consequently, the same degree of flexibility, and so of moisture content, is not required of filler leaf as in the case of binder and wrapper.

Most tobacco receives a final curing treatment, known as "sweating" in the preparation department. Sweating is an aptly named process. The tobacco, in open boxes, or occasionally on racks, is moved into a "sweat room," an insulated chamber maintained at a high relative humidity and a high temperature (up to 120° F.). The tobacco remains here for from 4 to 8 weeks, during which period it undergoes a type of fermentation and gives off strong fumes. The odor of ammonia is much in evidence, and workers entering sweat rooms frequently are required to wear gas masks for protection. Sweating is really a continuation of the curing process begun in the storage warehouse, and has the effect of mellowing the tobacco, driving off much of those substances which give the smoke of raw tobacco a sharp and acrid flavor.

Filler tobacco is usually stored in bins for 3 to 6 weeks or longer before it leaves the preparation department. This permits the tobacco to attain a more even condition and aroma, especially where several grades of filler have been mixed together.

Binder leaf may be binned for a short time (1 week), but wrapper leaf usually proceeds directly from the preparation department to the next operation.

Very little machinery of any kind is used in leaf preparation departments. Where found, it takes the form chiefly of conveying equipment to move the tobacco from one operation to another or to carry it through humidifying or sweating chambers. Naturally, the use of such machinery is economical only in the case of the largest plants, since the labor-time saving is small and relatively few employees are found in this department.

¹ Three types of leaf enter the making of most cigars. The body of the cigar, a clump of loose leaves or cuttings, is formed of filler leaf tobacco. Filler is selected principally on the basis of its smoking qualities. The filler is held together by a strip cut from a single leaf, known as the binder. Binder leaf tobacco is selected for smoothness, toughness, and elasticity. The outside covering of the cigar or wrapper is a strip cut from still another single leaf. Wrapper is selected on the basis of its color, smoothness, elasticity, and toughness.

Most of the wrapper leaf used in this country is either imported from the Dutch East Indies (Sumatra leaf), or is grown under shade in the Connecticut River Valley, in Georgia, or in Florida. Binder leaf is grown principally in the Connecticut River Valley, Pennsylvania, Ohio, and Wisconsin. Filler type leaf is grown in Pennsylvania, Ohio, Wisconsin, and adjacent States, and is also imported from Cuba, Puerto Rico, and the Philippine Islands. The types given are not exclusive, since there is a degree of alternative use within these classifications. For instance, although most Cuban-grown leaf used in this country is of the filler type, manufacturers of "all Havana" cigars use wrapper and binder leaf from the same source.

With the exception of those in charge, nearly all workers employed in leaf-preparation departments are unskilled men paid on an hourly basis.

Stripping

Stripping, also called stemming, is the operation in which the hard central rib or midvein of the tobacco leaf is removed. With respect to filler tobacco, either domestic or imported, this is most characteristically done at the storage warehouse before the leaf enters the cigar plant.² Binder and wrapper leaf, on the other hand, are usually stripped at the cigar plant.

As the binder or wrapper leaf enters the stripping department, it may or may not go through a process known as selecting. This consists of classifying the leaves according to size, and picking from the less expensive filler and binder grades leaves which may be suitable for use as binder or wrapper. However, this process is not found in most plants.

Stripping may be done by hand or by machine. Either type of operation is relatively simple. When leaf is to be stripped by hand, the operator grasps the tip end of the leaf in one hand, and with the thumb and forefinger of the other hand picks out the end of the leaf's midrib. The midrib and stem is then removed by winding the leaf around the wrist and hand.

Hand stripping of cigar tobacco is unusual today. It is generally found only in very small factories, or in those plants where selecting is done, in which case leaves too small to be stripped economically by machine may be stripped by hand.

A number of stripping machines are on the market, all operating in about the same manner. The attendant picks up a leaf, spreads it out, and feeds the tip end between two rollers. When the operator presses a foot pedal, the rollers turn, and a small strip of leaf wide enough to include the stem is cut out or torn away. The stem is rejected and the remaining halves of the leaf are wound on a drum. The machine is so constructed that the drum on which the leaf is wound always returns to the same relative position. Thus the tips of the various strips wound on it are always together.

² The Annual Report of the Commissioner of Internal Revenue for the fiscal year ending June 30, 1937, states that 125.9 million pounds of tobacco (unstemmed basis) were used in the manufacture of large cigars in 1936. About 3/10 of the weight of tobacco used in cigars consists of binder and wrapper leaf (according to information given by cooperating manufacturers). Therefore, about 38 million pounds of the tobacco used in 1936 was binder and wrapper. It may be assumed that all this leaf entered cigar factories in unstemmed condition. A total of 55 million pounds of unstemmed leaf entered cigar factories in 1936 (Annual Report of Commissioner of Internal Revenue). Therefore it is estimated that on an unstemmed basis about 17 million or on a stemmed basis about 13 million pounds of filler tobacco entered cigar factories in unstemmed condition in 1936 (on basis 25 percent waste in stemming—conversion basis used by Bureau of Internal Revenue). This compares with 35 million pounds of stemmed leaf (which may be assumed to have been all filler) and 18 million pounds of scrap (filler) which were used in 1936 (stemmed basis). It is therefore estimated that only 20 percent of all filler leaf used in 1936 was stemmed after reaching the cigar factories.

After about 50 leaves have been run into the machine the two packets of stripped leaf are removed, one consisting of all right-hand strips, the other of all left-hand strips. These pads of leaf are known as right-hand or left-hand "books." The separation is important because the direction of the spiral of the binder and wrapper around a cigar is determined by the side of the leaf from which the strips are cut. Since a cigar machine is built to handle only one type of spiral, it is necessary to supply the machine operators with the correct halves of the leaf.

As stated, most filler leaf, either domestic or imported, is stripped before it reaches the cigar factory. In cases where it is stripped at the plant, the operation is carried on in much the same manner as for wrapper and binder leaf, except that less care is necessary to keep the leaf unmarred.

Most plants making short-filler cigars buy their filler leaf in the form of scrap, a byproduct of the manufacture of long-filler cigars. This, of course, requires no stripping. However, in recent years a new type of operation has been introduced. A few manufacturers making short-filler cigars buy unstripped whole leaf, and at the factory feed it into a machine known as a "thresher." This machine beats the leaf between revolving arms, tearing the leaf from the stem. A current of air removes all dust and sand, and carries the scrap leaf to a storage receptacle. The heavier stem falls to the bottom of the machine. This machine thus eliminates the need for stripping, but it is applicable only to the manufacture of short-filler cigars and is used in few plants.

The skill required to strip leaf tobacco by hand is slight. Even less skill is required of the machine operator. The process of stripping leaf by either method is learned in a short period of time.

Both hand and machine strippers are usually paid on a piece-work basis. The fact that the labor time required to strip leaf depends on the type of the leaf, and within any one type more on the size and uniformity of leaves than on aggregate weight (since it requires nearly as much time to strip a small leaf as a large one), has produced in many factories a rather unusual system of piece-work payment. The person in charge of the stripping department separates the unstripped leaf tobacco into lots, each of which in his judgment represents a standard amount of labor. These lots are then given to the strippers, who individually receive payment for the number of lots they are able to complete. Because the worker's record is usually kept on a card which is punched to indicate the number of lots completed, the lots are known in many factories as "punches." The size of a "punch" is different for filler, binder, and wrapper tobacco, and, even within one of these grades, varies in size according to the supervisor's

judgment as to the average size of the component leaves and the stripping difficulties involved.

Changes in pay in the stripping department of cigar factories are often made by changing the average size of the "punch" rather than by changing the piece-work rate. Naturally, this has tended to make wage-rate or productivity data applying to stripping departments difficult to obtain and unreliable.

Stripping machines were introduced about 1890.³ However, adoption of the machines was slow at first because of the low wages paid strippers and the then relatively profitable condition of the industry.⁴

The decline in the total volume of production of cigars during the 1920's forced manufacturers to make economies wherever possible and the use of stripping machines became more common. By 1933 the bulk of all stripping was carried on with their assistance.⁵ The Code of Fair Competition for the Cigar Manufacturing Industry, negotiated under the National Industrial Recovery Act of 1933, in guaranteeing a minimum wage for all workers in the cigar industry probably acted still further to reduce hand stripping with its higher labor cost. In the plants covered by the present survey, hand stripping of leaf was found in only two cases, and in these cases was applied to but a very small proportion of the leaf used.

Another contrast between present-day and earlier plants may be pointed out. It appears that the stemming of filler leaf tobacco in cigar factories is less prevalent today than formerly, much of this work being done before the filler tobacco reaches the plants. This has resulted in a diminution in the amount of stripping department labor, which, however, is more apparent than real, since the labor is now performed in storage warehouses and its cost included in the cost of the tobacco.

Cigar Making

This department, in which the actual operation of making the cigar is carried out, accounts for the bulk of all workers employed in a plant. The cigar-making operation at the present time may be performed by hand, by machine, or by a combination of hand and machine methods. The same company may use different methods of manufacture in different plants and it is not even uncommon to find different methods employed side by side in a single factory.

³Baer, W. N.: *The Economic Development of the Cigar Industry in the United States*. Art Printing Co., Lancaster, Pa., 1933, p. 86.

⁴The work (stemming) is done almost entirely by hand; only a few factories have machines, and employ them on wrapper and binder leaf alone. U. S. Bureau of Labor Statistics Bull. 135: *Wages and hours of labor in the cigar and clothing industries, 1911 and 1912*. Washington, 1913, p. 12.

⁵A special survey of the cigar-manufacturing industry, conducted for the National Recovery Administration by the Census of Manufactures of 1933, covering 52,273 wage earners, reported 3,048 machine strippers employed as compared with 2,457 hand strippers.

Making Cigars By Hand

The oldest and the simplest method of making a cigar is still in use in a few shops, particularly those making higher-priced cigars. By this method one worker starting with the leaf tobacco and using no tools except a knife with a curved blade and a board on which to work produces finished cigars. This is referred to as the "out-and-out" hand method.

The worker cuts a thin strip from the wrapper leaf, another from the binder, and selects the right amount of filler leaves. He fashions the filler into proper form and size in the palm of his hand and wraps it in the strip of binder, making the "bunch." This is then placed on the strip of wrapper which lies flat on the board and with a deft rolling movement the worker fashions the cigar, beginning at the lighting end (the "tuck") and finishing at the end which goes into the mouth (the "head"). It is necessary to trim the wrapper a trifle just before the head is formed; then with a bit of paste made of water and gum tragacanth the last bit of wrapper is fastened securely and the head is smoothed between the thumb and forefinger. The other end of the cigar is then trimmed to the proper length. When the worker has completed a standard number of cigars, usually about 50, he ties them together with a ribbon and takes them to a foreman who inspects them and credits the cigar maker with the number finished. This "out-and-out" method of cigar making was general until the introduction of the mold about 1870.

The mold consists of two wooden boards, one thicker than the other. The heavier board has deep cigar shaped grooves carved in it, usually about 15 in number. The upper board is correspondingly carved to fit on the lower board and compress material placed in the grooves to a cigar shape. In use, a worker makes bunches as previously described and places them in the depressions of the mold. When the mold is filled the top is placed on and the mold put under pressure for a short while. The blocks are then separated and the bunches, properly shaped, are ready for rolling. Excess tobacco of the bunches protrudes from the grooves on each side of the mold. The cigar maker who is to wrap the bunches first trims one end of each of the bunches by running his knife down the edge of the mold. He then removes the bunches from the mold and puts on the wrapper leaf as previously described.

The mold made it possible to introduce division of labor into cigar making since one person, known as the "bunch-maker," could fashion sufficient bunches to supply about two others applying wrappers, known as "rollers." Some increase in productivity could be effected in this way since less care was necessary in fashioning the bunches, and in addition shorter training periods were required for the various workers.

This team-work system made possible by the mold has formed the pattern for hand manufacture of cigars ever since the device was introduced. Later tools were designed principally to aid in making the bunches or in rolling the bunches after leaving the mold.

About 15 years after the introduction of the mold, a hand-operated device to assist in making bunches was developed. This tool consists of a heavy cloth or canvas belt fastened at one end to a stationary cross frame and at the other end to a movable lever handle. The belt rests on the base, which has a cigar-shaped depression at the handle end and a convexly curved surface from this depression to the other end where the belt is attached. The filler is placed in the depression and a strip of binder leaf laid on the belt a short distance ahead. The handle is then pushed forward, rolling the bunch in the binder strip and giving it a cigar-like shape. Bunches so made are put in molds until the wrapper is applied. The use of this device has resulted in some increase in labor productivity, but its principal effect has been to lower still further the skill requirement in making bunches.

At about the same time that the manually operated bunching tool was introduced, a device to assist the roller was invented—the suction plate. This consists of a perforated steel plate with a sharp edge of exactly the shape to which the roller would trim the wrapper leaf. In operation, the roller places the wrapper leaf on the plate. Suction applied through the perforations holds the leaf smoothly in place, and a bar passed over the edge of the plate cuts the wrapper strip to shape. A bunch is then taken from a mold, laid on the wrapper strip, and the cigar finished as usual.

Skilled cigar makers may be found who will claim that the suction plate is of little or no value to them. In many hand plants today rollers who prefer their unaided hand skill may be found working at a bench next to workers who use the suction plate. However, like the mold and the manually operated bunching tool, the suction plate somewhat reduces the skill requirement, and less experienced rollers find it helpful. Its use is favored by the manufacturer since he finds that it may bring about a considerable saving in wrapper leaf, particularly in the case of inexperienced workers. This saving is of importance because of the relatively high cost of wrapper leaf. In hand factories, manufacturers ordinarily supply suction plates to workers who wish to use them, but do not arbitrarily require either method of operation. The same piece-work rates are paid whether the tool is used or not.

The most characteristic combination of methods employed in the manufacture of cigars by hand today consists in making the bunch with the assistance of the manually operated bunch machine and placing it in the mold. The bunches may then be wrapped with or

without the assistance of the suction plate, both methods frequently being used in the same plant.

One bunch maker ordinarily works with two rollers forming a team. The team is paid on a piece-work basis for the number of cigars produced and the workers divide their earnings either equally or according to some prearranged schedule. Hours of labor may or may not be the same for all members of a team, depending upon the speed and skill of the individual workers.

Despite the fact that use of the manually operated bunching tool and the suction plate have reduced to a degree the skill required of team workers, a high degree of manual dexterity is still requisite. A long training period, usually of several years duration, is required before a worker is qualified to become a member of a team.

Making Cigars by the Combination Hand and Machine Method

While the various tools mentioned in the preceding section were being devised there was also an effort made to perfect power equipment which would perform automatically all or part of the making operation. As early as 1886 a power-driven machine to make short filler bunches was introduced by a New Jersey firm.⁶ In 1902 another New Jersey firm introduced a similar but improved device.

These earlier machines represented a combination of the manually operated bunching machine and the suction plate. The proper amount of scrap filler was placed in a groove on a canvas belt, a strip of binder was placed ahead of it, held by suction applied through perforations in the belt, and the machine rolled the bunch, depositing it in another groove. The finished bunch was then placed in a mold. Two operators were required, one to feed in the filler, the other to lay the binder and place the finished bunches in a mold. Gradually the machines have been improved until today the filler is fed automatically and only one operator is required on a machine.

In plants using this machine the hoppers are kept full of shredded filler by floor boys or employees known as hopper fillers. Strips of binder are cut to shape from books of leaf by a worker who uses a hinged knife similar to that used to cut paper. The resulting pads of binder strips are brought to the machine operators.

Two types of power bunching machines are in use: In one a set of mechanical fingers picks up the proper quantity of filler from the hopper and drops it into a chute from which it falls by gravity into the machine; in the other type of machine, the filler is forced by pressure through a hole at the bottom of the hopper and so in successive measured quantities into the depression or pocket in the canvas belt. With either type, the operator simply lays a strip of binder leaf on

⁶ Baer, W. N.: *Economic Development of the Cigar Industry in the United States*. Art Printing Co., Lancaster, Pa., 1933, p. 85.

the canvas belt where it is held in position by suction through holes in the canvas belt. The filler is brought forward in a rolling motion by the belt, wrapped in the binder strip automatically, and placed in the depression. The operator picks up the bunch, inspects it, and places it in a mold. When a mold is filled it is placed under pressure until it can be used by hand rollers who finish the cigar by hand. In general one buncher using the power bunching machine supplies bunches for about 8 or 10 hand rollers.

This machine not only substantially reduces the number of persons required to make bunches, but also permits employment of relatively unskilled persons directly in the cigar-making operation. Only a short training period is necessary for a person to operate one of these machines. Both rollers and bunchers using the power machine are usually paid on a piece-work basis.

The adoption of the short-filler bunching machine by the industry stimulated efforts to devise a machine which would make bunches for long-filler cigars. Early devices were not very successful. When a satisfactory machine was finally devised to perform this operation it was overshadowed by the invention of a machine which would make a complete long-filler cigar. As a result, very few long-filler bunching machines are used at the present time.

