

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Mechanization in Industry

Volume Author/Editor: Harry Jerome

Volume Publisher: NBER

Volume ISBN: 0-87014-026-4

Volume URL: <http://www.nber.org/books/jero34-1>

Publication Date: 1934

Chapter Title: Appendix B: Estimates of the Extent of Use in the United States of Selected Labor-Saving Devices

Chapter Author: Harry Jerome

Chapter URL: <http://www.nber.org/chapters/c5251>

Chapter pages in book: (p. 437 - 454)

APPENDIX B

ESTIMATES OF THE EXTENT OF USE IN THE UNITED STATES OF SELECTED LABOR-SAVING DEVICES

Explanation of abbreviations and footnote references

MD = Data furnished by one or more manufacturers of the specified device and believed to be exact or approximately so

ME = Estimates by one or more manufacturers of the specified equipment and believed to be reasonably accurate

MRE = Estimates by one or more manufacturers of the specified equipment and believed to have a wide margin of possible error

RE = Rough estimate

T = Based upon data given in the specified table in this report or in the sources from which it was prepared

The numbered references are to footnotes to the respective tables, with the exception that those prefaced with 'Ref.' refer to the serially numbered bibliography in Appendix D.

TABLE 48

AGRICULTURE

I. GENERAL PURPOSE EQUIPMENT

EXTENT OF USE IN THE UNITED STATES, YEAR TO WHICH
ESTIMATE APPLIES AND SOURCE OF INFORMATION

| TYPE | | 1920 | 1930 |
|--------------|---|-----------|-----------|
| Motor trucks | Number on farms ¹ | 139,169 | 900,385 |
| | Percentage of farms reporting trucks | 2.0 | 13.4 |
| Automobiles | Number on farms ¹ | 2,146,362 | 4,134,675 |
| | Percentage of farms reporting automobiles | 30.7 | 58.0 |

TABLE 48 (cont.)

AGRICULTURE

I. GENERAL PURPOSE EQUIPMENT (cont.)

| TYPE | EXTENT OF USE IN THE UNITED STATES, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION | | |
|------------------------|---|---------|-----------|
| | | 1920 | 1930 |
| Tractors | Number on farms ¹ (1925, 505,933) ⁴ | 246,083 | 920,021 |
| | Percentage of farms reporting tractors | 3.6 | 13.5 |
| | Domestic sales of tractors, 1922-29, (for both agricultural and industrial uses): all types, 991,000; tracklaying type, 64,000. ⁵ | | |
| | Percentage ratio of value of tractors to all farm equipment sold in 1929, 33.9 (T. 6) | | |
| Stationary gas engines | Number on farms ¹ | 7 | 1,131,108 |
| | Percentage of farms reporting gas engines | 7 | 15.0 |
| | Total domestic sales, 1920-29, 1,270,309 (sales in 1921 not known but estimated as equal to the number produced, T. 39) | | |
| Electrification | Electric motors on farms ¹ | 7 | 386,191 |
| | Percentage of farms reporting electric motors | 7 | 4.1 |
| | Farm dwellings lighted by electricity (including those lighted by gas in 1920): | | |
| | Number | 452,620 | 841,310 |
| | Percentage | 7.0 | 13.4 |
| | In 1931, of approximately 1,000,000 farms using electricity, 644,500 had high-line service, and between 300,000 and 400,000 had independent or unit farm-lighting plants (Ref. 24, p. 449). | | |
| | Of a group of farms surveyed in 1925-26, 23 per cent had stationary engine power, 28.5 per cent had electric power available | | |

TABLE 48 (cont.)

AGRICULTURE

I. GENERAL PURPOSE EQUIPMENT (cont.)

EXTENT OF USE IN THE UNITED STATES, YEAR TO WHICH

TYPE

ESTIMATE APPLIES AND SOURCE OF INFORMATION

and 16 per cent of the reporting farms without electricity were within one mile of a transmission line (T. 51).

II. SOIL PREPARATION AND GRAIN HARVESTING

TYPE OF
EQUIPMENTEXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES
AND SOURCE OF INFORMATIONTractor-drawn
disk plows

Total domestic sales (for use in the U. S.), 1920-29: moldboard, 655,319; disk, 126,822 (T. 39).

