

CENSUS BULLETIN.

No. 185.

WASHINGTON, D. C.

June 9, 1902.

AGRICULTURE.

IDAHO.

Hon. WILLIAM R. MERRIAM,

Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture in the state of Idaho, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes, also, the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of Idaho, June 1, 1900, numbered 17,471, and were valued at \$42,318,188, of which amount \$6,881,815, or 16.1 per cent, represents the value of buildings, and \$35,486,868, or 83.9 per cent, the value of land and improvements other than buildings. On the same date the value of farm implements and machinery was \$3,295,045, and of live stock, \$21,657,974. These values, added to that of farms, give \$67,271,202, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on farms, are referred to in this bulletin as "animal products." The value of all such products, together with the value of all crops, is termed "total value of farm products." This value for 1899 was \$18,051,625, of which amount \$8,784,364, or 48.7 per cent, represents the value of

animal products, and \$9,267,261, or 51.3 per cent, the value of crops, including forest products. The total value of farm products for 1899 is more than four and a half times that reported for 1889. A part of this increase is doubtless due to a more detailed enumeration in 1900 than in 1890.

The "gross farm income" is obtained by deducting from the "total value of farm products" the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$3,405,804, leaving \$14,645,821 as the gross farm income. The ratio which this latter amount bears to the "total value of farm property" is referred to in the text as the "percentage of gross income upon investment." For Idaho, in 1899, it was 21.8 per cent. As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

Special reports as to the dimensions and cost of the leading irrigation ditches and canals, the area of land under them, methods for the artificial application of water to the growing crops, and other facts relating to irrigation were obtained by correspondence with farmers, engineers, and others. This correspondence was under the joint direction of Mr. F. H. Newell, chief hydrographer of the Geological Survey, acting as expert special agent for the division of agriculture, and Mr. Clarence J. Blanchard.