At the same time that the complete cigar-making machine became available, a machine which would apply wrappers to bunches made by hand or machine was introduced. This made it possible to have a type of combination manufacture where bunches were made by hand and wrapped by machine. Although this combination of methods has been found in use in the industry, it is applied to an extremely small number of cigars. Where the rolling machine is used, it is usually teamed with a power bunching machine.

Making Cigars by Machine

Long-filler machines.—The use of power equipment in making bunches focused attention on the advantages of a machine which would apply the wrapper to the bunches as well. Since a team of hand workers consists in general of two rollers and one bunch maker, it is seen that use of power-driven bunching machinery reduces the labor requirements for that part of the cigar-making operation requiring the smallest number of workers.

Attempts to devise a machine to replace the work of hand rollers are recorded as early as 1890. At least one such machine was put on the market as early as 1912 but did not prove fully satisfactory. However, in 1917 the American Machine and Foundry Co. perfected and introduced a machine which has since almost revolutionized cigar manufacture. This machine uses leaf tobacco as material, and, with

four operators, produces finished cigars in a continuous and integrated series of operations.

The following rather detailed description of the operation of this machine is abstracted from the Monthly Labor Review of December 1931:

This machine carries out all the necessary operations for the complete manufacture of a long-filler cigar, from the feeding of the filler leaf into the machine by the first operator to the inspection of the cigar by the last operator.

The first operator, known as the "filler feeder," places the filler on an endless feed belt, between a guide and a shear bar which is adjustable for the length of cigar desired. There is an even distribution of the tobacco, and with the ends of the filler against the guide bar, the operator cuts off the other ends with the filler knife. As the tobacco feeds forward it passes under a row of star wheels and a set of guides adjusted to the correct height for the size of the cigar. It then passes under a second row of star wheels which travel at a slower rate of speed than the first row, giving sufficient time for the tobacco to be slightly compressed before being fed against the mechanical measuring fingers. As soon as the proper amount of tobacco has been pressed against these measuring fingers, a trip block stops the entire feed mechanism at this point. When the measured amount of tobacco is removed, the feed belt and star wheels again begin to operate, bringing forward each succeeding portion.

The measured tobacco is drawn by a set of reaper fingers to a pair of corrugated cutters which trim the ends to shapes determined by the amount of tobacco required at the "head" and "tuck" ends of the finished cigar. The tobacco that is trimmed off is carried by a return belt to the filler feed box. The tobacco, now formed to the shape of a cigar, is pushed forward to the rolling table where the binder, placed in position by the binder carrier, awaits it.

The second operator, known as the "binder layer," places the binder leaf on the binder die, where it is held down by suction and cut to the correct form for the type of cigar to be made. The suction is then transferred to the carrier, which picks up the leaf and deposits it on the rolling apron. The head end of the binder receives a supply of paste from the paster roller before being rolled around the cigar-shaped filler to form the bunch.

The bunch is softened by being rolled between a knurled drum and a concave, after which it is placed by thimbles at the head and tuck ends for the succeeding operations. A set of transfer fingers then carry it to a crimping mechanism for compression of the head and tuck of the shape required. Any projecting tobacco at the ends of the crimper jaws is trimmed off while the bunch is held firmly inside the jaws. From the crimper the bunch is carried over by another set of mechanical fingers to the wrapping mechanism.

The third operator, known as the "wrapper layer," places the wrapper on the wrapper die, where it is held down by suction and cut to the desired form in the same manner as the binder. It is then carried by the wrapper carrier to the wrapping device, where the bunch is revolving between fluted rollers. The head end of the wrapper receives a supply of paste, after which the wrapper, drawn off the carrier by the revolving bunch, is rolled in a spiral around it, starting from the tuck end.

After being wrapped, the cigar is carried by mechanical fingers to a roller drum and concave where it is softened, smoothed at the head end by a knurler, cut to length at the tuck end, and deposited on the inspection table.

The last operator on this machine, known as the "inspector," examines all cigars before placing them in trays. Her duties often also include the patching of imperfect cigars.

These machines are adjusted for the making of only one size or shape of cigar. With any change in the size or shape of the cigar to be manufactured it is necessary to change the dies. It is also necessary to have at least two machines, one right-hand and one left-hand, to apply the right or left hand portion of the binder and wrapper.

The machine utilizes practically any grade or kind of filler, binder, or wrapper tobacco and makes complete headed cigars uniform in size, shape, and weight. Each machine will make only right- or left-hand cigars, so a battery of at least two machines is required for full utilization of the leaf. The machine must be carefully adjusted to a particular size and shape of cigar, so considerable time may be lost where frequent changes are made.

No special skill is required of any of the machine operators, nor is it even particularly advantageous for any of them to have had experience in making cigars by hand, except perhaps in the case of the inspector who patches minor defects. In most factories the machine operators are girls. In addition to the four operators, a number of mechanics, oilers, and machine adjusters are required to tend a battery of machines.

Each machine occupies about 6 feet by 9 feet of floor space. Each is operated by a $\frac{1}{2}$ -horsepower motor and a $\frac{1}{20}$ -horsepower auxiliary motor. The machine is geared to operate normally at a rate of about seven and one-half cigars per minute, although by using special gears it is possible to increase this rate. In one plant the machines were operated normally at a rate of about 9 cigars per minute, and satisfactory cigars had been produced at the rate of 10 per minute.

Automatic long-filler cigar machines have usually been supplied to plants on a lease basis, the cigar manufacturer paying the cost of producing and installing the machine—about \$4,500—and contracting to pay a royalty on all production and a minimum charge whether the machine is in use or not.⁷

The royalty is reported to be \$1 per thousand cigars made.⁸

Apparently the manufacturers of the machines have preferred not to install them in units of less than six.⁹ This limitation has resulted in a fairly sharp line of demarcation between hand and machine producers of cigars. Because of the high cost of installing, using, and maintaining automatic machinery, the great majority of the machines have been concentrated in the hands of relatively few large-scale producers. The large output of a battery of machines and the

⁷ Mack, R. H.: *The Cigar Manufacturing Industry*. University of Pennsylvania Press, Philadelphia Press, Philadelphia, Pa., 1933, p. 54, states in a footnote, "The writer has been informed by the secretary of the International Cigar Machinery Co. that not all machines are leased on this basis, some being leased on the basis of a flat monthly rental irrespective of the number of cigars actually produced on the machines. Details concerning this matter, however, cannot be made public."

⁸ *Fortune*, issue of June 1930.

⁹ Baer, W. N.: *The Economic Development of the Cigar Manufacturing Industry in the United States*. Art Printing Co., Lancaster, Pa., 1933, p. 201.

high cost of maintaining idle machines has necessitated assurance of a large sustained demand. Therefore, while there are a few large manufacturers who make cigars by hand, there are practically no small producers using the four-operator machine.

During the period 1919 to 1924 the machine really passed through a testing period. Many manufacturers did not concede its efficiency, while others felt that the public would not knowingly accept a machine-made cigar. After 1924 the rate of installation of machines increased, and it may be recalled that by 1929 certain manufacturers were advertising that their cigars were made by machine rather than by hand. Since 1931 the number of machines installed has remained about stationary (table 1).

There are no reliable statistics indicating the proportions of cigars made by different methods today. However, on the basis of data presented later in the text, it is estimated that about six-tenths of all cigars made at the present time are manufactured with the aid of long-filler cigar machines.

TABLE 1.—Average number of four-operator, long-filler cigar machines on lease to cigar manufacturers, 1917-36

Year	Number of machines	Year	Number of machines
1917.....	0	1927.....	2,412
1918.....	16	1928.....	2,659
1919.....	252	1929.....	2,991
1920.....	522	1930.....	3,591
1921.....	542	1931.....	3,803
1922.....	639	1932.....	3,777
1923.....	844	1933.....	3,764
1924.....	970	1934.....	3,774
1925.....	1,265	1935.....	3,706
1926.....	1,847	1936.....	3,683

Source: International Cigar Machinery Co., subsidiary of the American Machine and Foundry Co.

Short-filler machines.—Success of a machine to make short-filler cigars, after the invention of the power bunching machine, depended upon the development of a practical attachment which would automatically apply wrappers. This occurred at about the same time that the complete long-filler machine was introduced.

The machine used to make short-filler cigars is in reality a combination of two separate devices, each worked by one operator. The first device is a short-filler power bunching machine operating as previously described. The rolling attachment operates in the same manner as the rolling part of the long-filler cigar machine, excepting that a separate operator to inspect the cigars is not used on each machine. The operator of the bunching machine, instead of placing the finished bunch in a mold, places it in an attachment of the rolling machine. In some machines there is a place for only one bunch at a time. With this type

of machine the closest type of cooperation must exist between the two operators. Other machines are equipped with a large wheel which carries places for a number of bunches. With this machine the two operators work more independently of each other.

The speed of the combined machine is governed by the speed of the rolling equipment, which is fixed as long as the machine is in operation. The speed of the bunching attachment is dependent on the operator. In plants using a number of these machines, the inspection and patching of defective cigars is often done by a group of workers in a separate inspection department.

Packing

The term used to designate this department, though in general use throughout the cigar industry, is somewhat misleading to the layman. In this department cigars are not usually packed in the boxes in which they are sent to the market. The principal functions of the workers in the packing department are to separate the cigars by color and shade and to pack them in stock boxes, in which pressure imparts to them their characteristic flattened shape.

Even before 1900, it was found that a mottled or variegated appearance in the top row of a box of cigars was not pleasing to customers. Accordingly, a class of workers known as packers or shaders grew up whose function was to sort cigars according to color. The work required considerable manual skill and a very high degree of accuracy in estimating the shades of color of cigar wrappers. These workers were well paid and were considered to be about on the same skill level as hand cigar makers.

About 1926 a machine was introduced which selected cigars according to color with even greater accuracy than the human eye. It was based upon the operation of a photo electric cell and separated cigars into 32 classes of color gradations.

The machine had a much higher productivity than hand workers but was not accepted generally by manufacturers. One manufacturer stated that though the machine had been installed in his factory it was removed because it damaged too many cigars. Another major reason why the machine was not more widely used is probably to be found in the fact that cellophane wrapping of cigars became general a few years later. Cellophane, slightly obscuring the color, eliminated the need for shading cigars into a great number of finely differentiated color classes. Whereas formerly cigars often were sorted into as many as 20 different color groups, today the general average seems to be around 5, and in some cases less.

It was early determined that workers have difficulty in accurately shading cigars in the yellow light of ordinary incandescent lamps. The packing department of a cigar plant is, therefore, usually located

on the top floor of the building where skylights admit abundant sunlight. However, some of the larger factories have recently installed their packing departments on other floors illuminated by special lamps which give off a blue-white light very similar to sunshine.

Packers, working at benches, are supplied with large lots of cigars in stock boxes or trays. The worker spreads a double handful of cigars out on the bench and then, moving rapidly from one end of the row to the other, separates the cigars according to shade. When a sufficient number of cigars of the various groups have been separated the worker takes a shell, which is of the same shape as the box in which the cigars are to be sold but more substantially constructed, and fills it with cigars of one color. Ordinarily the operator also subshades the cigars, that is, the darkest cigar in a row is placed at one end of the box and the lightest at the other, the intermediate cigars being graduated according to shade.

When a shell is filled, it is covered with a lid and put under pressure, usually by means of a small screw press operated by hand. Up to this time the cigars have had a perfectly round cross section. This pressure gives them their characteristic square shape. The cigars, still in the shells, are then transported to the next department of the plant.

Ordinarily the operations of shading, subshading, and packing in shells are all performed by a single worker. In a few plants this work is divided between tray packers who separate the cigars into the primary color groups, and subshaders who make the finer distinctions while packing the cigars in shells.

The amount of labor involved in shading cigars is dependent to a considerable degree on the type of wrapper leaf used and on the price class of the cigar. Sumatra leaf, being usually of a more even color, requires less shading than some other varieties of wrapper leaf. Many of the cheaper cigars are not shaded at all or are shaded in only perfunctory fashion, while the more expensive the cigar the greater the care taken in shading and subshading.

Though the degree of skill required of packers today is naturally somewhat less than before the use of cellophane became general, still packers are relatively well paid and work on a piece-work basis.

Cellophaning and Banding

In the early days of the cigar industry cigars carried no identifying marks, and one of the problems of the cigar manufacturer was to induce "brand consciousness" in his customers. This resulted in the plan being adopted of pasting around the cigars a small varicolored band bearing the brand name. These bands were pasted on by hand until some time prior to 1925 when an automatic banding machine was introduced. An operator fed the cigars into one end of this ma-

chine (taking them in rows from the packing shells) and they emerged at the other end with a band neatly pasted around each. The same operator then packed them in the cigar box in which they were to be sold, retaining the order in which they were placed by the packer, and closed and fastened the box with a small brad. This banding machine was widely adopted by all but the smallest manufacturers.

In 1925 a machine was put on the market which wrapped cigars in tissue paper or foil. It was not used a great deal until 1929, when the machine was adapted to wrap the cigars in cellophane. The foil or cellophane wrapping machine operated in about the same manner as the banding machine—that is, an operator fed cigars into one end of the machine and they came out at the other end in their original order.

The cellophaning and banding machines were placed next to each other and eventually became one machine which still required two operators. Recently an automatic feeding device has replaced one operator. The single operator of this newest machine places all the cigars contained in a packing shell into a hopper at one end of the machine, and the cigars are dropped down, a row at a time, to a corrugated belt which feeds them into the machine. As the cigars emerge, banded and cellophaned, the operator packs them in boxes. Duties of the operator also include keeping the machine supplied with bands, paste, and rolls of cellophane.

Improved banding and cellophaning machines with automatic feed are found in most cigar plants today. No particular skill is required of the operators. The machine can handle any shape or size of cigar, but adjustment is required whenever a change is made from one type to another.

A small amount of banding and cellophaning is still done by hand, usually in the case of small lots where it would not pay to adjust and readjust the machine. The cellophaning is done in two ways—the cigars may be slipped into little cellophane pouches, supplied by the cellophane company, and the end folded over, or the cigar may be wrapped in a straight slip of cellophane. Either method of operation requires considerable manual dexterity.

While machines band and wrap cigars much more rapidly than could possibly be done by hand, it is an open question whether this has caused any direct displacement of hand labor. At the present time, most cigars offered for sale are banded and wrapped in cellophane or other covering, whereas before machines became available few cigars had individual protective jackets and banding was not universal.¹⁰ It may be argued that the machines which made these operations economical are responsible for the prevalence of banding and

¹⁰ "While the banding of cigars is a common practice, it is not universal." U. S. Bureau of Labor Statistics Bull. No. 135: Wages and hours of labor in the cigar and clothing industries, 1911 and 1912. Washington, 1913, p. 12.

cellophane wrapping today, and to this degree for an increase in the number of workers required. At the same time, they may also be charged with the indirect displacement of workers in the packing department.

Box Labeling

Before leaving the factory, boxes of cigars must have pasted on them a Federal internal revenue stamp. In addition, manufacturers usually paste on labels of their own which identify the contents of the boxes. The labels are pasted around the box in such fashion that they must be broken before the box can be opened. The operation is normally done by hand; however, in a few of the largest factories a box-labeling machine is used. This machine requires two operators, one to supply it with boxes, the other to take the labeled boxes away. It automatically affixes labels and internal revenue stamps and cancels the latter at the rate of 50 or 60 boxes per minute. Whether the machine is used or not, this department requires but a few unskilled workers.

Miscellaneous

There are in all cigar factories some workers who cannot be readily allocated to any particular manufacturing department. Such workers include floor boys, truckers, cleaners, office employees, shipping clerks, and mechanics. Some plants are air-conditioned, and employees who take care of this equipment fall in this class. In the larger plants locker-room attendants and nurses may be found.

The number of such employees depends to a very large degree on the company's policy and the efficiency of the plant lay-out. For instance, installation of conveyor machinery in a plant would reduce the number of those subsidiary workers engaged in transporting cigars or tobacco from one operation to another. Again, certain factories distribute their product locally. These manufacturers therefore require more shipping-room labor per unit of output than the manufacturer who produces only in large lots for wholesale outlets.

Chapter III

Labor Productivity

Methodology

When this study was first organized, an attempt was made to secure information from plants fairly representative of various methods of manufacture. It soon became apparent that most of the small companies and many of the larger ones kept no records of the type suitable for this study. It was further discovered that even most of the larger companies destroyed their records after a short period of time, in general, not exceeding 2 years. It was thus possible to secure information in most cases for the years 1935 and 1936 only, and in some cases for the year 1936 only.

Wherever possible, production and pay-roll data were obtained for the week including the 15th day of the month for the months of February, May, August, and November 1935, and January, April, July, and October 1936. Some small changes in productivity between these quarterly periods were observable in the cases of individual companies. However, it was felt that these changes were not of great significance. Therefore, the data for the individual companies are presented as averages over the entire period covered by the survey rather than as series of quarterly figures. For instance, in the case of a plant where information was obtained for eight pay-roll periods, the average for the eight periods is used to represent the plant. In arriving at averages, no periods were included during which changes in manufacturing methods occurred. Periods with incomplete information were excluded from the calculations of the averages.

The information from different plants was obtained and treated on a departmental basis. The methods used in averaging the departmental data from different plants will be explained in detail in the sections where this information is presented.