Percentage of total value of moldboard plows sold which are tractor-drawn (1929) 66; of disk plows, 83. No pronounced trend in these ratios (T. 6).

In 1928 on 25 per cent of Illinois farms surveyed most of the plowing was done with tractor-drawn plows.²

Tractor-drawn
disk harrows

Total domestic sales (1920-29) 371,513 (T. 39).

Percentage ratio to dollar value of all disk harrows sold (1929) 60. No pronounced trend in this ratio. 28 per cent of Illinois farms had tractor-drawn disk harrows in 1928.²

Harvester-
thresher
combines

Total number, domestic sales (1920-29), 68,013.

Percentage ratio to dollar value of all harvesting machinery sold (1929), 51.9. Sharp increases in this ratio in 1926, 1927 and 1928.

Estimated that 30 per cent of wheat acreage in Kansas was harvested with combines in 1926.³

Used on only 0.2 per cent of Illinois farms (1928).

Tractor-drawn
binders

13 per cent of Illinois farms used tractor-drawn binders in 1928; 62 per cent used the horse-drawn type.²

Small-size
threshing
machines

On 63 per cent of Illinois farms (1928) threshing was hired, but 11 per cent of threshing machines were farmer-owned, 77 per cent of these being 28-inch cylinders or less (most of which can be powered by tractors sufficiently small for field work). 88 per cent of separators sold in 1929 were 28-inch or less, as compared with 73 per cent in 1921.

TABLE 48 (cont.)

III. ROW CROPS

| TYPE OF EQUIPMENT | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|--|---|
| Tractor-drawn listers | Total number, domestic sales, 1920-29, over 37,000. Percentage ratio to dollar value of all listers sold: 14.2 in 1920; 34.9 in 1928. Sharp increases in this ratio in 1926, 1927 and 1928 (T. 6). |
| Tractor-drawn cultivators | Percentage ratio to dollar value of all cultivators sold: 16.6 in 1929. Sharp increases in this ratio in 1927, 1928 and 1929. |
| Motor cultivators | Not extensively used. It is estimated that most of the cultivation was done with motor cultivators on only 0.7 per cent of Illinois farms in 1928. ² |
| Rotary hoes | Use relatively small but increasing. Domestic sales in 1929 were 14,504. Used for most of the cultivation on 4.3 per cent of Illinois farms in 1928. |
| Multiple-row corn planters | Use of more than two-row planters limited. For example, in 1928, 87 per cent of Illinois farms had two-row planters; 0.2 per cent, three-row; and 0.02 per cent, four-row. |
| Mechanical corn pickers | Use small but increasing. Domestic sales of mechanical picker-huskers totalled 25,381 in 1927-29. In 1928, they were in use on 11,000 Illinois farms or 4.9 per cent of farms over 50 acres. |
| Corn huskers and shredders (usually belt-driven at barn) | Practically all power. Sales stationary or declining (T. 39). Used on 9.4 per cent of Illinois farms in 1928. |
| Cotton sleds and pickers | Cotton sleds used for a portion of the crop in western Texas and Oklahoma in late 'twenties, especially when prices were low. Also there has been some experimental use of mechanical cotton pickers. |
| Potato diggers | Total domestic sales, 1920-29: plow type, 35,343; elevator type, 91,130. |

EXTENT OF USE

441

TABLE 48 (cont.)