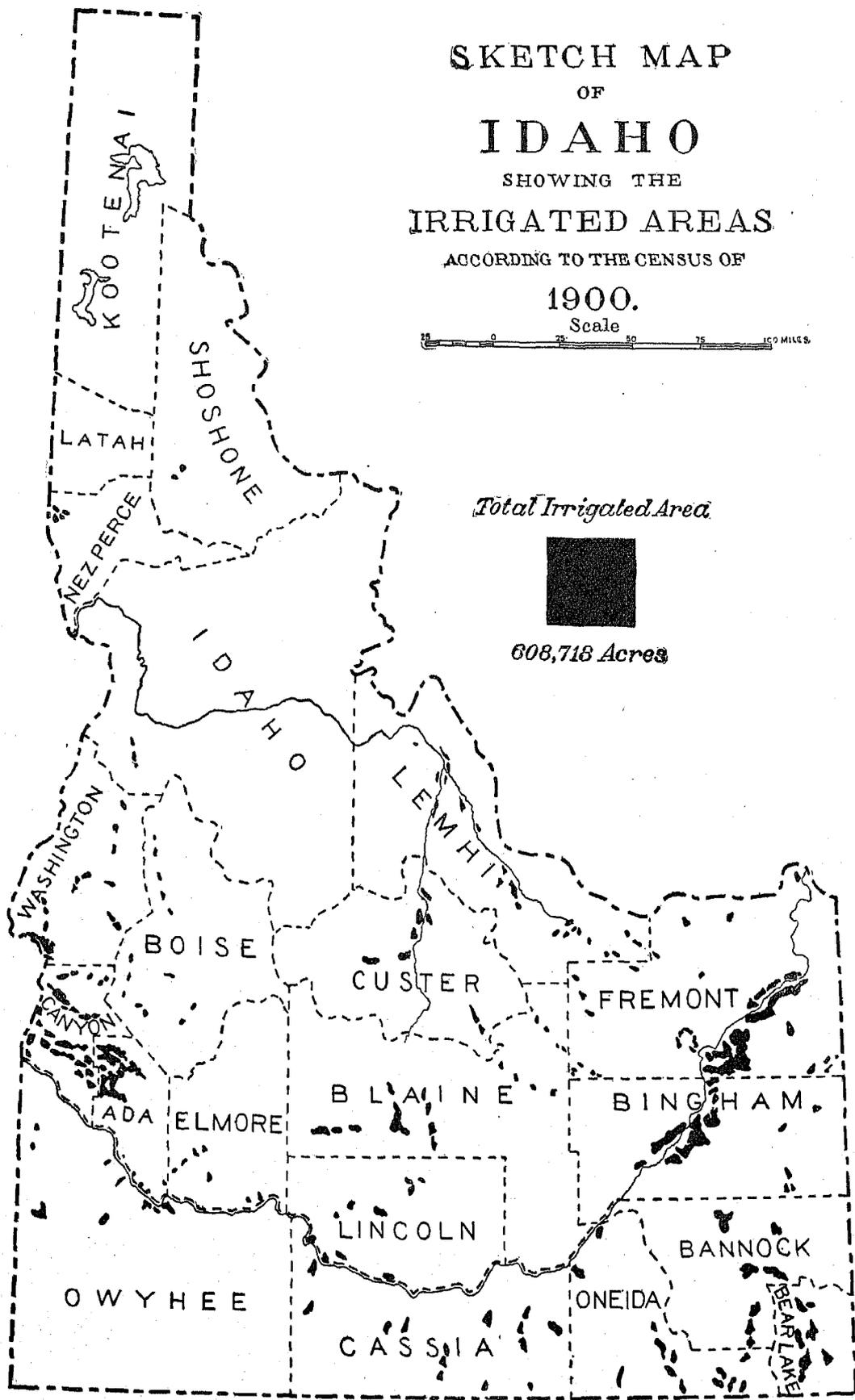
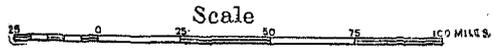
The statistics presented in this bulletin will be treated in greater detail in the report on agriculture in the United States. The present publication is designed to present a summarized advance statement for Idaho.

Very respectfully,

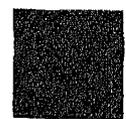


Chief Statistician for Agriculture.

SKETCH MAP
OF
IDAHO
SHOWING THE
IRRIGATED AREAS
ACCORDING TO THE CENSUS OF
1900.



Total Irrigated Area



608,718 Acres

AGRICULTURE IN IDAHO.

GENERAL STATISTICS.

Idaho has a total land surface of 84,290 square miles, or 53,945,600 acres, of which 3,204,903 acres, or 5.9 per cent, are included in farms.

The surface of the state is for the most part rugged, rising unevenly from the valley of the Snake River on the west, to the Bitter Root and Rocky mountains along the eastern boundary. A series of elevated plateaus extends from the southwestern corner irregularly toward the northeast; while east of these the mountains attain a height of about 10,000 feet. Large portions of the state have been subject to comparatively recent volcanic action, and are thus rendered valueless for agricultural purposes. Arable land is found in several broad valleys in the north, but chiefly in the southeast, along the upper courses of the Snake River. The soil of these valleys is often sandy and unstable but with irrigation yields good crops.

NUMBER AND SIZE OF FARMS.

Table 1 gives, by decades since 1870, the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE 1.—FARMS AND FARM ACREAGE: 1870 TO 1900.

| YEAR. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | | Per cent of farm land improved. |
|-----------|------------------|---------------------------|-----------|-------------|----------|---------------------------------|
| | | Total. | Improved. | Unimproved. | Average. | |
| 1900----- | 17,471 | 3,204,903 | 1,413,118 | 1,791,785 | 183.4 | 44.1 |
| 1890----- | 6,608 | 1,902,256 | 606,362 | 695,894 | 197.1 | 46.6 |
| 1880----- | 1,885 | 827,798 | 197,407 | 130,351 | 175.9 | 60.2 |
| 1870----- | 414 | 77,139 | 26,608 | 50,536 | 186.3 | 34.5 |