The Sample

The sample originally included 19 factories, 4 of which were excluded from final tabulations because of incomplete records. The 15 plants included in the sample employed an average of about 9,600 wage earners. This represents 17 percent of the number of wage earners reported for the industry by the 1935 Census of Manufactures.

Average annual production of the plants included is estimated at about 863 million cigars, or 18 percent of the total reported by the Commissioner of Internal Revenue for 1935. The distribution of the sample according to retail price classes as compared with the distribution for the entire industry as reported by the Commissioner of Internal Revenue in 1935 is as follows:

	Sample	Industry
	<i>Percent</i>	<i>Percent</i>
Class "A".....	87.5	87.5
Class "B".....	1.0	1.4
Class "C".....	12.4	10.2
Classes "D" and "E".....	.1	.9

¹ Less than 0.05 percent.

Principal coverage of the sample was therefore in the two most important retail price classes, class "A" and class "C", in about the same proportions existing in the industry as a whole.¹

Average annual production of the plants included in the sample was divided according to methods of manufacture approximately as follows: Hand, 65 million; machine, 788 million; combination hand and machine, 10 million. No reliable data applying to the industry as a whole with which to compare these figures are available.

In general, the survey is representative only of the larger plants. No plant included in the sample produced less than 5 million cigars per year and eight of the plants included produced over 30 million per year. However, according to the reports of the Commissioner of Internal Revenue, plants producing more than 5 million cigars per year have in recent years consistently produced more than 80 percent of all cigars manufactured.

Regionally, the plants included in the sample were all located in Pennsylvania, New Jersey, and New York. An effort was made to include some of the Florida plants, but none was found with suitable records.

Adequate data regarding man-hours and production could not be obtained for all departments of all the plants. In a few cases, a particular process was carried through by two different methods in the same plant, with no way of determining output or labor time expended for each. In several other instances, groups of workers were found who divided their time between two or more of the smaller departments, without any records available to show the time spent in each.

¹ The letters, which will be used frequently in the following pages of this report, refer to the classification of cigars established by the Bureau of Internal Revenue for the purpose of assessing tobacco taxes. It is commonly used in the industry, and is based on the intended retail price, as follows: Cigars which are manufactured to retail at not more than 5 cent each are designated as class "A"; more than 5 cents each and not more than 8 cents each as class "B"; more than 8 cents each and not more than 15 cents each as class "C"; more than 15 cents each and not more than 20 cents each as class "D"; and more than 20 cents each as class "E". Within each class cigars are usually referred to by the trade according to their intended retail selling price. Thus in class "A" there are, among others, 2-for-5-cent, 3-for-10-cent, and 5-cent cigars.

In all such cases, data regarding the affected departments were not used.

The sample is definitely not properly constituted to give any information regarding wages and hours of labor purporting to be representative of the industry as a whole. However, it is felt to be adequate to indicate productivity of labor in individual types of operation. This conclusion is strengthened by the excellent agreement frequently obtained between productivity averages taken from different plants.

Productivity of Labor

In most productivity studies, productivity is measured by the quantity of product per standard unit of time. Because of the presentation of information on a departmental basis, it was found more feasible in the present case to show the data in the form of the amount of labor time required to produce a given quantity of product. By this method, labor-time totals for any operation or series of operations may be obtained by simple addition. Of course, if labor requirements for any particular operation are given as a certain number of hours per thousand cigars, productivity in the more familiar units of cigars per man-hour may be obtained by dividing the given number of hours into one thousand.

Leaf Preparation

A number of difficulties immediately become apparent in any attempt to determine average man-hour requirements in the leaf-preparation departments of cigar factories.

In the first place, unstripped leaf as a rule requires more labor in preparation than stripped leaf. Therefore, it is necessary to adopt some standard with regard to the condition in which the leaf arrives at the plant. The most characteristic type of operation that was found by this study was for a plant to receive all binder and wrapper leaf unstripped and all filler leaf stripped.

In the second place, no data for the output of a preparation department as such were available in the case of any cigar plant covered. It therefore became necessary to apply the output of some other department as a standard for the preparation department. In the following study the output of the cigar-making department was chosen, as man-hours of labor per thousand cigars provides a convenient unit which may be used for comparison of all departments.

Adoption of this standard raises a third difficulty. A considerable time may elapse between preparation of leaf and its use in cigars. Therefore, during any 1-week period the outputs of the two departments—preparation and making—may not be at all closely correlated. By averaging together a series of periods, differences may be expected to be minimized and eventually to disappear. These differences

would also be less where plants had a relatively stable schedule of production.

Finally, records of labor time expended were not available for most of the smaller factories. Four plants were found meeting the conditions set up—that is, they stripped binder and wrapper leaf at the factory and received filler already stripped, and they had adequate records. The information derived is presented in table 2. Data for two other plants, which received a small proportion of their domestic filler in unstripped condition but satisfied the other criteria, are also shown in table 2.

TABLE 2.—*Labor requirements in the leaf preparation departments of plants stripping wrapper and binder leaf and receiving filler leaf in stripped condition*

Type of filler tobacco	Plant ¹	Man-hours in the preparation department per 1,000 cigars produced in the making department					Type of cigar manufactured
		Direct labor only			Super- visory aver- age	Total aver- age	
		Maxi- mum	Mini- mum	Aver- age			
Domestic and imported.....	{ ² A	2.04	1.47	1.64	0.17	1.81	Class "A," 5 cents each. Class "A," 5 cents each.
Average, plants A and B.....	{ ² B	1.77	1.56	1.67	.12	1.79	
Domestic and imported.....	{ ^(2 3) C	1.72	1.14	1.35	.15	1.50	Class "A," 5 cents each. Class "A," 5 cents each, and class "C".
Average, plants C and D.....	{ ⁽³⁾ D	2.22	1.03	1.29	.08	1.37	
Imported only.....	{ ⁽³⁾ E	1.50	1.12	1.31	.10	1.41	Class "A," 5 cents each, and class "C." Class "A," 5 cents each, and class "C."
Average, plants E and F.....	{ ⁽³⁾ F	1.07	.73	.82	.15	.97	
				1.12	.13	1.25	

¹ Letters assigned plants have no connection with letters given in other tables.

² Plants A and B receive a small proportion of domestic filler tobacco in unstripped condition, and so are given separately from plants C and D.

³ Weighted on basis of total production of cigars by individual plants during periods covered by survey.

Source: Plant records, 1935-36 survey.

It will be noted that not only average but also minimum and maximum direct labor requirements are given in the case of each plant. These are inserted to show the range of values encountered in practice. The differences exhibited between maximum and minimum values are probably in most part a reflection of different rates of operation in the preparation and making departments.

The type of filler tobacco used seems to be in part a determining factor as to the amount of labor required in leaf-preparation departments, much more so than binder or wrapper tobacco, since it forms a greater proportion of the total amount of tobacco entering the plant.

From a comparison of the average labor required in plants C and D with that required in plants E and F, table 2, it seems that less labor per unit of output is required in the preparation of imported filler.

Because of the many experimental difficulties and assumptions involved, the data of table 2 are presented as merely indicative of approximate labor requirements in preparation departments.

Stripping

Many of the same difficulties experienced in attempting to determine labor requirements in the preparation department are encountered in a treatment of the stripping department. However, in this case some output data were obtained, making it possible to calculate directly the average labor involved in stripping different kinds of leaf.

Table 3 presents labor-requirement data in terms of man-hours per hundred pounds of stripped leaf for workers stripping wrapper leaf tobacco by machine. The information is given separately according to the type of leaf stripped. The data are presented for stripping-machine operators separately and as an average for all labor in the department. The averages of plants presented were calculated on the basis of average leaf stripped per plant per period since it was felt that the larger the plant operations in this field the more reliable and more representative the information would be.

Maximum and minimum average amounts of labor required per hundred pounds of leaf are given for stripping machine operators. Since in this case labor time was related directly to output data, the differences shown may be taken as indicating variations in labor requirements occasioned by changes in type of leaf used by a plant at different periods. Most of the differences from the averages shown are small.

It seems that the labor time required to strip Connecticut shade-grown wrapper (plants C and D) is less than that for Sumatra leaf (plants A and B). Labor requirements in stripping Connecticut and Florida shade-grown together (plants E and F) appear to be even less; however, the plants from which this information was taken were not producing cigars of a grade comparable with the other four included in the sample. The higher productivity here, therefore, may be caused by greater emphasis on speed and less on the quality of results in these plants.

In the case of plant F, table 3, some information with regard to hand stripping of Connecticut shade-grown wrapper for use in 5-cent cigars was obtained. These hand strippers took an average of 75.8 hours to produce 100 pounds of stripped leaf, with a maximum labor requirement of 78.7 hours in one period and a minimum of 70.9 in another. Therefore in this plant the productivity of machine wrapper strippers was on the average 3.3 times greater than that of hand strippers.

Table 4 presents labor requirements in machine stripping of binder leaf tobacco. The differences between plant A and plants B, C, and D in this table may have been due in part to a difference in the type of leaf stripped. It seems more probable that they were caused by the difference in the type of cigars manufactured—the binder used in the more expensive class C cigars produced in plant A probably requiring more care than was necessary in the other plants.

TABLE 3.—Labor requirements in stripping wrapper leaf tobacco by machine

Type of leaf	Plant ¹	Man-hours per hundred pounds of stripped leaf				Type of cigars manufactured
		Stripping-machine operators only			All labor ²	
		Maximum	Minimum	Average	Average	
Sumatra.....	{ A	34.6	29.0	32.9	41.5	Class A, 5-cent, and class C. Class A, 5-cent.
Average, plants A and B ³ .	B	33.4	31.8	32.5	39.1	
Connecticut, shade-grown.....	{ C	31.9	25.8	28.7	(⁴)	Class A, 5-cent. Class C.
Average, plants C and D ³ .	D	28.2	23.8	25.5	30.0	
Connecticut and Florida, shade-grown.	{ E	27.2	24.0	25.5	26.6	Class A, 5-cent and less than 5-cent. Class A, 5-cent and less than 5-cent.
Average, plants E and F ³ .	F	26.0	23.8	24.6	(⁴)	
				25.1	(⁴)	

¹ Letters assigned to plants have no connection with letters given plants in other tables.

² In addition to stripping-machine operators, includes supervisors, mechanics, weighers, floor and stock boys, and other incidental labor attached to this department.

³ Weighted average, based on average quantity of leaf stripped per period.

⁴ Information not available.

Source: Plant records, 1935-36 survey.

It is apparent that productivity in machine stripping of binder leaf is about twice that in stripping wrapper leaf. This is due to greater care necessary in stripping better grades of wrapper leaf where an unblemished condition of the stripped leaf is of major importance.

TABLE 4.—Labor requirements in stripping binder leaf tobacco by machine

Type of leaf	Plant ¹	Man-hours per hundred pounds of stripped leaf				Type of cigars manufactured
		Stripping-machine operators only			All labor ²	
		Maximum	Minimum	Average	Average	
Connecticut broadleaf.....	{ A	16.8	14.8	15.4	18.2	Class C. Class A, 5-cent and less than 5-cent.
	B	15.2	13.0	14.3	14.9	
Connecticut broadleaf and Pennsylvania seed leaf.	{ C	13.4	12.6	13.2	13.9	Class A, 5-cent. Class A, 5-cent and less than 5-cent.
	D	15.6	11.8	13.1	(³)	
Average, plants B and C. ⁴				13.6	14.3	
Average, plants B, C, and D. ⁴				13.4	(³)	

¹ Letters assigned to plants have no connection with letters given plants in other tables.

² In addition to stripping-machine operators, includes supervisors, mechanics, weighers, floor and stock boys, and other incidental labor attached to this department.

³ Information not available.

⁴ Weighted average, based on average quantity of leaf stripped per period.

Source: Plant records, 1935-36 survey.

Data on machine stripping of domestic filler type leaf were obtained from only one plant. This filler was used in making 5-cent long-filler cigars. The information covered quite a large production over a number of periods. Machine strippers in this plant required an

average of 9.49 hours to produce 100 pounds of stripped leaf. Maximum and minimum labor requirements were 10.36 and 9.14 hours per hundred pounds, respectively. Including all labor found in the department with the machine operators, average labor requirements were 10.06 hours per 100 pounds of stripped leaf. It appears that man-hour productivity in stripping filler by machine is about one and a half times as great as the productivity exhibited in stripping binder.

Table 5 gives the man-hour requirements in the stripping departments of cigar plants stripping wrapper and binder leaf by machine but stripping no filler. The data were calculated in a manner analogous to that employed for the preparation department.

In the four plants shown an average of 1.47 hours of labor by stripping-machine operators was required per thousand cigars produced in the making department. In the case of individual plants this figure ranged from 1.33 to 1.88 man-hours. There seems to be no particular correlation between these labor requirements and the type of cigar made, the type of wrapper or binder leaf used, or the small variations in the proportion of total leaf stripped which was wrapper or binder. It is probable that the differences displayed were due to a combination of these influences, no one acting as the determining factor.

The lack of adequate data covering stripping by hand makes it difficult to estimate the labor-time savings made possible by stripping machines. In the one case where data were secured comparing the two methods, it was found that about 3.3 times as much labor time was required to strip the same amount of product by hand as by machine. However, this covered wrapper tobacco only. If it be assumed that a like ratio holds for binder tobacco and that the same amount of supervisory and incidental labor is required by either process, the average requirement of 1.64 hours of stripping labor per 1,000 cigars produced as shown in table 5 for plants stripping binder and wrapper leaf by machine would be increased to about 5.11 hours in plants where this was done by hand, a difference of 3.47 hours per 1,000 cigars in favor of the mechanized process.

This calculation excludes savings made possible by mechanized stripping of filler leaf, savings which are of equal importance in relation to costs whether the operation is carried on in the plant or at the storage warehouse. It may be estimated that about 1.2 hours of labor are required to strip by machine the filler tobacco required for 1,000 cigars.² Even were machine productivity three times greater,

² Dividing the total amount of leaf tobacco used (stemmed basis) by the total number of cigars produced in 1936, as given by the Annual Report of the Commissioner of Internal Revenue, indicates that about 18.26 pounds of stemmed tobacco are used per 1,000 cigars. About $\frac{1}{10}$ of the weight of tobacco entering cigars is filler (information volunteered by manufacturers). Combining, it is indicated that about 12.8 pounds of stemmed filler are required per 1,000 cigars. It was found that about 9.49 hours are required to strip 100 pounds of filler leaf tobacco by machine. (See p. 29.) It would therefore require about 1.2 hours to strip sufficient filler tobacco for 1,000 cigars by machine.

TABLE 5.—Labor requirements in stripping departments of plants stripping only wrapper and binder leaf tobacco by machine

Type cigars manufactured	Plant ¹	Man-hours labor, stripping department, 1,000 cigars output of making dept. ²					Percentage total leaf stripped which was—		Type of leaf	
		Stripping-machine operators only			Other labor, average ³	All labor, average ⁴	Wrapper	Binder	Wrapper	Binder
		Maximum	Minimum	Average						
Class A, 5-cent, and class C	A	2.38	1.06	1.33	0.15	1.48	37.5	62.5	Connecticut shade-grown.	Connecticut broadleaf and Wisconsin.
Class A, 5-cent.....	B	1.59	1.21	1.33	(⁵)	(⁵)	30.7	69.3	do.....	Do.
Class C.....	C	1.82	1.50	1.62	.22	1.84	27.2	72.8	Sumatra.....	Connecticut broadleaf.
Class A, 5-cent and less than 5-cent.....	D	2.31	1.74	1.88	.08	1.96	26.9	73.1	Connecticut and Florida shade-grown	Connecticut broadleaf and Pennsylvania seed leaf.
Average, plants A, C, and D ⁶				1.51	.13	1.64	33.8	66.2		
Average, plants A, B, C, and D ⁶				1.47	(⁵)	(⁵)	33.1	66.9		

¹ Letters assigned plants have no connection with letters given plants in other tables.

² Man-hours of labor per period in the stripping department divided by output of cigar-making department expressed in thousands of cigars.

³ Includes supervisors, mechanics, weighers, floor and stock boys, and other incidental labor attached to the stripping department.

⁴ Sum of 2 preceding columns.

⁵ Information not available.

⁶ Weighted average, based on average production of cigars per period.

Source: Plant records, 1935-36 survey.

only 2.4 more hours of labor would be required by the hand process. While no data are available, it seems doubtful that productivity in mechanized stripping of filler leaf is so much greater than by the hand process, and the general average may be materially less than the figure given.³

Combining the data calculated for binder, wrapper, and filler types, it is estimated that the labor-time savings resulting from complete mechanization of the stripping process probably do not exceed, and may be materially less than, 6 hours per 1,000 cigars. Since stripping by machine is now common, while 20 and 30 years ago it was decidedly unusual, this figure of 6 hours may be taken as the probable maximum difference in labor requirements per 1,000 cigars in the stripping departments of present-day cigar factories as compared with those of an earlier period.

Cigar Making

Table 6 presents data on the man-hours of labor required to make various types of cigars by hand. Throughout all the plants shown the team-work system was employed, workers using the hand-operated bunching tool and, where desired, the suction plate.