IV. STOCK AND DAIRY FARMING

TYPE OF EQUIPMENT

EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION

| | |
|---|---|
| Milking machines | <p>Total domestic sales (1920-29), 188,415, assuming domestic sales in 1921 were the same as the number manufactured (T. 39).</p> <p>In use on 3.1 per cent of Illinois farms of over 50 acres (1928), and on 9 per cent of Wisconsin farms (1928).³ Sampling surveys found milking machines on 10 per cent of 204 farms in southeastern Pennsylvania; on 23.6 per cent of 318 farms in northeastern New Jersey (1930-31); on 23.2 per cent of 414 farms in Grafton County, N. H. (1930); on 34.5 per cent of 863 farms in Connecticut; and on 50.6 per cent of 83 farms in Coos County, N. H. (1931).⁸</p> |
| Cream separators | <p>Percentage ratio of value of power-driven separators to value of all cream separators sold (1928), 7.4 (T. 6). No distinct trend in this ratio, 1922-28.</p> |
| Water systems | <p>Total domestic sales (1922-28), 655,976, mostly power operated.</p> <p>Percentage of farms with water piped into the dwelling house: 10.0 in 1920; 15.8 in 1930.</p> <p>Percentage of farms in Wisconsin with running water in barns (1927), 30.³</p> <p>Mechanically operated water systems on Illinois farms (1928): electric on 5.7, gas engine on 12.2 and wind-mills on 16.1 per cent of the number of farms.²</p> |
| Overhead feed and litter carriers | <p>Total domestic sales (1920-29), 87,528.</p> |
| Power hay presses | <p>Constituted 71 to 84 per cent of value of all hay presses sold, each year 1920-29. No marked trend.</p> |
| Power feed grinders and crushers | <p>Total domestic sales (1920-29), 401,539. In value, over 90 per cent of all feed grinders sold. No distinct trend.</p> |
| Ensilage and fodder cutters | <p>Total domestic sales (1920-29), 137,993.</p> |
| Power corn shellers | <p>83 per cent of all corn shellers sold (1929) were power-driven. No trend in this ratio, 1920-29.</p> |
| Power spraying outfits | <p>Percentage ratio of power type to total value of all spraying outfits sold (1929), 69.0. No marked trend.</p> |

MECHANIZATION IN INDUSTRY

TABLE 48 (cont.)

IV. STOCK AND DAIRY FARMING (cont.)

| TYPE OF EQUIPMENT | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|---|---|
| Farm elevators, portable and stationary | Total domestic sales (1920-29), 70,244. |

¹ U. S. Bureau of the Census, *15th Census of the U. S., 1930, Agriculture*, Vol. II, Pt. 1.

² All data given for Illinois in Table 48 are from mimeographed report of estimates based on a survey made by A. J. Surratt and R. K. Smith, *Illinois Farm Equipment Survey*, and are for 1928.

³ All data for Wisconsin in Table 48 are from Bulletin No. 90, U. S. Department of Agriculture and Wisconsin Department of Agriculture, *Wisconsin Agriculture—A Statistical Atlas, 1926-27*.

⁴ U. S. Bureau of the Census, *Census of Agriculture, 1925*.

⁵ Based upon data in Table 39 or given in the sources listed in footnote 1 thereto. Unless otherwise specified, the sales data in Table 48 are in terms of the number of machines sold for use in the U. S.

⁶ U. S. Department of Agriculture, *Yearbook of Agriculture, 1932*.

⁷ Comparable data for 1920 not available.

TABLE 49

EXCAVATING AND HIGHWAY CONSTRUCTION ¹

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|--|---|
| Power shovels, contractors' sizes (1½-1¾ yds.) | Widely used in excavation for buildings and in deep cuts for highway grading. Number sold, 1900-13, by 2 leading manufacturers, 1,097; 1914-24, by 3 to 10 manufacturers, 6,337 (MD). Total production in census years 1925, 1927 and 1929: \$102,063,000 (T. 13). |
| Trenching | Large ditching almost entirely a machine process. Total production of trench excavators in 1925, 1927 and 1929: \$9,068,584 (T. 13). Narrow trenchers for pipe lines, gas mains, telephone conduits, etc., relatively new. 1,089 machines sold by leading manufacturers, probably representing at least 50 per cent of the industry, 1923-29. By 1925 |

EXTENT OF USE

443

TABLE 49 (cont.)

EXCAVATING AND HIGHWAY CONSTRUCTION ¹

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|--|---|
| | about 30. per cent of work for which they are adapted was handled by these machines; by 1929, about 70 per cent (MRE). |
| Central proportioning plants | In general use on larger highway jobs by 1925, as a substitute for wheelbarrow proportioning at point of construction (Ref. 20-a). |
| Subgrader, in highway construction | Introduced in 1920. In 1926 in use on 80 to 90 per cent of larger jobs, where its use is most clearly advantageous (MRE). In use on 79 per cent of those construction operations inspected in 1925 where the subgrader was feasible (Ref. 20-a). |
| Machine finishers on cement highway construction | Used on 80 to 90 per cent of larger jobs (1926, MRE). In use on 84 per cent of 1925 field inspections (Ref. 20-a). |

¹ For further detail concerning sales of selected types of excavating machinery, see Tables 13 and 41.