In the census of 1870 only 414 farms were reported in the newly settled territory of Idaho. The number increased rapidly in the following decades, keeping pace with the growth of population, until in 1900 there were 17,471 farms, or nearly three times as many as were reported in 1890. Each decade shows, also, a large increase in the total farm acreage. The average size of farms has fluctuated, increasing from 1880 to 1890, but decreasing in the last decade, as intensive cultivation has become more general and special branches of agriculture have been developed. The percentage of improved farm land increased

greatly between 1870 and 1880, but since 1880 has shown a decrease for each decade, owing, in part, to the increase in the number of live-stock farms in the state and the consequent increase in the area of unimproved grazing land, and also, with respect to the last decade, to a more strict interpretation of the term "improved land" in 1900 than in previous census years.

FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year beginning with 1870.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF FARM PRODUCTS: 1870 TO 1900.

| YEAR. | Total value of farm property. | Land, improvements, and buildings. | Implements and machinery. | Live stock. | Farm products. ¹ |
|-------------------------|-------------------------------|------------------------------------|---------------------------|--------------|-----------------------------|
| 1900----- | \$67,271,202 | \$42,318,183 | \$3,295,045 | \$21,657,974 | \$18,051,625 |
| 1890----- | 25,857,530 | 17,481,580 | 1,172,460 | 7,253,490 | 3,848,930 |
| 1880----- | 5,443,620 | 2,832,890 | 863,930 | 2,246,800 | 1,516,314 |
| 1870 ² ----- | 1,072,735 | 492,860 | 59,295 | 520,580 | 4637,797 |

¹ For year preceding that designated.

² Exclusive of the value of animals on ranges.

³ Values for 1870 were reported in depreciated currency. To reduce to specie basis of other years they must be diminished one-fifth.

⁴ Includes betterments and additions to live stock.

Since 1870 the total value of farm property has increased \$66,198,467, and in the last decade, \$41,413,672, or 160.1 per cent. Of the latter amount, \$24,886,603, or 60.1 per cent, represents the increase in value of land and buildings; \$14,404,484, or 34.8 per cent, in that of live stock; and \$2,122,585, or 5.1 per cent, in that of implements and machinery. Since 1890 the values of land and of implements and machinery have each more than doubled, and that of live stock has nearly trebled, while the value of farm products is now almost five times as great as that reported ten years ago. However, some portion of the increases in value of farm products and of implements and machinery, is doubtless the result of a more detailed enumeration in 1900 than heretofore.

COUNTY STATISTICS.

Table 3 gives an exhibit of general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH GROSS INCOME (PRODUCTS OF 1899 NOT FED TO LIVE STOCK), AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