The approximate uniformity in the productivity of cigar makers from plant to plant within the various price groups is apparent. As might be expected, more labor time was expended the more expensive the cigar made.

Perhaps more insight may be gained by examining the productivity of the individual operatives making up the teams. Table 7 presents this information.

The most striking divergence in output per man-hour is displayed between short-filler and long-filler cigars. Rollers making 5-cent long-filler cigars averaged 59.5 cigars per hour. In the case of short-filler cigars retailing at less than 5 cents, productivity averaged 77.5 per hour. The difference of 18 cigars per hour, equivalent to 5.55 man-hours per thousand cigars, illustrates the lesser care taken in making the cheaper cigars. However, the greatest difference appears in the bunching operation. The short-filler bunch makers averaged more than twice as many bunches per hour as those making 5-cent long-filler cigars. A part of this also is due to the less painstaking methods used in making cheaper cigars, but much of it must be attributed to the fact that it requires less labor time to make short-filler bunches than to make long-filler bunches with the hand-operated bunching tool. The difference in productivity represents the extra

³ There is a marked difference in productivity between hand stripping of filler, and hand stripping of binder and wrapper tobacco, due to the fact that greater care must be exercised to avoid tearing or otherwise marring the latter types of leaf, slowing the speed of the operation considerably.

time needed by the long-filler bunch maker to arrange the filler leaves and make certain they lie evenly and in the correct density through the length of the bunch.

TABLE 6.—*Labor requirements in making cigars by hand (team-work system)*

Type of cigar	Plant ¹	Man-hours per 1,000 cigars manufactured		
		Cigar makers only	All other labor ²	Total ³
Short filler:				
2 for 5 cents	A	16.27	0.35	16.62
Do	B	16.88	.19	17.07
3 for 10 cents	B	16.17	.15	16.32
5 cents each	B	16.34	.15	16.49
Average, all short filler ⁴		16.46	.21	16.67
Long filler:				
5 cents each	C	26.97	.30	27.27
Do	D	25.51	.73	26.24
Do	E	22.86	.89	23.75
Average, all 5 cents each ⁴		24.40	.79	25.19
Class C:				
Do	E	33.19	1.12	34.31
Do	F	32.23	.75	32.98
Do	G	31.97	(⁵)	(⁵)
Do	H	32.67	.53	33.20
Average, all class C ⁴		⁶ 32.66	⁶ .80	⁶ 33.46
Class D:				
Do	F	34.70	.79	35.49
Do	H	35.81	.62	36.43
Average, all class D ⁴		35.38	.69	36.07

¹ Letters assigned plants have no connection with letters given in other tables.

² Includes all supervisory and other incidental labor, such as inspectors, floor boys, etc., attached to this department.

³ Sum of preceding columns.

⁴ Weighted on basis of average production per period of cigars of type indicated.

⁵ Information not available.

⁶ Average of plants E, F, and H.

Source: Plant records, 1935-36 survey.

TABLE 7.—*Productivity of hand bunch makers and hand rollers*

Type cigar made	Plant ¹	Cigars per man-hour	
		Bunch makers	Rollers
Short filler:			
Retailing for less than 5 cents each	A	253	81.2
Do	B	270	75.6
Average, plants A and B ²		264	77.5
Long filler:			
5 cents each	C	117.5	59.2
Do	D	148.3	60.4
Do	E	(³)	59.7
Do	F	(³)	58.6
Average, plants C, D, E, and F ²		⁴ 130.4	59.5
Class C:			
Do	E	96.3	48.1
Do	F	90.7	47.3
Do	G	94.6	46.7
Do	H	93.2	45.5
Average, plants E, F, G, and H ²		93.6	46.8

¹ Letters assigned plants have no connection with letters given in other tables.

² Averaged on basis of total production of plants of type indicated.

³ Not available.

⁴ Plants C and D only.

Source: Plant records, 1935-36 survey.

The rollers and bunch makers making class C cigars showed a substantially lower productivity than those making class A cigars. The difference is principally due to more careful operation. A second cause for a part of the difference may lie in the fact that the more expensive class C cigars are usually a little larger than class A cigars.

It may be pointed out that although one buncher is usually teamed with two rollers in making long-filler cigars, productivity of bunchers is not in general exactly twice that of rollers. This is due to the fact that the buncher must keep ahead of the rollers, but at the same time must not get too far ahead. As a result, though production of a buncher must be equal to that of the other two members of the team over a period of time, the buncher's hours of labor may be somewhat different. Because of this, and because hand cigar makers are paid on a piece-work basis, hand cigar plants permit a rather flexible schedule of working hours.

In one plant it was found that for two pay-roll periods a separate record was kept of the output and man-hours of rollers using the suction plate and others rolling strictly by hand. The cigars produced by the two groups of rollers were of the same size and in the same price class (class C), but were of slightly different shape. The rollers using the suction plate averaged 43.0 cigars per hour, those rolling by hand averaged 44.6. This comparison lends point to the claim of many experienced cigar makers that the suction plate lowers the skill requirement and the necessary training period but is not of much assistance to the experienced and skillful worker.

Two plants were found where bunches for 5-cent short-filler cigars were made by means of a short-filler bunching machine, the bunches then being finished by hand. Information regarding these two plants is presented in table 8. Productivity in these plants should be compared with productivity in plants C, D, and E of table 6, rather than with productivity for 5-cent short-filler cigars made by hand in plant B, table 6, since the plants of table 8 were engaged principally in making higher-priced cigars, whereas plant B of table 6 was engaged principally in making cheaper cigars. The hand rollers in plant B, table 6, showed a very high productivity, comparable to the speed of rollers making cigars to retail at less than 5 cents each, whereas the hand rollers in the two factories of table 8 were applying wrappers at almost exactly the same rate as the rollers finishing 5-cent long-filler bunches shown in plants C, D, and E, table 6, and plants C, D, E, and F, table 7.

The machine bunch makers in the plants shown in table 8 averaged 528 bunches per hour. This is exactly twice the productivity of the hand bunch makers of plants A and B, table 7. The difference in productivity would probably be even greater if the comparison were

made directly between machine bunchers and hand bunch makers making cigars of a comparable quality in the same plant.

Data obtained regarding the four-operator long-filler cigar machine is presented in table 9. Information was obtained regarding this type of operation from six plants, three of which were operating their machines at rates of between eight and eight and one-half cigars per minute, the other three at rates from eight and one-half to nine cigars per minute. The averages for these two groups of plants are presented both separately and combined.

TABLE 8.—*Labor requirements in making short-filler cigars, bunching by machine and rolling by hand*

Type of cigar	Plant ¹	Man-hours per 1,000 cigars manufactured		
		Operators only	All other labor ²	Total labor ³
Five cents each.....	A	18.86	0.88	19.74
Do.....	B	18.95	.16	19.11
Average, plants A and B ⁴		18.87	.77	19.64

¹ Letters assigned plants have no connection with letters given in other tables.

² Includes supervisors, mechanics, oilers, inspectors, floor and stock boys, and other incidental labor attached to this department.

³ Sum of preceding columns.

⁴ Weighted on basis of average production per period of cigars of type indicated.

Source: Plant records, 1935-36 survey.

TABLE 9.—*Labor requirements in making long-filler cigars on four-operator cigar machines*

Type of cigar	Plant ¹	Man-hours per 1,000 cigars manufactured			Approximate rate of operation of machines, cigars per minute
		Operators only	All other labor ²	Total labor ³	
5 cents each.....	A	9.05	1.85	10.90	8 to 8½.
Do.....	B	9.17	1.70	10.87	8 to 8½.
2 for 5 cents and 3 for 10 cents.....	C	8.87	1.14	10.01	8 to 8½.
Average, plants A, B, and C ⁴		9.10	1.67	10.77	
Class C.....	D	8.01	1.21	9.22	8½ to 9.
6cents each.....	D	7.85	1.26	9.11	8½ to 9.
Do.....	E	7.75	1.45	9.20	8½ to 9.
Do.....	F	7.98	.94	8.92	8½ to 9.
Average, plants D, E, and F ⁴		7.96	1.03	8.99	
Average, plants A to F, inclusive ⁴		8.32	1.23	9.55	

¹ Letters assigned plants have no connection with letters given in other tables.

² Includes supervisors, mechanics, oilers, inspectors, floor and stock boys, and other incidental labor attached to this department.

³ Sum of preceding columns.

⁴ Weighted on basis of average production per period of cigars of type indicated.

Source: Plant records, 1935-36 survey.

It is interesting to note that the rate of operation of this machine in different factories does not seem to depend on the quality of the cigars made. Indeed, productivity in plant D was practically the same in

making both class "A" and class "C" cigars, and was higher than productivity in plant C, which made cigars to retail at less than 5 cents each.

Table 10 presents data on man-hour requirements in making short-filler cigars by means of the two-operator short-filler cigar machine. Here again it is apparent that the labor time required depends on company policy with regard to the rate of machine operation rather than on the quality of the cigar made. Plant C, making the most expensive cigar of the three plants shown, had the highest productivity.

The amount of incidental labor required by this method of manufacture is much higher than in the case of the four-operator machine, the average being 1.80 man-hours per thousand cigars in the case of the two-operator machine as compared with 1.23 man-hours per thousand with the four-operator machine. This is due principally to the fact that patchers and inspectors appear as incidental labor rather than as machine operators where the two-operator machine is used. In the case of the four-operator machine, the fourth machine operator acts as inspector and patcher. A comparison of the two methods on an "operators only" basis would therefore not be equitable.

TABLE 10.—*Labor requirements in making short-filler cigars on two-operator cigar machines*

Type of cigar	Plant ¹	Man-hours per 1,000 cigars manufactured		
		Operators only	All other labor ²	Total labor ³
2 for 5 cents and 5 cents each	A	(⁴)	(⁴)	5.47
3 for 10 cents	B	3.94	1.84	5.78
5 cents each	C	3.89	1.23	5.12
Average, plants B and C ⁵		3.94	1.80	5.74
Average, plants A, B, and C ⁵				5.58

¹ Letters assigned plants have no connection with letters given in other tables.

² Includes supervisors, mechanics, oilers, inspectors, patchers, floor and stock boys, and other incidental labor attached to this department.

³ Total of preceding columns.

⁴ Information not available.

⁵ Weighted on basis of average production per period of cigars of type indicated.

Source: Plant records, 1935-36 survey.

In order to compare the various methods used in the making department a standard of some sort must be adopted. Perhaps the most typical cigar made is the 5-cent long-filler cigar. Plants C, D, and E of table 6 required 25.19 man-hours of labor on the average to make 1,000 of this type of cigar by hand. All plants shown in table 9 using the four-operator machine averaged 9.55 man-hours of labor per 1,000 cigars. Thus, on the average, only 38 percent as much making-department labor is required to make the same type of cigar by this machine as by hand. A change from the hand method of operation to the four-operator machine would then entail a decrease in employment in the making department of about 62 percent, provided no change was made in the operating schedule.

Comparing the data presented in table 8 with that presented in table 6 it appears that installation of power bunching equipment to take the place of hand bunch makers would probably result in a net reduction of employment in the making department of about 22 percent. Of course, this would also entail a change from short-filler to long-filler operation. If the change should be carried further and rolling machines be combined with the bunching machines to form two-operator short-filler cigar machines the reduction in labor would be much greater. Comparing the average shown for the three plants of table 10 with table 6 it appears that the labor force in the making department might be reduced as much as 78 percent.

Packing

Information regarding the packing departments of 10 cigar plants is presented in table 11. Two determining influences are apparent, namely, (1) the more expensive the cigar, the more care taken in shading and subshading; (2) the less uniform in color the wrapper leaf used, the more labor is required to shade and subshade. The latter effect is borne out by the fact that in the case of plants F, G, and H, and J and K, the plants using the more uniformly colored Sumatra leaf required less packing labor than those using Connecticut shade-grown wrapper.

TABLE 11.—*Labor requirements in the packing departments of cigar factories*

Type of cigar	Plant ¹	Man-hours per 1,000 cigars					Type wrapper leaf used
		Pack-ers only	Other direct labor ²	All direct labor ³	Super-visor-y	Total ⁴	
5 cents each and less.....	{ A	0.82	0.49	1.31	0.05	1.36	Connecticut and Florida shade-grown. Do. Do. Do.
	{ B			1.36			
	{ C			1.61			
	{ Average, plants A, B, and C.			1.40			
5 cents each.....	{ D	1.27	.59	1.86	.09	1.95	Sumatra. Do. Do.
	{ E	1.42	.44	1.86	.10	1.96	
	{ Average, plants D and E.	1.38	.48	1.86	.10	1.96	
	{ F	1.35	.41	1.76	.22	1.98	
5 cents each and class "C".....	{ G			2.03	.10	2.13	Do. Sumatra and Connecticut shade-grown. Connecticut shade-grown.
	{ H			2.10	.08	2.18	
	{ Average, plants F, G, and H.			2.05	.10	2.15	
	{ J			2.10	.15	2.25	
Class "C".....	{ K	1.83	.48	2.31	.22	2.53	Sumatra. Connecticut shade-grown.
	{ Average, plants J and K.			2.22	.19	2.41	

¹ Letters assigned plants have no connection with letters given in other tables.

² Includes examiners inspectors, floor boys, and other incidental labor attached to this department.

³ Sum of 2 preceding columns.

⁴ Sum of 2 preceding columns.

Source: Plant records, 1935-36 survey.

One subsidiary item of information was gathered in a plant that manufactured class A 5-cent and class C cigars, using Connecticut

shade-grown wrappers. In this plant the cigars were tray packed; that is, shaded by one group of workers and subshaded and packed in shells by another group, instead of the more usual method where one worker performs all operations. In this plant, tray packing and shading required 0.33 man-hours of labor per 1,000 for both class A and class C cigars. Subshading and shell packing required 1.25 man-hours of labor per thousand cigars in the case of the 5-cent cigars and 1.27 hours for the class C cigars, making totals of 1.58 and 1.60 man-hours of labor for class A and class C cigars, respectively. It is apparent that by far the greater proportion of labor required in packing departments goes into subshading and shell packing rather than the primary separation of cigars according to colors.

Cellophaning and Banding

Table 12 presents information on cellophaning and banding operations in a number of cigar plants. Plants A to F used the improved cellophaning and banding machine with automatic feed, requiring one operator. The remarkable uniformity of results from plant to plant indicates that the speed of this machine must be relatively standard throughout the industry.

In one plant (plant G) the older style two-operator machine was found in use. The labor time required by this machine was almost double that required by the improved machine.

TABLE 12.—*Labor requirements in cellophaning and banding cigars*

Type of operation	Plant ¹	Man-hours per 1,000 cigars output		
		Oper-ators only	All others ²	Total ³
1-operator cellophaning and banding machine with automatic feed.....	A	0.308	0.031	0.339
	B	.330	.076	.406
	C	.336	.043	.379
	Average, plants A, B, and C ⁴.....	.314	.043	.357
1-operator cellophaning and banding machine with automatic feed.....	A	.308	(⁵)	(⁵)
	B	.330	(⁵)	(⁵)
	C	.336	(⁵)	(⁵)
	D	.308	(⁵)	(⁵)
	E	.308	(⁵)	(⁵)
	F	.310	(⁵)	(⁵)
Average, plants A to F ⁴.....	.313	(⁵)	(⁵)	
2-operator cellophaning and banding machine, hand feed.....	G	.582	(⁵)	(⁵)
Banding only by hand.....	H	1.302	.030	1.332
	I	1.278	.049	1.327
Average, plants H and I.....		1.288	.041	1.329

¹ Letters assigned to plants have no connection with letters given plants in other tables.

² Includes mechanics and supervisory and incidental labor attached to this department.

³ Sum of preceding columns.

⁴ Weighted average, based on average production per period of the individual plants.

⁵ Information not available.

Source: Plant records, 1935-36 survey.

In two plants a small amount of banding by hand was found. Cellophaning of these hand-banded cigars was also done by hand, but

no reliable man-hour data for this operation were available. Supervisory officials stated that the productivity of hand cellophaners was approximately the same as that of hand banders; that is, one hand cellophaner would be teamed with one hand bander where a batch of cigars was to be banded and cellophaned entirely by hand. Therefore, the figure given for hand banding should probably be doubled to afford a comparison between hand and machine cellophaning and banding. On this assumption, it is estimated that man-hour productivity in cellophaning and banding by machine on the basis of operators only is approximately eight times higher than where the operation is done by hand. However, this does not at the present time raise any question of labor displacement since the use of cellophaning and banding machines is quite general throughout the industry, the hand process only being used in small shops or where relatively small lots or special orders are made up.

Box Labeling

Man-hour requirements in pasting labels and affixing internal revenue stamps to cigar boxes by hand and by machine are presented in table 13. Only four plants, two by each method, are shown, since in most cases satisfactory man-hour data were not available. Output information was lacking in all cases, so, as with leaf preparation and stripping departments, output of the making department was used as a basis for comparison.