TABLE 50

SELECTED HOUSEHOLD APPLIANCES ¹

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|--|---|
| <i>Availability of power</i> (see also Table 48, I) | Number of wired homes, December 1930, 20,438,774, with 70.5 per cent of the total population in dwellings with electric current. ² |
| <i>Laundrying</i> | |
| Electric washing machines | 7,185,000 users, December 1930; in 35 per cent of wired homes (T. 44 and 45). |
| Gasoline-power washing machines | Number sold, 1920-27, 318,000 (T. 43, footnote). |
| Electric irons | Users, December 1930, 20,000,000; in 98 per cent of wired homes (T. 44 and 45). |
| Electric ironing machines (flat work) | Users, December 1930, 680,000; in 3.3 per cent of wired homes (T. 44 and 45). |
| Stationary laundry tubs | Percentage of dwellings equipped, 1925-26: urban, 28; rural, 6 (T. 51). |

TABLE 50 (cont.)

SELECTED HOUSEHOLD APPLIANCES¹

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|-----------------------------|--|
| <i>House cleaning</i> | |
| Electric vacuum cleaners | Users, December 1930, 9,086,000; in 44.4 per cent of wired homes (T. 44 and 45). |
| Electric floor polishers | Number sold, 1925-30, 322,000 (T. 43). |
| <i>Sewing</i> | |
| | Electric sewing machines, number sold, 1925-30, 1,818,000 (T. 43). |
| | In 1925-26, 4 per cent of urban and 2 per cent of rural reporting homes had electric ma- chines; 80 per cent of rural homes had hand or power type (T. 51, note). |
| <i>Food preparation</i> | |
| Electric dishwashers | Number sold, 1925-30, 57,000 (T. 43); in 1925 used in less than one per cent of urban homes (T. 51). |
| Electric cookers | Users, December 1929, 1,175,000; in 5.9 per cent of wired homes (T. 44, 45). |
| Electric ranges | Users, December 1930, 1,000,000; in 4.8 per cent of wired homes (T. 44, 45). |
| Electric refrigerators | Users, December 1930, 2,625,000; in 12.8 per cent of wired homes. ⁴ |
| Bread mixers | Percentage of reporting farm homes equipped, 1926, 8.9 (WCS). ³ |
| <i>Heating</i> | |
| | Estimated number of oil burners in homes, 1928, 600,000 to 650,000. ⁵ |
| | Sales of mechanical stokers of the residential type totalled 6,915 in 1931, 6,783 in 1932 and 9,507 in 1933. ⁶ |

¹ For further detail concerning the extent of use of household appliances, see Tables 43, 44, 45 and 51.

² *Electrical World*, January 3, 1931.

³ WCS = Women's Club Survey (see T. 51).

⁴ *Electrical Merchandising*, January 1931, p. 24.

⁵ Letter to author from H. F. Tapp, Assistant Secretary, American Oil Burner Association, March 12, 1928.

⁶ U. S. Department of Commerce press release, *Mechanical Stokers*, December, 1933.

TABLE 51

PERCENTAGE OF RURAL AND URBAN HOMES EQUIPPED WITH SPECIFIED LABOR-SAVING DEVICES

*(based on a sampling survey made in 1925-1926)*¹

| TYPE OF EQUIPMENT | PERCENTAGE OF REPORTING HOMES EQUIPPED WITH SPECIFIED DEVICE | |
|--|--|-------------|
| | RURAL | URBAN |
| Electricity available | | |
| Central station service | 19.6 | 2 |
| Individual plant | 8.9 | 2 |
| Electric or gas lighting | 30.6 | 87.0 |
| Laundry equipment | | |
| Electric washing machines ³ | 13.1 | 23.0 |
| Hand washing machines | 17.5 | 2 |
| Other power washing machines | 11.7 | 2 |
| Electric irons | 20.3 | 63.6 |
| Gas irons | 7.4 | 2 |
| Flat-work ironers | 2 | 1.9 |
| Laundry tubs | 6.0 | 28.3 |
| Vacuum cleaners, electric ³ | 9.1 | 34.6 |
| hand | 8.4 | 2 |
| Sewing machines, electric ³ | 2.0 | 4.0 |
| foot | 72.1 | 2 |
| Electric dish washers | 2 | 0.5 |
| Heating, furnaces other than oil oil-burning furnaces | 12.9 2 | 46.8 1.8 |
| Water and sanitary equipment | | |
| Water piped to house | 47.2 | 2 |
| Stationary kitchen sink | 33.3 | 83.9 |
| Stationary wash bowl | 16.3 | 71.3 |
| Stationary bath tub | 21.3 | 68.3 |

¹ Based on mimeographed reports of surveys made under the direction of the Industrial Survey and Research Service for the General Federation of Women's Clubs, one covering urban home equipment (1925-26), the other farm home equipment (1926).