TABLE 13.—*Labor requirements in pasting labels and affixing internal revenue stamps on cigar boxes*

Type of operation	Plant ¹	Man-hours per 1,000 cigars output of making department ²	Type of cigar
By hand.....	{ A B	0.87	Class C.
Average, plants A and B ³.....		.59	Class A, 5 cents each, and class C.
By machine.....	{ C D	.66	
Average, plants C and D ³.....		.17	Class A, 5 cents each.
		.16	Do.
		.16	

¹ Letters assigned plants have no connection with letters given in other tables.

² All labor, including labelers, pasters, supervisors, and other incidental labor attached to this department.

³ Weighted on basis of average production of cigars per period by individual plants.

Source: Plant records, 1935-36 survey.

Approximately four times as much labor per thousand cigars was required to perform this operation by hand as compared with the machine. The machine used for this purpose has a very large capacity (50 to 60 boxes per minute) and is found in only the largest factories. The large capacity of the machine, combined with the fact that only a small amount of labor is required for the operation in any case, would probably make the use of the machine uneconomical in small plants.

Miscellaneous Labor

As might be expected, quite a wide range in the amount of miscellaneous labor used in cigar plants was found. Two general factors appear to determine the quantity: First, more labor is found in plants making more expensive cigars; and second, more labor is required in hand plants than in machine plants. Of even greater importance are the matter of company policy and the matter of special conditions. For instance, an inefficient plant lay-out would require extra miscellaneous labor.

Table 14 presents information with regard to this group of workers for eight cigar plants. The man-hour data are correlated with output data of the making department to provide a basis of comparison.

The hand plants shown required on the average about 2½ times as much miscellaneous labor as the machine plants. Within each group the plant making the most expensive cigars required the most labor.

It is probable that the comparison between the hand and machine plants is not completely equitable since the hand plants were in general making more expensive cigars than the machine plants. Moreover, the machine plants were in general larger than the hand plants, and so probably better fitted to make use of such devices as conveyors, automatic lifts, and the like, or to take advantage of modern plant-efficiency methods. Though the figures of table 14 should probably be considered at best as approximations, they are of interest in at least indicating the relative amounts of miscellaneous labor required.

TABLE 14.—Average miscellaneous labor requirements in cigar plants

Type of plant operation	Plant ¹	Man-hours of labor per 1,000 cigars output of making department ²
Using the 4-operator long-filler cigar machine to make:		
Class A, 5 cents each, and class C cigars.....	A	1.48
Class A, 5 cents each.....	B	.87
Do.....	C	.62
Do.....	D	.62
Average, plants A, B, C, and D ³.....		.88
Making cigars of the following classes by hand:		
Class C.....	E	2.95
Class A, 5 cents each, and class C.....	F	2.51
Do.....	G	1.97
Do.....	H	1.50
Average, plants E, F, G, and H ³		2.16

¹ Letters assigned plants have no connection with letters given in other tables.

² Includes all labor not previously assigned departmentally, such as watchmen, elevator operators, cleaners, office help, shipping clerks, electricians, nurses, maids, locker attendants, etc.

³ Weighted on basis of average production of cigars per period by individual plants.

Source: Plant records, 1935-36 survey.

The Plant as a Whole

While it is of interest to examine the changes occurring within any one department, it is more significant to determine the effects on the plant as a whole which occur when the method of operation is changed. For instance, whereas installation of a labeling machine to paste on internal-revenue stamps might reduce the amount of labor required in this department to less than one-fourth of its former figure (table 13) the effect on the total amount of labor employed by the factory would be very small.

For this purpose, it again becomes necessary to adopt some type of standard for making comparisons. Probably the most typical cigar is the 5-cent cigar. Table 15 presents departmental averages derived from preceding tables with regard to this type of cigar.

The types of plants represented are designated "hand made" and "four-operator cigar machine" for long-filler cigars, and "machine bunched, hand rolled" and "two-operator cigar machine" for short-filler cigars, according to the methods employed in the making departments. No totals are presented for hand-made short-filler cigars, since there was doubt as to whether the making-department data obtained for 5-cent cigars of this type could be considered representative (available in but one plant, and that principally engaged in the manufacture of cheaper short-filler cigars).

An effort was made to select figures representing conditions actually prevailing in a majority of the factories investigated, rather than any ideal factory using either the least efficient or most efficient plant methods, or using all possible hand methods as compared to all possible mechanized methods.

TABLE 15.—*Approximate amounts of labor required to make one thousand 5-cent cigars by various manufacturing methods*

Operation	Number of man-hours			
	Long-filler		Short-filler	
	Hand-made	Four-operator cigar machine	Machine-bunched, hand-rolled	Two-operator cigar machine
Leaf preparation.....	1.41	1.41	1.41	1.41
Stripping.....	1.64	1.64	1.64	1.64
Making.....	25.19	9.55	19.64	5.58
Packing.....	1.96	1.96	1.96	1.96
Cellophaning and banding.....	.36	.36	.36	.36
Box labeling.....	.66	.16	.66	.16
Miscellaneous labor.....	2.16	.88	2.16	.88
Total, all above operations.....	33.38	15.96	27.83	11.99

Source: Plant records, 1935-36 survey. Figures taken from tables 2 to 14.

The choice of certain of the figures presented in table 15 perhaps requires a few words of explanation. Proceeding departmentally, the figure for the leaf-preparation department is the average for plants C and D, table 2. It is felt that this figure best reflects average labor requirements in plants making 5-cent long-filler cigars, where binder and wrapper leaf are stripped at the factory, and filler is received in stripped condition. Plant D is included even though this plant manufactured a small number of class "C" cigars. These data, applicable to long-filler cigar manufacture, are carried over to the two short-filler classes even though in such plants the amount of leaf-preparation labor would probably be much less, because no other more appropriate data are available. However, any errors introduced by this procedure are necessarily small, compared to total labor requirements.

The figure for the stripping department, taken from table 5, is an average for plants making less than 5-cent, 5-cent, and class "C" cigars. Since in these plants the amount of labor required did not appear to be directly correlated with the price class of the cigars manufactured, it was felt that the general average was probably most representative. The figure used is for machine stripping, which is the most common method employed.

The labor requirements for making 5-cent long-filler cigars by hand and 5-cent short-filler cigars by combination hand and machine methods are taken directly from tables 6 and 8, respectively. The amount of labor required in the making departments of plants using four-operator long-filler or two-operator short-filler cigar machines appears to depend principally on other factors than the price class of cigars manufactured (tables 9 and 10). Averages for all plants using these methods are therefore presented in table 15 as being probably most representative of general industry conditions.

Packing department labor requirements are taken directly from table 11 and need no explanation. The figures for the cellophaning and banding department, taken from table 12, refer to the mechanized rather than the hand process, since use of cellophaning and banding machines is quite general throughout the industry.

There is a choice with regard to the averages used for the box-labeling department. Plants making cigars by hand or by combination hand and machine methods in general have smaller outputs than mechanized plants, and so presumably would not find use of a box-labeling machine economical. Accordingly, the figure for a nonmechanized labeling department has been used for hand and combination hand and machine plants, while the figure for a mechanized department has been applied to factories using four-operator or two-operator cigar machines (table 13).

Somewhat the same reasoning has been followed with regard to miscellaneous labor, the average for hand plants being used for both hand and combination methods, while that for factories using four-operator machines has been extended to plants using two-operator machines (table 14).

Greatest interest attaches to a comparison of 5-cent long-filler cigars as made by hand with those made on four-operator cigar machines, since long-filler cigars constitute the bulk of all cigar production. The totals given in table 15 show that only about half as much labor is used in machine plants. Presupposing a comparable schedule of hourly operation, a plant changing from one method to the other then would either double its output, or at the same production level would reduce the number of workers employed by about half.

Adequate data for the hand method of making short-filler cigars were not obtained. However, it is shown that concerns using two-operator machines require about 57 percent less plant labor than concerns using a combination of machine bunching with hand rolling to make short-filler cigars. Since making bunches by hand would require some additional labor time, an even greater proportionate reduction in total plant labor required would be expected in the case of concerns using two-operator machines as compared with plants using straight hand methods of making short-filler cigars.

Since 1920 there has been a steady increase in the proportion of short-filler to total cigar production (p. 54), lending point to a comparison of labor requirements in the manufacture of short-filler cigars with those in the making of long-filler cigars by different methods. The characteristic method of making short-filler cigars is with the two-operator machine, which requires about 25 percent less plant labor than to make the same number of long-filler cigars with the four-operator machine, or about 64 percent less than to make an equal number of long-filler cigars by hand.⁴

The foregoing comparisons have all been between present day "average" plants, but the results of the field survey may also be used to indicate some of the differences between factories of today and those of several decades ago.

In most departments, little difference in the amount of labor required in present day plants as compared with those of an earlier period would be expected. For instance, in the preparation department no significant changes in methods of operation have occurred. In the packing department, use of cellophane has probably reduced the amount of labor needed to a degree. In the cellophaning and banding department, wide-spread use of machines today may or may not have caused a decrease in the average amount of labor required. Box labeling is still done by hand in most present-day plants. The

⁴ The totals given in table 15 have been recalculated in the more familiar units of product per man-hour of labor and are so presented in table 16.

amount of miscellaneous labor required around a factory may have been slightly reduced because of better planning and arrangement in modern plants. However, since the labor time required by all these departments together is only about 6½ hours per thousand cigars in a present-day hand factory (table 15), the total difference in labor time occasioned by all changes probably does not exceed 1 or 2 hours per thousand cigars.

TABLE 16.—*Over-all man-hour productivity in plants manufacturing 5-cent cigars by alternative methods*

Method of manufacture	All plant labor	
	Productivity, cigars per man-hour	Productivity relative to hand-made long-filler cigars
Hand-made, long-filler.....	30.0	1.00
Four-operator-machine-made, long-filler.....	62.7	2.09
Machine-bunched, hand-rolled, short-filler.....	35.9	1.20
Two-operator-machine-made, short-filler.....	83.4	2.78

Source: Calculated from data presented in table 15.

Significant changes in labor requirements have been confined to the stripping and making departments. It has been shown that the reduction in labor time brought about by complete mechanization of stripping probably does not exceed 6 hours per thousand cigars, and that this may be assumed to be the probable maximum difference in labor requirements in this department between modern and earlier factories. In the making department, hand factories use substantially the same methods today as were in general use 20 and 30 years ago. Labor requirements in this department of present-day factories may therefore be fairly used to represent those in plants of an earlier period.

It seems probable therefore, that labor requirements in hand plants today are not more than 7 or 8 hours less per thousand cigars than they were in plants of the premachine era. This would indicate that earlier factories required about 40 or 41 hours of labor per thousand cigars as compared with about 33.4 hours in modern hand plants (table 15). This is equivalent to a reduction in labor requirements of 20 percent or less. Practically all the reduction must be credited to use of stemming machinery in the modern plant.

The present-day mechanized producer, taking advantage of labor-time savings made possible both by stemming machines and long-filler cigar machines, would require only about 40 percent as much labor to produce the same output as the 1910-17 plant. By changing to short-filler cigar manufacture and using two-operator short-filler cigar machines, the present-day manufacturer could further reduce his labor requirements to about 30 percent of those in the 1910-17 long-filler factory.

Chapter IV

Mechanization and Its Effects

Major changes in the productivity of labor in the cigar industry have resulted principally from the mechanization of one process only—from the development of ingenious machines to perform the fabricating operation itself. However, introduction of these machines was not followed by their general installation throughout the industry. Today, more than 20 years after the machines were first made available, a number of factories continue to use manufacturing methods little different from those which might have been observed 20 and even 50 years ago. These circumstances make the industry a somewhat unusual case in the study of mechanization. Many of the effects of mechanization, which in other industries are all too frequently obscured in a multiplicity of small changes, are here brought out in sharp relief. The following sections briefly appraise some of these effects.

Cost Advantage of Mechanization

The economic force behind introduction of mechanical aids into the industry has naturally been the savings in costs made possible by their use. Before attempting an analysis of the effects of mechanization, it may be well to appraise the extent of these cost savings, insofar as this is possible. It has been shown that significant reductions in labor time have come from increased use of two types of machines only—stripping machines and cigar machines.

In the case of stripping machines, it has been estimated that complete mechanization of the stripping process does not reduce the labor required per thousand cigars by more than about 6 hours. In terms of costs, this labor-time saving is not as important as it would be in the case of other operations, since stripping is and has been in the past the lowest-paid occupation in the cigar industry.¹ On the basis of wage rates prevailing in 1936, the gross labor-cost savings resulting from complete mechanization of the stripping operation would probably not exceed \$1.50 per thousand cigars (6 hours at about 25 cents per hour). From these gross savings should be deducted certain costs pertaining to the use of machines, such as

¹ Bulletin of the U. S. Bureau of Labor Statistics No. 135, Wages and hours of labor in the cigar and clothing industries, 1911 and 1912, shows male hand strippers receiving wages of 13 cents per hour and female hand strippers 12 cents per hour on the average, and adds in the text (p. 11) "Stemming is the lowest paid occupation of the industry and very little skill is required."

Monthly Labor Review, April 1937, p. 961, shows that in March 1936 hand strippers averaged about 25½ cents per hour, less than average wages paid any other regular class of employees.

interest on investment, depreciation, repairs, and power. No information is available regarding the extent of these other costs, but they would probably serve to reduce the maximum net cost savings resulting from mechanization of stripping to well under \$1.50 per thousand cigars.

Turning to the making operation, it was shown that use of long-filler cigar machines in place of hand methods results in a reduction of about 15½ hours of labor per thousand 5-cent cigars manufactured. At a rate of 35 cents per hour, reported as the average hourly wage paid hand cigar makers in March 1936,² this represents a gross labor-cost saving of about \$5.50 per thousand 5-cent cigars.

The extent of the extra costs entailed by use of long-filler cigar machines as compared with hand methods may be estimated from data shown in tables 17a and 17b. It will be seen that the items given include many charges not directly applicable to the use of cigar machines. Thus, in table 17a, the item of power includes all factory power and light as well as power necessary to run cigar machines. The item of machine repairs and repair parts includes costs of repair of all other machines used at the factory. In table 17b all items, except royalties, apply to the factory as a whole rather than simply to cigar machines. Taken together, the two sources indicate that the extra costs entailed by use of automatic long-filler cigar machines do not exceed and may be materially less than \$2.50 per thousand cigars. Subtracting this from the estimated gross labor-cost savings, it is concluded that manufacturers using the four-operator long-filler cigar machine have a net cost advantage over nonmechanized producers of at least \$3 per thousand 5-cent cigars manufactured. Since the net wholesale price of such cigars is in the neighborhood of \$33 per thousand, the great relative importance of this cost saving is readily appreciated.

TABLE 17a.—Costs of manufacture by four-operator, long-filler cigar machines not common to manufacture by hand methods

Elements of cost	Costs per 1,000 5-cent cigars	
	May 1933	September 1933
Power (all factory power and light).....	\$0. 1499	\$0. 1489
Machine repairs and repair parts (all machines, including cigar machines).....	. 1537	. 1395
Depreciation of cigar machines.....	. 3760	. 3760
Interest on investment in cigar machines.....	. 2917	. 2844
Insurance on cigar machines.....	. 0050	. 0047
Overhead chargeable to cigar machines, including supervision.....	. 4698	. 5615
Cost of maintaining idle cigar machines.....	. 1340	. 1054
Royalties on leased cigar machines.....	1. 0062	1. 0051
Total.....	2. 5863	2. 6163

Source: Rossmore, Robbins & Co., Investigation of cigar manufacturing industry in re Establishment of a code of fair competition, Nov. 11, 1933, table 15. Brief filed with National Recovery Administration, prepared in behalf of group of cigar manufacturers by firm of accountants; based on certified data from 4 leading manufacturers; in National Recovery Administration files, U. S. Department of Commerce.

² Monthly Labor Review, April 1937, p. 961.

TABLE 17b.—Costs of manufacture by four-operator, long-filler cigar machines not common to manufacture by hand methods

Elements of cost	Cost per 1,000 5-cent cigars
Power (all factory power).....	\$. 121
Maintenance (all factory maintenance).....	. 253
Lubrication (all factory lubrication).....	. 097
Depreciation (all factory depreciation).....	. 614
Miscellaneous (all miscellaneous expenses).....	. 517
Royalties (on cigar machines).....	. 960
Total.....	2. 562

Source: Special canvass regarding costs of production of 5-cent cigars made by Census of Manufactures as of July 1, 1933, of 11 representative manufacturers of 5-cent cigars selected by the National Recovery Administration.

No data are available regarding the savings made possible by use of two-operator short-filler cigar machines. Since the labor time required is far less than in the case of four-operator machines, and the cost of the machines and the power, lubrication, and similar items they require is less, it may be concluded that the reduction in costs made possible by their use is substantially greater.

The cost difference between hand and mechanized processes is, of course, not constant. It will vary according to the efficiency with which the various methods of fabrication are applied or as wage scales prevailing in the industry or its branches fluctuate. Also, in the manufacture of the more expensive types of cigars it becomes less important as other items, especially cost of raw materials and emphasis on quality of workmanship, assume greater significance. However, a definite and important cost advantage in favor of mechanized producers seems indisputably established, this advantage being most effective in the low-priced field. It is in this field that most cigar production takes place.³

Extent of Mechanization

With a substantial cost difference in favor of mechanization definitely established, it becomes of interest to determine how far mechanization of the industry has actually proceeded. Mechanization of the stripping process is probably nearly complete. Cellophaning and banding machines are now almost universally used. Box-labeling machines are found in a few factories, but they are of minor importance. Examination of the extent of mechanization, then, confines itself to a study of the degree to which cigar-making machines are used by the industry today. This must remain, in large part, an open question, since much of the data necessary for an accurate determination are lacking, though some inferences may be drawn.

³ Cigars selling for 5 cents or less constituted 88 percent of all cigar production in 1936, according to the Annual Report of the Commissioner of Internal Revenue for the fiscal year ending June 30, 1937.

In the first place, on the basis of the amount of scrap tobacco used in the manufacture of cigars as compared with all leaf so used, it is estimated that short-filler cigars constituted about one-quarter and long-filler cigars about three-quarters of the total number of cigars produced in 1936 (p. 54).

Turning first to long-filler cigars, the concern which manufactures and leases long-filler cigar machines states that 3,683 machines were used on the average in 1936 (table 1). On the basis of this number, and an estimate of average annual productivity per machine in 1936,⁴ it is calculated that about 60 percent of all cigars produced in 1936 were long-filler cigars made on four-operator long-filler cigar machines. This is in approximate agreement with opinions expressed by cigar manufacturers visited in the course of the present survey. The number of long-filler cigars made by hand in 1936 may then be estimated to have been in the neighborhood of 15 percent of the industry's total production.⁵ It is therefore estimated that the manufacture of long-filler cigars in 1936 was about three-quarters mechanized.

There is no method available by which the degree of mechanization prevailing in the manufacture of short-filler cigars may be calculated. It is probably greater than in the case of long-filler cigars. Use of the two-operator short-filler cigar machine offers such economies in labor costs that manufacturers using hand methods must have found competition extremely difficult. There are many instances in the industry of factories—even whole areas—formerly producing large numbers of short-filler cigars by hand, which within the past 10 years have turned almost exclusively to use of short-filler machines. This

⁴ It is estimated in table 9 that an average of 8.32 hours of labor by machine operators was required to produce 1,000 cigars by means of the 4-operator cigar machine. Since 4 operators are required to each machine, this would represent 2.08 hours of machine operation. A survey of the cigar industry by the Bureau of Labor Statistics indicates that in March 1936 average hours of labor of cigar-machine operators were about 31 per week (Monthly Labor Review, April 1937, p. 961). However, production of the industry in March 1936, as judged by withdrawals of internal revenue stamps for use on large cigars (Annual Reports of the Commissioner of Internal Revenue, 1936 and 1937) was only 88.3 percent of the monthly average for the year. Presumably, then, the average hours of labor of cigar-machine operators over the year would have been about 31 divided by 0.883, or 35 hours per week. Multiplying by 52, the number of weeks in the year, would indicate that average hours of cigar-machine operators and also hours of operation of cigar machines were about 1,800 in the year 1936. Dividing by the number of hours of machine operation necessary to produce 1,000 cigars, as derived above, indicates that each cigar machine in operation in 1936 probably averaged a production of about 865,000 cigars. Multiplying by the number of machines reported in use in 1936 (3,683) gives an estimated total production of long-filler cigars on cigar machines of 3.19 billions of cigars. This is 62 percent of total cigar production of 5.17 billions in 1936 as reported by the Commissioner of Internal Revenue. On the other hand, two factors have not been taken into account in the above. In the first place, mechanized factories appear to operate on a steadier production schedule than hand plants. The level of operations of machine factories in March 1936 might therefore have been somewhat above the 88 percent of the average for the year indicated for the industry as a whole. In the second place, some cigar machines in place in cigar factories in 1936 might have been idle for periods of a week or more, these periods of idleness not being taken into account in either the figures for average hours of labor of machine operators or number of machines used by the industry during the year. Both these possible sources of error operate in the same direction, and correction for their influence would somewhat reduce the estimate of total production on cigar machines given above. It may be concluded that the number of cigars produced on four-operator long-filler cigar machines in 1936 was less than 62 percent of the industry's total production of all types of cigars, and was probably in the neighborhood of 60 percent.

⁵ Since this figure is derived as the approximate difference between two much larger numbers, both estimated, it must be regarded as liable to substantial error.

machine was even found in use in some plants primarily engaged in the production of long-filler cigars by hand, such plants finding it an economical way of utilizing scrap tobacco.

Effects of Mechanization on Production

In order to appraise the effects of mechanization on the cigar-manufacturing industry, it is necessary first to examine the competitive background against which the industry has operated.

At the beginning of the present century, cigars constituted the most important form in which tobacco was consumed. In fact, the value of the annual production of cigars at that time was over 50 percent greater than that of all other tobacco products combined.⁶ During the period 1900-1920, the annual production of cigars increased, reaching a peak of 8.1 billion cigars in 1920. That year saw the highest production level ever attained by the cigar industry, and marked the beginning of its decline. Between 1920 and 1929 production fell to 6.5 billions. During the depression years following, production declined sharply to a low of 4.3 billions in 1933. Subsequent recovery raised the level only to 5.2 billions in 1936, as indicated below.

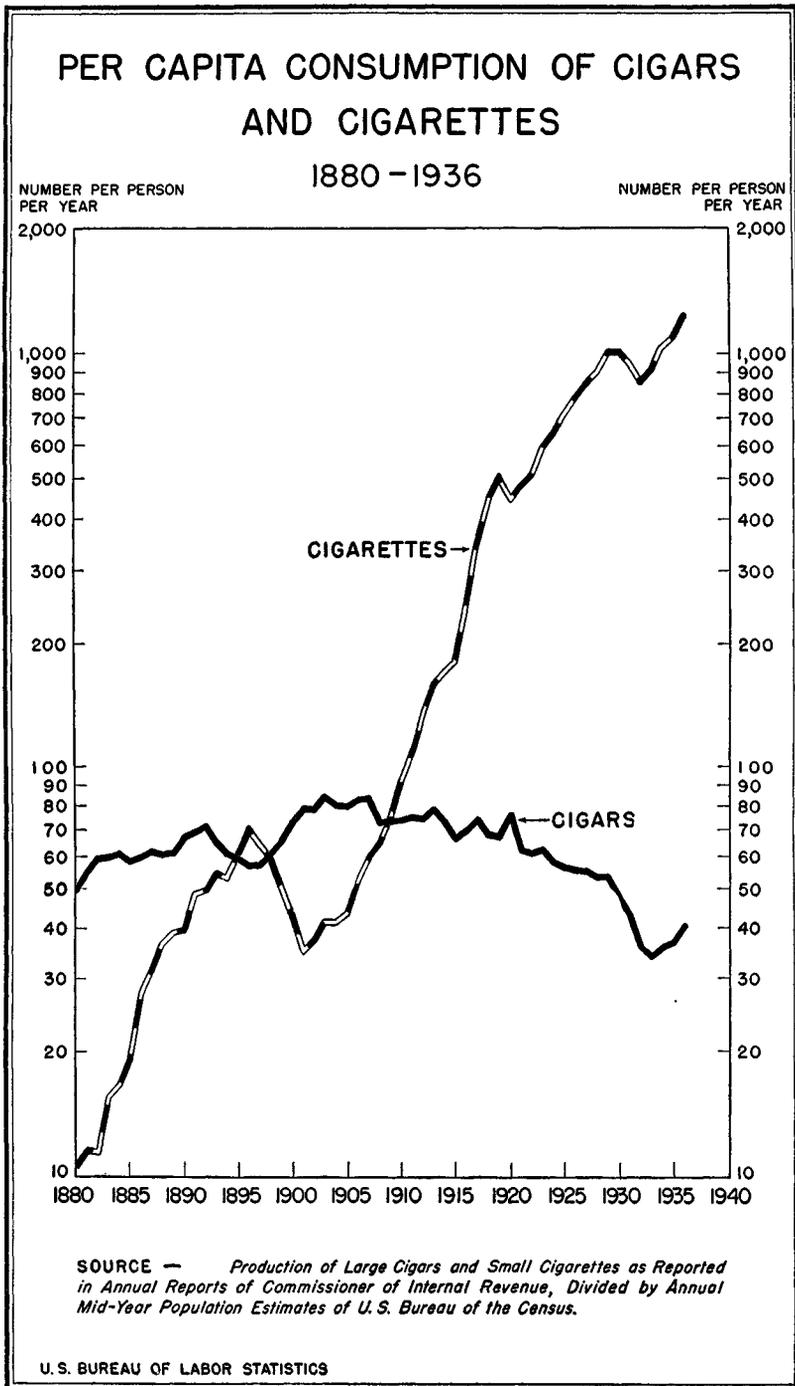
<i>Cigars produced</i> ¹		<i>Cigars produced</i> ¹	
1919.....	7, 072, 000, 000	1928.....	6, 373, 000, 000
1920.....	8, 097, 000, 000	1929.....	6, 519, 000, 000
1921.....	6, 726, 000, 000	1930.....	5, 894, 000, 000
1922.....	6, 722, 000, 000	1931.....	5, 348, 000, 000
1923.....	6, 950, 000, 000	1932.....	4, 383, 000, 000
1924.....	6, 598, 000, 000	1933.....	4, 300, 000, 000
1925.....	6, 463, 000, 000	1934.....	4, 526, 000, 000
1926.....	6, 499, 000, 000	1935.....	4, 685, 000, 000
1927.....	6, 519, 000, 000	1936.....	5, 172, 000, 000

¹ Data are from annual reports of the Commissioner of Internal Revenue.

Per capita consumption is perhaps more revealing than total production in analyzing general trends. On a per capita basis, cigars began to lose favor with the public, not in 1920, but as early as 1907 (chart, p. 48). The downward trend was accelerated after 1920 and 1929. Each of these major changes in trend coincided with the onset of a period of marked business depression.

Increased consumption of cigarettes is usually advanced as the primary cause for decreased consumption of cigars. The divergent trends displayed in this chart seem to bear out this contention. Numerous explanations to account for the increased popularity of cigarettes at the expense of cigars have been advanced. Perhaps the most quoted is to the effect that the cigarette became popular through its use by soldiers during the World War. The fact that the upward trend of cigarette consumption was almost as marked from 1905-13

⁶ United States Commissioner of Corporations. Report on the Tobacco Industry. Washington, 1909, pt. I, p. 149.



as it was from 1915–20 indicates that this explanation is not sufficient. A second much-quoted reason ascribes the change to cigarette smoking by women; a third to the need of this modern age for a quick, short smoke. All these are undoubtedly significant factors, but others need consideration.

Cigarettes and cigars cater to the same human want—the pleasure obtained from smoking tobacco. It is a common observation that cigarettes are a less expensive form of tobacco consumption than cigars. It seems logical, therefore, to assume that the relative costs of the two products to the consumer have been a factor in the success of cigarettes. This conclusion is strengthened by the observation that the major changes in per capita consumption of cigars have taken place during periods of general economic depression, when this influence should be at its strongest.

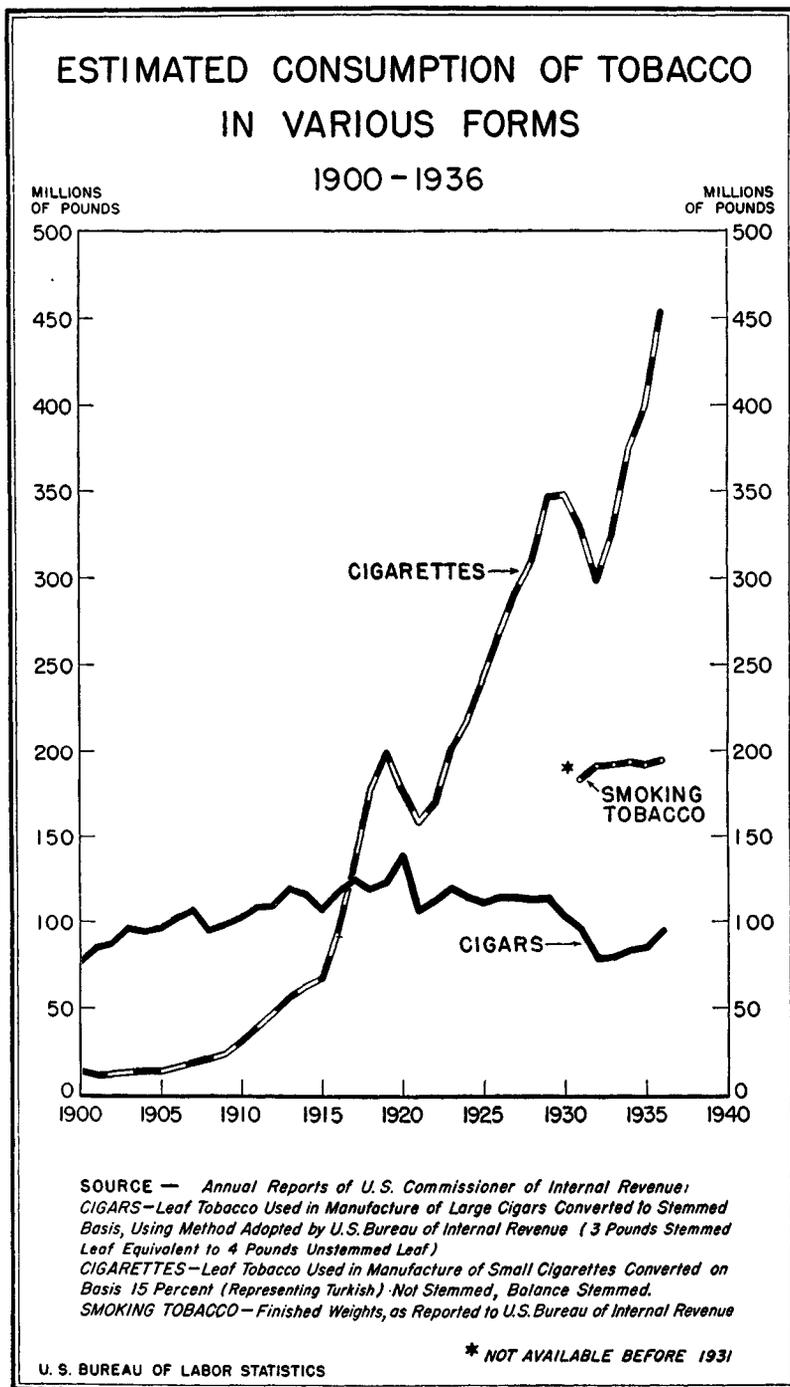
The process has not been simply one of substitution of a lower-priced for a higher-priced article, however, as per capita cigarette consumption also declined during depression periods. In addition to any substitution which has taken place, there has been a real increase in the demand for cigarettes. While the amount of tobacco used annually in the manufacture of cigars decreased 34,800,000 pounds between 1926 and 1934, that used in the manufacture of cigarettes increased 85,500,000 pounds—a net increase of over 50,000,000 pounds per year.⁷ Even with allowance for population growth, the per capita consumption of tobacco in cigars and cigarettes increased.

The consumption trends of the two products, indicated on page 48, somewhat exaggerate the true situation since the units used to represent the two products are not strictly comparable. One cigar is equivalent to a number of cigarettes.

An approximate measure of the relative importance of the two products may be obtained by considering them on the basis of weight as presented in the chart (p. 50). It will be seen that at the turn of the century cigarettes, though produced in numbers equal to cigars, were relatively unimportant as a form of tobacco consumption. However, in the period around 1920 they became of approximately equal importance with cigars and by 1936 were nearly four times as important.

During depression periods both cigarettes and cigars might prove too expensive, in which case consumers might well turn to smoking tobacco, either in pipes or in the form of “roll your own” cigarettes. Unfortunately, it is not possible to follow the changes in demand for smoking tobacco prior to 1931, since before that date smoking tobacco was combined in the annual reports of the Commissioner of Internal Revenue with scrap chewing tobacco—a product of decidedly dissimilar character. However, it will be noted that during the depression

⁷ Annual reports of the Commissioner of Internal Revenue.



years following 1931 the production of smoking tobacco increased, in contrast to that of cigarettes and cigars which showed decreases (chart, p. 50).

Differences in advertising methods have probably had some influence on the relative cigar and cigarette markets. Cigar manufacture has been carried on by a large number of concerns with a multiplicity of brands, shapes, and sizes of cigars. Cigarette manufacture, on the other hand, early attained volume production of a few standardized brands. Consequently, cigar advertising has been "spread thin" while cigarette advertising has emphasized and reemphasized the merits of a few major brands. Moreover, the type of advertising used has differed between the two products. Cigar advertising, in general, has been of the type to induce only the selection of one brand of cigar over another. Cigarette advertising, through design or accident, has served in addition to stimulate a desire to use the product itself, thus widening the market for cigarettes.

As might be expected, the decline in the market for cigars following 1920 engendered severe competition in the industry. The efforts of manufacturers to maintain sales volume in a shrinking market made price cutting inevitable.

In the cigar industry this has taken two forms. Cigars are sold for the most part in standard retail price classes under established brand names, and improvement in the quality of tobacco used in any cigar therefore may be the equivalent of a price cut without any price change having taken place. Conversely, there may be a cut in the retail price without a corresponding reduction in quality. Since cigars have this quality flexibility, it is frequently difficult to follow real changes in cigar prices.