² No information given.

³ Of the rural homes for which reports on washing machines were obtained, 44.3 per cent in all had some type of washing machine, though only 42.3 per cent specified whether the machines were hand, electric or other power. Likewise, the percentages for vacuum cleaners and sewing machines, irrespective of whether hand or electric types, were 18.3 and 80.1.

TABLE 52

HANDLING EQUIPMENT

I. MOBILE TYPES

| EQUIPMENT | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|--|--|
| Electric industrial trucks and tractors | Shipments, domestic, 1914-29, 19,742 (T. 46). Number in use, June 1928, 14,103, including 2,133 tractors (T. 12). Leading users: metal products, marine and railway terminals, iron and steel mills, automotive industries (T. 11). Used in one-fourth to one-half of potential market (MRE, 1926). |
| Gasoline tractors in industrial use Lumber carriers and pilers, electric and gasoline | About 50,000 to 70,000 sold for non-farm uses by 1926 (MRE). Total number sold, four models, 1914-29, 1,151 (MD). In the Northwest, used for probably 75 per cent of lumber cut and by 90 per cent of mills where use is feasible. Probably used for 65 per cent of lumbering in South and on West Coast (MRE, 1929). Use in large wholesale and retail yards increasing rapidly. |
| Portable conveyors | Number of users, 1929, about 11,000 (MRE). Estimated percentage of total work for which they are adapted actually done with aid of these machines: 1920, 15; 1925, 30; 1929, 40 (MRE). |
| Portable elevators or tiering machines, hand and power | Widely used in such industries as wholesale paper, large newspapers, oil in barrels, etc. for from 15 to 20 years. One firm sold over 2,000 (1921-25); peak in sales 1917-20 (MD). Increasing demand for power types. |
| Hand lift trucks | Estimated 30,000 users, or 50 per cent of potential market (MRE, 1926). |
| Motor trucks | Registrations, 1929, 3,380,000. Number produced in the United States, 1914-29, 5,211,000 (T. 46). |
| Self-feeding wagon or truck loaders for | Use in bituminous coal mines small but increasing; 3.6 per cent of output so handled |

TABLE 52 (cont.)

HANDLING EQUIPMENT

EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES
AND SOURCE OF INFORMATION

| EQUIPMENT | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|-----------------------------------|--|
| handling loose materials in piles | in 1929 (T. 40). Percentage ratio of actual to potential use in fields for which its practical feasibility had been demonstrated: 1920, 10; 1925, 40; 1930, 25. The 1930 decline arises, not from less extensive use, but from a widened field as the machine was improved (MRE, 1930). Over 3,000 of 3 models sold, 1914-29 (MD). |

II. FIXED AND SEMIMOBILE TYPES

EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES
AND SOURCE OF INFORMATION

| EQUIPMENT | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|---|--|
| Electric hoists | About 44,300 sold, 1920-29. ¹ Dollar value of new orders, 1920-29, 9 firms, over \$21,000,000. |
| Electric overhead cranes | Shipments and new orders, for about 98 per cent of total output, each over \$80,000,000, 1921-29. Peak in 1929 (T. 47). |
| Cupola charging hoists, for foundries | In use in a small proportion of work for which suitable (MRE, 1926). |
| Electric locomotives (See also Table 53) | Shipments, 1926-29, by 10 firms, representing the bulk of the industry (T. 47): |
| | For industrial use Trolley type, aggregate value \$2,600,000 Storage battery type, aggregate value \$1,300,000, |
| | For mining use Trolley type, aggregate value \$10,500,000 Storage battery type, aggregate value \$2,900,000. |
| Installed handling systems | Installations by 3 reporting firms, chiefly in the automotive and tire industries, totalled \$6,800,000, 1922-25 (MD). Not over 25 per cent of potential market for package conveyors equipped (MRE, 1926). For conveyors of all types, see T. 13. |

¹ Letter to author from Secretary of Electric Hoist Manufacturers' Association, March 10, 1930.