From 1921 to 1929 economic conditions were in general quite favorable. No increasing economic pressure on the average cigar smoker, making it necessary for him to revise his smoking habits and turn to lower-priced cigars, was apparent during this period. Nevertheless, between 1921 and 1929 the proportion of all cigars which sold for 5 cents or less each increased from 30 to 55 percent (table 18). It seems reasonable to assume that during this period there was an actual improvement in the quality of cigars offered for sale at any given price level, which in turn permitted consumers to buy cigars of the same quality at constantly decreasing average prices.

The second form of price cutting was much in evidence after 1929 when a number of large concerns selling cigars under nationally advertised brand names directly cut their established retail prices, at the same time guaranteeing to consumers that the quality of tobacco used was not cheapened. In many instances, the cut in the advertised price of these brands was from 10 to 5 cents apiece. During this same period, the depression presumably operated on the average purchaser's

budget so that there was a definite factor of consumer change to lower-quality products. Whatever the cause, by 1936 the proportion of all cigars which sold for 5 cents apiece or less rose to more than 88 percent of the national production.

TABLE 18.—Percentage distribution of production of cigars, by retail price classes, 1921 to 1936¹

Year	Percentage of total cigar production—cigars retailing at—					Total
	5 cents or less	Over 5 to 8 cents	Over 8 to 15 cents	Over 15 to 20 cents	Over 20 cents	
1921.....	30.2	27.8	39.2	2.7	0.1	100.0
1925.....	41.6	17.6	33.7	2.0	.1	100.0
1927.....	48.4	11.5	37.9	2.1	.1	100.0
1929.....	54.9	8.8	34.2	2.0	.1	100.0
1931.....	69.7	3.2	25.5	1.5	.1	100.0
1932.....	78.6	1.2	18.8	1.3	.1	100.0
1933.....	85.7	.7	12.9	.7	(?)	100.0
1934.....	86.1	1.2	12.0	.7	(?)	100.0
1935.....	87.5	1.4	10.2	.8	.1	100.0
1936.....	88.3	1.0	10.1	.6	(?)	100.0

¹ Data are from annual reports of Commissioner of Internal Revenue.

² Less than 0.05 percent.

Lower selling prices, while induced by competition, could have been made possible only through decreased costs of production. General wage reductions may have provided a part of the decrease. Costs of raw materials certainly dropped materially (table 19). However, economies made possible through improvements in techniques of manufacture must also have been a contributing factor. It is not possible to estimate the relative importance of each of these influences in the price reductions which took place in the industry.

It seems probable that, barring unforeseen developments, the era of price reduction in the cigar industry is approaching an end. In the past it was aided by savings on both labor and materials. However, tobacco-leaf prices have been advancing since 1933. Wage rates since the depression have been extremely low, so further savings from this source seem unlikely.⁸ The only other possibility for savings in cost would seem to rest with introduction of machinery into the still unmechanized part of the industry, but the substantial degree of mechanization already prevailing indicates that savings from this source would be small.⁹

It may be mentioned that, although the use of improved cigar-making machinery has lowered the cost of production, it has had a secondary effect in stimulating low-priced cigar consumption. Cigar-making machinery was first used and is still largely used in the manu-

⁸ Monthly Labor Review, October 1935, Man-Hours of Employment in 35 Manufacturing Industries in 1933. Table 1 lists cigar manufacturing as thirty-fourth in a list of 35 selected industries according to average wages paid per man-hour.

⁹ See p. 45.

facture of low-priced cigars where a steady demand is assured. Large-scale producers in this field have therefore consistently encouraged consumption of such cigars through advertising or other means at their disposal.

TABLE 19.—Average farm prices of domestic leaf tobacco used for filler, binder, and wrapper, 1919 to 1936 ¹

Year	Average farm prices ² (in cents) per pound of domestic tobacco used for—			Year	Average farm prices ² (in cents) per pound of domestic tobacco used for—		
	Filler	Binder	Wrapper		Filler	Binder	Wrapper
	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>		<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
1919	18.8	29.7	78.0	1929	12.7	20.4	55.3
1920	13.5	24.6	75.0	1930	8.3	15.3	68.7
1921	13.2	14.2	70.6	1931	6.8	8.7	62.8
1922	15.2	20.5	70.7	1932	4.5	6.9	50.7
1923	16.5	21.9	83.3	1933	5.4	8.6	57.7
1924	14.9	16.2	73.1	1934	9.0	12.1	75.1
1925	10.7	15.3	83.8	1935	9.7	12.8	79.7
1926	9.9	20.2	83.3	1936	11.0	14.7	83.1
1927	13.7	19.0	86.9				
1928	14.9	17.8	76.3				

¹ Data are from U. S. Department of Agriculture, Crop Reporting Board releases of Apr. 16, 1934; June 15, 1935; Apr. 15, 1936; and May 10, 1937.

² Average prices of tobacco grown during seasons in years indicated.

To sum up, labor-cost savings made possible by increased use of improved, mechanized methods of cigar manufacture have been at least in part responsible for reductions in the average retail price of cigars since 1921. Also, to the degree that mechanization has permitted price reductions, it has probably assisted the cigar industry in competition with cigarettes, maintaining the total volume of cigar production at higher levels than would otherwise have been possible. The actual extent of this effect, however, is not subject to measurement.

Another change in the type of production since 1920 may be credited at least in part to mechanization. Before the introduction of cigar-making machines, short-filler cigars constituted a relatively insignificant proportion of all cigars manufactured. They were made principally to dispose of the scrap and cuttings produced as a byproduct of the manufacture of long-filler cigars. However, since 1920 the ratio of short-filler cigars to all cigars manufactured has been steadily increasing, as indicated by the statement showing the estimated percent ¹⁰ the short-filler cigars manufactured each year formed of total cigar production.

Of great significance is the fact that some concerns now manufacture short-filler cigars directly from whole leaf, utilizing a thresher which beats the leaf from the stem, this taking the place of the stemming operation for the filler. In such factories, therefore, short-filler cigars

¹⁰ These estimates are based on the amount of scrap tobacco reported used in the manufacture of cigars. This method, while not wholly satisfactory, is sufficiently accurate to indicate the steady increase in the proportion of short-filler cigars.

become a primary product rather than a byproduct of the manufacture of long-filler cigars.

	<i>Percent of short- filler cigars</i> ¹		<i>Percent of short- filler cigars</i> ¹
1920.....	11. 1	1929.....	16. 5
1921.....	12. 6	1930.....	20. 3
1922.....	12. 4	1931.....	22. 2
1923.....	12. 4	1932.....	21. 3
1924.....	15. 1	1933.....	21. 0
1925.....	16. 2	1934.....	24. 4
1926.....	17. 3	1935.....	25. 9
1927.....	16. 3	1936.....	27. 2
1928.....	16. 9		

¹ Computed as follows: The amount of scrap (filler) tobacco used in manufacture of cigars as given in annual reports of Commissioner of Internal Revenue was assumed to represent seven-tenths weight of all tobacco entering short-filler cigars (stemmed basis). This amount, compared to all leaf used in manufacture of cigars, was assumed to represent proportion of short-filler to all cigars manufactured.

It cannot be doubted that manufacturers are attracted by the substantial labor-cost savings made possible by use of short-filler cigar machines. Not only does manufacture of cigars by this method require about 42 percent less labor in the making department than where long-filler cigars are made by machine, and about 78 percent less than long-filler cigars made by hand, but a secondary saving is also possible through elimination of stemming of the filler.¹¹

In past years consumers objected that short-filler cigars tended to shred in the mouth during smoking. Short-filler cigar machines, however, have been improved so that today scrap tobacco in larger sizes may be used, partially overcoming this tendency.

How much farther the manufacture of short-filler cigars may be expected to expand at the expense of long-filler cigars it is not possible to estimate. It is significant that as yet there is no sign of any halt in the steady increase in the proportion of total production represented by short-filler cigars.

Effects of Mechanization on Number and Size of Establishments

Cigar manufacturing was introduced on a commercial scale in this country about the year 1800. It was in general a small-scale industry, and a typical cigar shop was frequently the establishment of a single owner-worker. There was little change in the industry until after the Civil War.

Between 1870 and 1900, the mold, suction plate, and hand-bunching tool were introduced. Before this time no tools had been used save a knife and a bench on which to work, so for the first time the matter of investment in equipment had to be considered by a prospective manufacturer. Moreover, the division of labor made possible by these

¹¹ Figures refer to cigars manufactured to retail at 5 cents each. See p. 39.

tools gave a group of workers a slight efficiency advantage over a single individual. This period saw the establishment of the factory system of cigar manufacture.¹²

Nevertheless, small-scale manufacture continued to be most characteristic. There were some advantages in large-scale manufacture, but these were not such as to disqualify the small shop from successful competition. A small cigar factory could be started with very little money, and could compete on fairly even terms with larger long-established concerns.

Increasingly bitter competition, described by the Supreme Court as "fierce and abnormal,"¹³ had the effect of bringing about a combination of five important cigarette and tobacco manufacturing concerns in 1890 by the formation of the American Tobacco Co., known at the time as the "Tobacco Trust." This organization has influenced the history of every branch of the tobacco industry.

By acquiring other important concerns, the company established its position so strongly that by 1901 its proportion of the country's total output of plug and twist was 68 percent; of smoking tobacco, nearly 60 percent; of snuff, over 80 percent; of cigarettes, 90 percent; and of "little cigars," 73 percent. The only important field that remained to be conquered was the manufacture of cigars, and to that task attention was next directed.¹⁴

The American Cigar Co. was incorporated as a part of the "Trust" in January 1901. Between 1900 and 1903 the "Trust" increased its proportion of the country's cigar production from 4.8 percent to 16.4 percent. These increases were due not only to the further absorption of independent concerns, but also to extensive advertising, price cutting, and the granting of premiums. The ambitious program, however, failed to accomplish the results expected, and the campaign was relaxed after 1903. At no time thereafter did the "Trust" make more than 15 percent of the cigars produced in this country. It was apparent that the cigar branch of the industry could not be captured so readily as had been the other branches of the tobacco industry.¹⁴

The principal reason for the failure of the company to establish itself in a dominant position in the cigar industry lay in the fact that machinery for making cigars had not been developed to such an extent as to disqualify the small manufacturer from successful competition. It is worth noting that the "Trust" succeeded in obtaining a strong foothold¹⁵ approximating a position near to monopoly, in the manufacture of "little cigars" where machinery was more successfully used.

¹² Twelfth Census of the United States, vol. 9, pp. 671 et seq.

¹³ 221 U. S. 157 (1911).

¹⁴ Statistics are from United States Commissioner of Corporations, Report on the Tobacco Industry, Washington, 1909.

¹⁵ United States Commissioner of Corporations. Report on the Tobacco Industry, Washington, 1915, pt. III, p. 195.

The obvious way to establish supremacy in cigar production was to develop machinery for making cigars. This the company endeavored to do. It organized the American Machine & Foundry Co. in 1900 and later acquired the International Cigar Machine Co. The executive in charge was given the specific problem of developing automatic cigar-making machinery.¹⁶ However, in 1911 the tobacco combination was declared to be in restraint of trade and was ordered dissolved by the Supreme Court of the United States,¹⁷ and the shrewdly conceived plan was interrupted.

It was not until 1917 that the long period of research bore fruit and the idea of cigar-making machinery became a reality. And now there was no "Tobacco Trust" to use the machines. Their introduction depended on the antipathies and convictions of a large group of independent manufacturers.

It immediately became apparent that use of cigar machines was not suited to small-scale manufacture. Prerequisites to use of machines were:

1. A considerably larger investment in equipment than was required for hand manufacture.
2. An assured and uniform demand for a large volume of product to permit maximum efficiency.¹⁸
3. A stable location.

TABLE 20.—*Distribution of cigar factories according to annual output in specified years*¹

Annual output	Number of factories with classified output in—				Percentage of total production			
	1921	1926	1931	1936	1921	1926	1931	1936
All factories.....	14, 578	10, 247	7, 138	5, 292	100. 0	100. 0	100. 0	100. 0
Under 500,000 cigars.....	13, 149	9, 281	6, 664	4, 902	13. 7	8. 0	5. 2	4. 8
500,000 to 5,000,000.....	1, 130	680	320	256	26. 2	17. 6	10. 7	7. 5
5,000,000 to 40,000,000.....	288	263	122	107	44. 4	49. 4	31. 5	31. 1
Over 40,000,000.....	11	23	32	27	15. 7	25. 0	52. 6	56. 6

¹ Data are from annual reports of the Commissioner of Internal Revenue.

Practically all small concerns and a number of larger establishments, unable to meet these conditions, therefore found installation of machines impractical or impossible. To this group was added a number of producers who felt that consumers would not knowingly accept machine-made cigars, and who therefore hesitated to jeopardize their established brand names in a new field. Consequently,

¹⁶ *Fortune* (Jersey City, N. J.), June 1930.

¹⁷ 221 U. S. 106 (1911).

¹⁸ Machines are usually installed in batteries of not less than six, each machine having a rated capacity up to 1 million cigars per year in one shift of operation. Overhead costs on the investment required wipes out any advantages accruing to the mechanized methods of operation if machines are permitted to remain idle for considerable periods.

machines first found their way into a few large factories, and later gradually spread through the industry as other large units became convinced that machine-made cigars could be sold in competition with the hand-made product.

In 1921 small-scale operation remained the more common type. For example, of a total of 14,578 cigar-manufacturing establishments in business that year, there were only 11 manufacturing more than 40 million cigars each per year, and these together produced but 15.7 percent of the total output of the industry. Nearly as important collectively were 13,149 small establishments each manufacturing less than one-half million cigars per year, who together produced 13.7 percent of the industry's total. The greater part of all production, 70.6 percent, was contributed by the 1,418 factories each manufacturing more than one-half million but less than 40 million cigars per annum (table 20).

The shrinking market following 1920 and the sharp competition it engendered made economies in manufacturing costs most important. In this situation, the labor-cost savings offered by use of cigar machines proved a decisive factor. But, as has been pointed out, because of intrinsic limitations, these machines were installed in the larger factories only.

As a result, the smaller concerns, most of which could not be mechanized, were at a competitive disadvantage and were forced to bear the brunt of the market decline. As the market drop continued and mechanization of large factories increased, smaller establishments gradually assumed a subordinate position. Mortality among them was high. In contrast, the largest establishments actually succeeded in improving their positions.

Thus, in a period of 15 years the number and type of cigar-manufacturing establishments changed radically. By 1936 there were but 5,292 concerns in business, a reduction of over 60 percent from 1921. The smallest establishments, those manufacturing less than one-half million cigars each per year, now numbered 4,902 and produced 4.8 percent of the total number of cigars made. Those establishments manufacturing more than one-half million but less than 40 million cigars each per year, which in 1921 represented 70.6 percent of the industry's total production, had declined in number to but 363 and contributed collectively but 38.6 percent of the industry's production. In contrast, the largest factories, those producing in excess of 40 million cigars each per year, during the same period increased in number from 11 to 27 and produced 56.6 percent of all cigars made in 1936, as compared with 15.7 percent in 1921 (table 20).

A part of the reduction in the number of establishments and the concentration of production in the larger of those remaining may be attributed to the market decline. However, the major factor respon-

sible for these changes was mechanization. That mechanization operated as an important influence, independently of the market level, may be seen from the fact that, despite an increase in total production of from 4.3 to 5.2 billion cigars between 1933 and 1936, the number of cigar-manufacturing establishments decreased from 6,620 to 5,292, and production in factories with capacity in excess of 40 million cigars per year increased from 50.3 to 56.6 percent of the industry's total.¹⁹

Effects of Mechanization on Labor

Total Employment

Perhaps the most direct effect of mechanization has been a reduction in the size of the labor force required by the industry. Between 1921 and 1935 the number of workers employed by the industry was reduced by half. The fall in the total volume of cigar production during this period was responsible for a large share of this decrease. The number of cigars produced by the industry in 1921 was 6.73 billions; in 1935 the number was 4.69 billions—a reduction of 30.3 percent.²⁰ This would account for a corresponding percentage reduction in the labor force, equivalent to 34,000 workers, but leaves a further decrease of 22,000 workers to be credited to other causes. Though no accurate records are available, hours of labor decreased substantially over the period 1921–35.²¹ It follows that improvements in manufacturing techniques would have caused displacement of even more than 22,000 workers had this effect not been in part compensated by reductions in the average hours of labor.

	<i>Wage earners in cigar manufacture</i> ¹		<i>Wage earners in cigar manufacture</i> ¹
1919.....	114, 300	1929.....	84, 200
1921.....	112, 000	1931.....	68, 200
1923.....	108, 800	1933.....	54, 600
1925.....	103, 000	1935.....	56, 000
1927.....	94, 600		

¹ Data are from Census of Manufactures.

The question may be approached in a slightly different way. For each long-filler cigar machine the labor of about 4.59 persons is

¹⁹ Additional information on concentration of production may be found in "The Tobacco Study," Division of Review, National Recovery Administration, Department of Commerce, March 1936, pp. 178-180 (mimeographed).