TABLE 53

COAL MINING

EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES
AND SOURCE OF INFORMATION

| PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|------------------------|---|
| <i>Bituminous coal</i> | |
| Stripping | Percentage of total tonnage produced by stripping with power shovels: 1.5 in 1920; 3.8 in 1929, varying from below 1 per cent in some Pennsylvania counties to 100 per cent in Wallace County, Georgia (Ref. 32). |
| Undercutting | Percentage of total tonnage undercut by machine: 59.8 in 1920; 75.4 in 1929 (T. 40). Percentage of tonnage of underground mines undercut by machine varied, in 1929, from 2.1 in Texas to 97.9 in Michigan (Ref. 32). |
| Loading into mine cars | Percentage of total tonnage loaded with self-feeding loading devices: 0.3 in 1923; 3.6 in 1929; 5.9 in 1931 (T. 40). Percentage handled on pit-car loaders and hand-loaded conveyors: 3.5 in 1929. Percentage of product of underground mines loaded by machine varied in 1929 from 0.8 in Kentucky to 39.9 in Wyoming (Ref. 32). |
| Drilling shot holes | Power drilling of shot holes with portable electric drills being rapidly introduced (Ref. 32, 1928, Pt. II, p. 482). In a sample group of 100 mines surveyed in 1929, 94 were using electric or compressed-air drills (Ref. 2, pp. 122-24). |
| Underground haulage | "Mines equipped with one or more electric locomotives now supply 85 per cent of the output, and 33 per cent is produced by mines in which even the gathering is done electrically and no animals whatever are employed" (Ref. 32, 1928, Pt. II, pp. 481-2). In 1925 percentage of deep-mined bituminous coal moved by animal haulage only, 12.0; locomotives only, 34.1; locomotives and animal haulage, 53.9 (U. S. Bureau of Mines, <i>Coal in 1925</i> , p. 445). |
| Cleaning | Percentage of total tonnage cleaned mechani- |

TABLE 53 (cont.)

COAL MINING

EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES
AND SOURCE OF INFORMATION

PROCESS

ally by wet washing or pneumatic methods:
3.3 in 1920; 6.2 in 1929 (Ref. 32).

Anthracite coal

Percentage mined by stripping with power
shovels: 2.5 in 1920; 2.7 in 1929 (T. 40).

Percentage of tonnage undercut by machine:
1.1 in 1920; 1.6 in 1929.

Percentage mechanically loaded: about 3 in
1928 (Ref. 2, p. 47).

Tonnage cleaned mechanically: very large, and
additional mechanical cleaning facilities total-
ling almost 8,200 tons per hour were under
construction in 1929 (Ref. 32).

TABLE 54

OTHER NON-MANUFACTURING INDUSTRIES

EQUIPMENT
OR PROCESS

EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES
AND SOURCE OF INFORMATION

Adding and calculating
machines

Number manufactured by principal manu-
facturers to March 1928¹

Full keyboard types 1,707,400

10-key keyboard types 326,500

Miscellaneous non-listers 314,000

(See also T. 7)

Motorized railway
section-crew cars

Number sold by 3 makers, 1914-29, 49,727
(MD). In 1927, approximately 55,000 were in
use, representing about 83 per cent motori-
zation of railway section cars (special inquiry
by makers). Used in practically all cases
where conditions are suitable.

Street cleaning

Motorization increasing. Over 700 of one type
of motorized sweeper sold, 1914-28, with
highest sales in 1926-28 (MD).

Sales of mechanical catch-basin cleaners, 1922-
28, reached peak in 1928 (MD).

Automatic equipment
in the commercial
preparation of food

Bottle-washing machines have long been used.
Sales of 5 models totalled 6,348 in 1914-26
(MD).

MECHANIZATION IN INDUSTRY

TABLE 54 (cont.)