²⁰ Annual reports of the Commissioner of Internal Revenue.

²¹ The Census of Manufactures in these early years reports a frequency distribution of workers in the cigar and cigarette industries combined according to prevailing hours of labor. However, prevailing hours of labor in the cigar industry may or may not be closely correlated with actual man-hours worked. Even today working hours in hand cigar plants are relatively flexible. More satisfactory information for later years is available, but because of the uncertainty mentioned above, it has been deemed inadvisable to attempt estimates of average change in hours of labor over the period.

required in the fabricating department of mechanized plants.²² An average of 3,706 long-filler cigar machines in use was reported in 1935. On this basis, it is estimated that machine factories making long-filler cigars employed about 17,000 workers in the fabricating departments of their plants in 1935.

The results of the field survey also indicate that about 2.64 times as many workers are required in the fabricating departments of factories using hand methods as in plants using cigar machines to make the same number of 5-cent long-filler cigars in the same time.²³

It follows that to manufacture the same number of long-filler cigars by hand as were made by machine in 1935 would have required about 44,900 workers ($2.64 \times 17,000$), or some 27,900 more than it is estimated were actually employed. This figure—27,900—approximately represents the hypothetical net displacement of workers from the industry in 1935 by reason of the use of long-filler cigar machines, always assuming the market could have been maintained despite added costs entailed in hand operation.

The long-filler cigar machine, though the largest single influence, has not been the only improvement in manufacturing techniques causing displacement of labor from the industry. Mechanization of manufacture of short-filler cigars must likewise have reduced the number of workers employed. Similarly, increased use of stripping machinery and conveyor equipment in factories must also have eliminated the need for some human labor. No data are available from which to estimate even approximately the number of workers displaced by these mechanical improvements. However, combining their effects with the effect of the long-filler machine, it probably understates the case to say that, in the absence of improvements in manufacturing techniques in the preceding two decades, 30,000 more workers would have been required to make the number of cigars produced by the industry in 1935.

Summarizing, it is estimated that the decrease in the volume of production of cigars between 1921 and 1935 resulted in the displacement of about 34,000 workers from the industry. A further displacement of about 22,000 wage earners is attributed to improvements in manufacturing techniques during the period. It is estimated that this latter number would have been in excess of 30,000 workers had

²² An average of 9.55 hours of labor, including 8.32 hours of labor by machine operators, was found to be required to produce 1,000 cigars by means of the 4-operator machine. Since 4 operators are required to tend each machine, this represents 2.08 hours of machine operation. Therefore, the labor of 4.59 persons is required to each cigar machine ($9.55/2.08$) (table 15).

²³ It was found by the survey that to make 1,000 5-cent long-filler cigars required an average of 25.19 hours of labor in the fabricating departments of a hand factory as compared with 9.55 hours in a plant using cigar machines. Put in a slightly different way, this indicates that it would require the labor of 25.19 persons in the fabricating department of a hand plant to make 1,000 5-cent long-filler cigars in 1 hour as compared with the labor of 9.55 persons in a mechanized factory, or 2.64 times as many persons (table 15).

not reductions in the average hours of labor per wage earner in part compensated for the effect of mechanization.

The actual character of displacement of men by cigar machines is more complex than would be indicated by the totals given above. Hand cigar makers have in general not been employed as cigar-machine operators. Machine operators have most commonly been recruited directly from the ranks of unskilled labor, and many, if not most, have had no previous experience in the cigar industry. Installation of each machine then has usually caused the induction into the industry of a few new unskilled workers and the complete displacement of a greater number of skilled hand cigar makers. It is estimated that by 1935 about 44,000 such hand workers had been severed from the industry because of use of long-filler cigar machines alone, and, concurrently, that jobs had been provided for about 17,000 new workers who were brought in to run the machines.²⁴ The amounts which would have to be added to these figures to account for the effects of short-filler cigar machines cannot be calculated.

While the newly introduced workers have been in the main unskilled young women, those displaced have been of both sexes and principally in upper age groups. With a continuous diminution in the hand branch of the industry, these displaced workers have seldom been able to find other outlets for their skill within the industry. Moreover, being accustomed to indoor work of a highly specialized nature, they have had great difficulty in locating or in adapting themselves to employment in other industries. Employment dislocations caused by mechanization have therefore frequently caused great hardship and distress among displaced workers.²⁵

Type of Labor Employed by the Industry

In addition to reducing the number of workers employed by the industry, mechanization has markedly changed the type of the labor force. About three-quarters of all employees in a hand cigar factory are cigar makers. These workers are skilled craftsmen who have gone through an apprenticeship period, usually of several years' duration, to acquire their skill. When a hand factory is mechanized, or is forced out of business by concerns using cigar machines, these skilled workers are replaced by machine operators classed as unskilled or semiskilled labor, usually recruited directly from the ranks of unskilled labor. As the industry has become mechanized, therefore, the labor

²⁴ The records of the field survey show an average of 4.6 persons per machine required in the making departments of plants using long-filler cigar machines. Multiplying by the number of machines in use in 1935 indicates about 17,000 workers in the fabricating departments of such plants in 1935. About 2.64 workers are required in the making department of a hand plant to equal in output each person in the making department of a plant using long-filler machines. It is therefore estimated that the 17,000 workers in machine plants replaced the labor of about 44,000 workers who would have been required in the making departments of hand plants to produce an equivalent output.

²⁵ For summary of a case study of this subject see Monthly Labor Review, May 1938 (p. 1120).

force has gradually changed from a group consisting largely of skilled workers to one in which these workers form only a minority.

At the same time the distribution of employment between the sexes has changed. Among hand cigar makers, prior to the introduction of machines, both sexes were represented. A report to the convention of the Cigar Makers' International Union in 1920 indicated that, of 111,400 hand cigar makers, 50,375 or 45.2 percent were males. Cigar-machine operators on the other hand have always been almost exclusively women.²⁶ Therefore, as mechanization has spread the proportion of males employed by the industry has steadily decreased.

A secondary effect applying to the hand branch of the industry may also be traced to mechanization. A special Census of Manufactures survey in 1933 indicated that of a total of 26,940 hand piece workers (predominantly hand cigar makers) only 31 percent were males. Comparison with the estimate of 45 percent in 1920 as given by the Cigar Makers' International Union indicates that there has been a substantial decrease in the proportion of males employed by the hand branch of the industry. This may be attributed to the difficulties of this branch in competing with mechanized factories. As hand production decreased and the amount of labor required was reduced, manufacturers tended to retain the female cigar makers, who in general were available at smaller rates of pay.

Organization of Labor

Labor organization has had a long history in the cigar-manufacturing industry. Local unions were reported as early as 1845. In 1886 the Cigar Makers' International Union played an important part in the formation of the American Federation of Labor, and for many years was one of the strongest bulwarks of that organization. Samuel Gompers, long the president of the Federation, came from this union and remained its vice president throughout his career.

The union was a craft organization of skilled hand cigar makers. It laid great emphasis on sickness, unemployment, and death benefits and on the value of the union label. It used the strike as an industrial weapon very sparingly.

Mechanization has strongly affected the fortunes of this organization. Since unskilled workers form the majority of all those employed in mechanized factories, the union in general has not spread into such concerns. As machines have been introduced into more and more factories and the hand branch of the industry has become smaller, the membership of the union and its influence have declined. In 1910 the union had in excess of 50,000 members. From 1920 to 1930—

²⁶ A special study of the cigar-manufacturing industry made for the National Recovery Administration by the Census of Manufactures of 1933 covered 12,001 machine piece workers, predominantly cigar-machine operators. Of these all but 23 were women.

a decade of mechanization—the union membership dropped from 41,000 to about 15,000. The depression years following 1930 made still further inroads into its membership, but an organization drive during the National Recovery Administration brought it back to about 15,000. Recently a number of local branches have been abandoned in places where machine introduction has made the position of the union untenable and the payment of unemployment benefits impossible.

Wages

Average annual earnings of workers in the cigar industry averaged about \$800 between 1921 and 1929. After 1929 they declined, reaching a low of \$551 in 1933. A slightly improved average of \$598 recorded in 1935 was still below that for any other census year excluding 1933. The decline in the volume of production after 1920 and especially after 1929 probably accounts for a large part of the decreases shown (table 21).

Mechanization has acted as a mixed influence. Factories using cigar machines, operating more economically than concerns using hand methods, have not been under such pressure to reduce costs. From a superficial examination it appears that wage and hour schedules in most mechanized plants are relatively stable, and wages are not markedly out of line with those paid by other industries in similar localities for comparable types of labor.

TABLE 21.—*Annual pay roll and average annual earnings per worker in the cigar-manufacturing industry, 1921–35*¹

Year	Annual pay roll	Average annual earnings per worker ²
1921.....	\$91,530,000	\$817
1923.....	90,860,000	835
1927.....	76,470,000	809
1929.....	67,220,000	799
1931.....	46,070,000	676
1933.....	30,060,000	551
1935.....	33,503,000	598

¹ Data are from Census of Manufactures.

² I. e., annual pay roll divided by number of workers.

In the hand branch of the industry, on the other hand, the constantly increasing number of hand cigar makers displaced from the industry and thrown on the labor market has created an oversupply of such labor. No longer in a position to bargain through their union for relatively high wages, many of these workers have been forced to accept whatever wages were offered. With hand manufacturers in a losing competitive struggle against mechanized concerns, these offers have frequently been meager. Mechanization has thus exerted a constantly depressing influence on wage rates in the hand branch of the

industry. For the industry as a whole, the probable net effect of mechanization has been to force wage levels downward.

The influences cited above have resulted in an anomalous situation in which hand cigar makers—skilled craftsmen—frequently receive smaller rates of pay for their labor than machine operators—unskilled or semiskilled workers—making the same class of cigars. This was indicated to be true in 1933 by a special survey of the cigar-manufacturing industry made for the National Recovery Administration by the Census of Manufactures, which showed that in different plants the weekly earnings of female hand cigar makers making class A cigars ranged from an average low of \$8.90 to an average high of \$11.60, while those of female cigar-machine operators making class A cigars ranged from \$10.71 to \$13.62.²⁷ Again, a survey in March 1936 showed that in the industry as a whole female long-filler and short-filler cigar-machine operators averaged 37 cents per hour, while female “out-and-out” hand cigar makers received 36 cents per hour, female hand bunch makers 35 cents per hour, and female hand rollers 32 cents per hour.²⁸

That the same influence operated in the plants covered by the present survey may be seen from the following tabulation of average hourly returns to hand cigar makers and cigar-machine operators found in the different factories:

	<i>Average rates (cents) per hour</i>
Hand-made cigars, selling for—	
Less than 5 cents each	25, 26, 34
5 cents each	28, 33, 35
Over 8 to 15 cents each	36, 41, 41, 43, 46
Over 15 to 20 cents each	46, 52
Cigars bunched by machine and rolled by hand, selling for 5 cents each.	32, 35
Cigars made on 4-operator machines, selling for—	
Less than 5 cents each	36, 39
5 cents each	36, 38, 38, 43, 43
Over 8 to 15 cents each	47
Cigars made on 2-operator short-filler machines, selling for less than 5 cents each	30, 35, 42, 48

Hours of Labor

What effect, if any, mechanization has had on the general level of hours of labor in the cigar-manufacturing industry is not clear. The average length of the workweek appears to have decreased, but how much of this may be attributed to increased use of machines is uncertain.

²⁷ Each manufacturer was asked to report the highest and lowest weekly wages paid in a scheduled week. All high rates and all low rates were then combined separately into an average high and an average low for the industry as a whole.

²⁸ Monthly Labor Review, April 1937 (p. 957).

However, mechanization has had the unmistakable effect of tending to stabilize work schedules. Hours of labor in factories making cigars by hand, especially before the introduction of machines, were in general somewhat informal. In a study of the industry in 1911 and 1912, conditions of work were described as follows:²⁹

Many cigar-factory employees do not work all the hours the factory is open and work afforded. The work is so largely individual in many factories that the coming and going of employees does not interfere materially with the work of others and expensive machinery does not stand idle when he is absent * * * No cigar factory visited keeps regularly a record of the time worked by its piece workers.

The situation described above does not obtain in mechanized units. There definite plant hours are established and employees are required to observe precise time schedules.

Mechanization and the Future

As a prelude to the consideration of mechanization in the future, the various types of concerns operating in the industry today should be appraised.

In the hand branch, a number of small shops remain—concerns of one or two workers depending on local demand or neighborhood trade to dispose of their product. Such shops (called “buckeyes”), though a common sight in our larger cities, are collectively of minor importance compared with the industry as a whole. A few large and a number of middle-sized concerns using hand methods remain. These factories depend upon the quality appeal of the term “hand-made” to counterbalance the cost advantage possessed by mechanized producers. In many cases, these concerns specialize in the production of higher-quality and higher-priced cigars. A third class of hand manufacturers, small in number, specializes in the production of special orders, small lots, and odd sizes or types of cigars. Because of the number of mechanical adjustments required, the use of machines is naturally not economical in this field.³⁰

The fact that only 12 percent of all cigar production in 1936 consisted of cigars selling at more than 5 cents apiece, while an estimated 15 percent of all production were long-filler hand-made cigars, indicates that some of the lower-priced grades are still made by hand. It is probable that any further displacement of hand by mechanized methods will take place first in this field, perhaps later extending into higher-priced classes.

The question as to the rate at which mechanization will spread through the remainder of the hand branch of the industry—even

²⁹ U. S. Bureau of Labor Statistics Bulletin No. 135.

³⁰ The dies in a cigar machine must be changed and the machine readjusted whenever the size or shape of cigar to be manufactured is changed.

whether there will be further significant mechanization—cannot be definitely settled. Physically, there appears to be no bar to further mechanization. Cigars made by machines are successfully marketed today in all but the highest price classes, but this higher-quality group constitutes but a minor fraction of total production. The total volume of the “special order” type of business, in which use of machines is not economical, must also be small. Thus these two fields combined constitute but a small part of total cigar production.

Practically, the persistence of hand methods of manufacture on a significant scale seems to rest on two factors. The first depends on the selling appeal of the term “hand-made.” As long as a group of consumers prefer cigars of this type, concerns will use hand methods to supply the demand. As has been suggested, this appeal is strongest in the case of higher-priced cigars. However, the net effect must depend in large part on the efforts, principally in the advertising field, of manufacturers themselves—efforts which naturally cannot be foretold.

The second factor deals with the question of wages. The original force impelling the industry toward mechanization was especially great because relatively unskilled workers using machines could produce more per hour than skilled and relatively well-paid hand cigar makers. This wage relationship has changed. The oversupply of skilled hand cigar makers on the labor market and the necessity on the part of many to obtain work on any terms have permitted some hand manufacturers to hire adequate numbers of these craftsmen at extremely low wage rates—in many cases at levels below those prevailing for machine operators in mechanized plants. Some hand manufacturers have thus been able to reduce labor costs so far that the difference in cost resulting from differences in productivity has been offset in part or perhaps in some cases completely by the extra costs entailed in using machines.³¹ However, this is a precarious position, and any influence tending to reestablish wage differentials between hand cigar makers and cigar-machine operators, or tending to raise wages in the industry as a whole, would renew the drive to mechanization, though probably not with its original force.

In summary, the rate at which further mechanization may be expected to take place will probably be slower than in the past,³² and will depend on factors which may not readily be evaluated with accuracy.

In any case, mechanization of the cigar-manufacturing industry has not much farther to go. Manufacture of long-filler cigars is about three-quarters mechanized, and that of short-filler cigars perhaps to

³¹ For instance, interest on added investment, power, lubrication, repairs and repair parts, depreciation, and royalties.

³² Since 1932 the number of long-filler cigar machines in place in the industry has been practically constant. However, more efficient utilization of equipment or changes to multiple-shift operation still may have resulted in increases in the proportion of machine-made to total production.

a greater degree. It does not seem, however, that a stable point has yet been reached, and some further mechanization will probably take place. The effects will probably be, in general, a continuation of those previously noted.

There is also a change taking place in the very character of the industry itself, a change which, though perhaps not directly caused by mechanization, would be impossible without it.

Formerly the cigar-manufacturing industry was a relatively loose, disorganized body. The typical establishment was small and sold its product in a localized market. The keystone of the industry was a group of craftsmen—skilled workers who made up the majority of all wage earners employed.

Today, the most important units in the industry are large factories, mechanized in every possible detail. These factories represent large investments and are run on a mass-production basis with efficiency as the watchword. The output of each of these units is huge, is distributed throughout the country, and is sold with the assistance of modern Nation-wide advertising.³³ Most of the workers in these factories are relatively unskilled.

At the beginning of the century the "Tobacco Trust" made determined attempts to obtain control of the cigar industry, without success. Today, with mechanization, concentration of production in the hands of fewer and larger concerns is taking place rapidly. Thus, through mechanization, the cigar-manufacturing industry is being transmuted from a small, localized form of enterprise to the status of a modern, mass-production industry.

³³ In 1934 the four largest cigar-manufacturing companies made 31.0 percent of all cigars produced, and less than 30 companies made 53.6 percent. (See *The Tobacco Study*, Division of Review, National Recovery Administration, Department of Commerce, March 1936, p. 130.)