OTHER NON-MANUFACTURING INDUSTRIES

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|---|---|
| <i>Note: in these estimates of use, an estimated total of 8,500 hotels over 50 rooms in size, and 120,000 restaurants, is taken as 100 per cent, as of 1928²</i> | Dish-washing machines extensively used; in about 50 per cent of the larger hotels and 20 per cent of restaurants in 1928 (RE). Total number sold, 1918-29, about 44,000, with heaviest sales in 1929 (MRE). Aggregate production of dish-washing machinery in the census years 1925, 1927 and 1929: \$6,915,500 (T. 8). |
| | Dish-drying machine, for blowing water off dishes, just entering commercial marketing in 1926 (MD). |
| | Vegetable peelers: used in about 40 per cent of the larger hotels and 15 per cent of restaurants (RE). Total sales of 2 makers, 1914-27, over 16,500, power and hand types (MD). |
| | Slicers used in about 60 per cent of the larger hotels and 30 per cent of restaurants (RE). |
| | Fruit-juice extractors used in 25 per cent of the larger hotels and 30 per cent of restaurants (RE). |
| | Dough mixers used in about 45 per cent of the larger hotels and 20 per cent of restaurants (RE). Total sales of 2 makers, 1919-29, over 54,000, with peak in 1927 (MD). |
| Coal stoking | Heavy industrial mechanical stokers: total new orders, 1919-29, over 17,000, with 6,412,000 horsepower (T. 41). |
| | Locomotive stokers: sales of 2 makers, 1922-26, over 5,000 (MD). |
| | Steam grate shakers: introduction began in 1914 and was rapid in 1916-20. |
| Automatic signals at railway grade crossings | "Automatically controlled crossings constituted 61.3 per cent of all protected grade crossings in 1930" (Ref. 61, p. 1,050). |
| Retail merchandising by coin device vending machines | Value of vending machines produced in the census years 1919 to 1929: \$27,971,000 (T.8). "It is said that 25 million dollars worth of cigarettes are sold through coin machines |

TABLE 54 (cont.)

OTHER NON-MANUFACTURING INDUSTRIES

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|-------------------------|---|
| | each year; that Automat restaurants feed 500,000 people a day in New York, Philadelphia and other cities; that there are 10,000 handkerchief vending machines in the United States; and it is well known that hundreds of millions of pieces of gum and candy are sold in this way." ³ |
| | ¹ Estimates made available by courtesy of Equipment-Research Corporation, Chicago, publishers of <i>The Business Machines and Equipment Digest</i> . |
| | ² Rough estimates of extent of use suggested by J. O. Dahl, Manager, Service Department, Ahrens Publishing Company, Inc., in letter to the author, February 23, 1928. |
| | ³ L. D. H. Weld, <i>The Cost of Marketing</i> , <i>Taylor Society Bulletin</i> , April 1933, pp. 26-30. |

TABLE 55

MANUFACTURING INDUSTRIES

I

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|--|---|
| Glass manufacture | 98 per cent of window glass was machine-made in 1926 (Ch. III, footnote 39). |
| | 90 per cent of bottles and jars were made on automatics in 1924 (T. 38). |
| | 95 per cent of electric light bulbs were made by automatic processes by 1926 (Ref. 36, p. 6). |
| Continuous kilns in clay products industries | Used in the production of approximately 50 per cent of high-grade clay products, but for only 3 to 5 per cent of crude clay products (MRE, 1929). |
| Automatic cigar machines | Used by most or all large cigar manufacturers (ME). Over 4,400 machines installed or ordered by principal manufacturers, 1918-29. |

TABLE 55 (cont.)

MANUFACTURING INDUSTRIES

I

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|---|--|
| Automatic paper-stock proportioning and metering system, in paper mills | 35 per cent of cigars were machine-made in 1929 (T. 38). In use for about 90 per cent of newsprint production, as a substitute for the intermittent-batch method (1929, ME). Most new mills equipped. |
| Continuous filters, in place of the intermittent type, for separation of liquids and solids | Used for from 50 to 70 per cent of materials in beet sugar factories and 100 per cent in wood-pulp mills (1928, ME), and for from 20 to 30 per cent of materials in the heavy chemicals industry (MRE). Over 5,000 sold by 1929. |
| Garment pressing machines, used in garment manufacturing and by tailors in pressing | Probably over 100,000 sold 1921-29 (author's estimate, based upon data for a substantial fraction of the industry). Aggregate value of machines produced in 1925, 1927 and 1929 was \$24,702,800 (T. 8). |
| <i>Metal and wood-working equipment</i> Blast furnaces | 81 per cent of output of merchant blast furnaces and 85 per cent of all pig iron not delivered molten was machine-cast (1927, T. 36); and 91 per cent of merchant blast furnace stacks were mechanically charged (1927, T. 36). |
| Machine tools | Ceaseless change in types and uses. Peak of production, 1917 and 1918 (Chart 2). Aggregate production in the census years 1925, 1927 and 1929: \$383,075,000 (T. 8). |
| Wood-working machines | Shipments by reporting group of manufacturers, 1918-29, totalled approximately \$190,000,000; and the number shipped 1923-29, 97,568 (T. 38). |
| Electric portable drills and valve grinders | It is estimated that 360,000 were sold in 1924-26 (<i>Electrical Merchandising</i> , January, 1928). |

TABLE 55 (cont.)

MANUFACTURING INDUSTRIES

I

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|-------------------------|--|
| Tire building | The core process predominated prior to 1926, the flat-drum process thereafter (U. S. Bur. of Labor Statistics, <i>Bul.</i> 585, p. 7). |
| Job printing presses | Two-thirds of presses sold, 1913-28, were machine-fed (T. 37). |

II

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|---|--|
| <i>Foundry equipment</i> | |
| Molding machines | 37 per cent of workers in the molding process in 80 foundries inspected were machine workers, 68 of 77 foundries inspected had some power molding machines, 9 had hand molding only (1925, Ref. 20-a). |
| Power types in general | In use for 50-100 per cent of small, and for 90 per cent of the medium and heavy work for which power machines are suitable (MRE, 1926). |
| Sandslinger type | Over 140 units installed, in 65 or more plants, by close of 1924. Used in 7 of 79 plants inspected (T. 3). |
| Hand types | One maker sold 1,900 to 2,000 of the hand squeezer type, 1920-29 (3,300 in the 6 preceding years), but chiefly as replacements or for new foundries rather than in displacement of other methods (T. 38). In 1927, molding machines constituted, in value, three-sevenths of total foundry equipment produced (1929 <i>Census of Manufactures</i> , p. 1100). |
| Core-making machines for cores, $\frac{3}{8}$ " to 7", hand and power | Used for about 80 per cent of suitable work (MRE, 1926). 23 of 79 foundries inspected reported their use. One maker sold about 5,000 in the quarter century ending 1925. |

TABLE 55 (cont.)

MANUFACTURING INDUSTRIES

II

| EQUIPMENT OR PROCESS | EXTENT OF USE, YEAR TO WHICH ESTIMATE APPLIES AND SOURCE OF INFORMATION |
|---|--|
| Sand mixers | Core and facing-sand mixers used for 75 per cent of suitable work (MRE, 1926). 61 of 79 foundries had power sand-conditioning equipment (1925, Ref. 20-a). |
| <i>Textile equipment</i> | |
| Automatic looms | Plain cotton goods made mostly on automatics, except in a few localities. In 1925, in the sample of New England mills inspected, 52 per cent of looms of all types were automatic; in the southern sample, 79 per cent (Ref. 20-a). In 1929, 74 per cent of plain looms were automatic; of fancy, 47. In the southern cotton states, 80 per cent of plain looms were automatic; in the New England states, 59 per cent (<i>1929 Census of Manufactures</i>). |
| Cotton goods | |
| Other textiles | Used quite extensively in worsteds, and getting into the silk field (1926, ME). |
| Tying-in and drawing-in machines, in cotton goods manufacturing | 808 tying-in machines in use at end of 1925; about 100 more sold, 1926-29 (MD). Approximately 450-460 drawing-in machines in use, 1919; about 100 sold, 1920-25 (MD). Possibly 80 per cent of cotton goods market equipped. A few used on finer grades of worsteds (ME, 1926). |
| Automatic spoolers and high speed warpers | Total number sold, 1917-29: 394 spoolers and 332 warpers. Only a small fraction of potential market equipped (ME). |
| Hand knotters, in spooling | Used in the majority of cotton mills by 1910; about 50,000 of one make sold in the quarter century after introduction in 1900 (ME). |