| COUNTIES. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | Gross income (products of 1899 not fed to live stock). | EXPENDITURES. | |
|---------------------------|------------------|-----------------|-----------------|-----------|---|-------------|---------------------------|--------------|--|---------------|--------------|
| | Total. | With buildings. | Total. | Improved. | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | Labor. | Fertilizers. |
| The State | 17,471 | 16,715 | 3,204,903 | 1,413,118 | \$35,486,368 | \$6,831,815 | \$3,295,045 | \$21,657,074 | \$14,645,821 | \$2,250,450 | \$17,150 |
| Ada | 769 | 726 | 92,161 | 56,817 | 2,888,000 | 467,000 | 172,750 | 1,174,249 | 1,177,006 | 227,825 | 2,370 |
| Bannock | 865 | 816 | 181,485 | 76,088 | 1,407,850 | 329,750 | 172,495 | 1,886,484 | 762,034 | 109,390 | 2,040 |
| Bear Lake | 761 | 713 | 117,172 | 72,014 | 1,156,960 | 308,370 | 151,210 | 975,562 | 386,148 | 38,450 | 80 |
| Bingham | 1,160 | 1,126 | 196,736 | 101,311 | 2,383,048 | 442,390 | 257,670 | 1,160,240 | 838,522 | 104,000 | 1,800 |
| Blaine | 639 | 483 | 118,963 | 42,749 | 894,220 | 202,780 | 108,790 | 1,883,317 | 681,940 | 91,260 | 400 |
| Boise | 437 | 408 | 81,593 | 28,737 | 553,680 | 136,960 | 60,960 | 588,852 | 319,028 | 43,160 | 180 |
| Canyon | 881 | 852 | 129,695 | 56,888 | 2,668,850 | 463,480 | 170,010 | 936,551 | 842,845 | 157,820 | 1,949 |
| Cassia | 477 | 457 | 97,387 | 38,158 | 1,044,590 | 236,340 | 95,735 | 1,430,836 | 782,521 | 116,810 | 70 |
| Custer | 215 | 211 | 49,629 | 20,375 | 315,030 | 88,160 | 52,730 | 527,421 | 207,495 | 23,730 | 100 |
| Elmore | 152 | 140 | 29,563 | 11,867 | 297,280 | 77,950 | 28,470 | 345,009 | 345,182 | 57,530 | 210 |
| Fremont | 1,500 | 1,442 | 264,571 | 120,916 | 3,108,450 | 491,520 | 347,730 | 1,948,077 | 1,193,461 | 215,820 | 640 |
| Idaho | 1,302 | 1,283 | 249,518 | 83,906 | 2,294,270 | 421,570 | 182,480 | 1,012,036 | 697,816 | 44,620 | 60 |
| Kootenai | 1,105 | 1,076 | 214,999 | 49,757 | 1,846,135 | 299,610 | 116,941 | 860,654 | 452,970 | 60,497 | 10 |
| Latah | 1,821 | 1,778 | 353,700 | 186,485 | 4,640,870 | 808,360 | 337,940 | 688,991 | 1,322,223 | 222,450 | 2,400 |
| Lemhi | 255 | 249 | 61,930 | 24,895 | 658,930 | 157,780 | 61,520 | 669,760 | 253,948 | 43,790 | 2,170 |
| Lincoln | 191 | 180 | 35,559 | 10,923 | 436,610 | 85,560 | 34,690 | 635,016 | 353,950 | 67,960 | ----- |
| Nox Perce | 2,144 | 2,097 | 400,510 | 200,455 | 4,097,960 | 690,200 | 885,840 | 939,733 | 1,192,372 | 134,860 | 590 |
| Oneida | 1,270 | 1,198 | 228,410 | 119,484 | 2,518,240 | 544,230 | 266,280 | 1,809,122 | 1,286,036 | 158,850 | 340 |
| Owyhee | 274 | 252 | 72,776 | 18,278 | 550,400 | 161,050 | 66,610 | 1,157,633 | 533,624 | 143,970 | 470 |
| Shoshone | 249 | 244 | 39,131 | 7,133 | 285,990 | 66,660 | 17,620 | 388,002 | 106,382 | 19,480 | 1,230 |
| Washington | 757 | 714 | 127,227 | 59,410 | 1,552,550 | 275,760 | 128,610 | 1,319,308 | 872,555 | 105,260 | ----- |
| Cœur d'Alene ¹ | 116 | 102 | 46,557 | 20,883 | 295,435 | 52,400 | 51,746 | 84,810 | 127,727 | 11,973 | ----- |
| Fort Hall ¹ | 163 | 114 | 14,019 | 5,785 | 122,065 | 21,375 | 22,295 | 174,865 | 11,324 | 1,305 | 290 |
| Lemhi ¹ | 68 | 49 | 2,272 | 849 | 18,660 | 2,010 | 3,920 | 16,426 | 4,167 | 500 | ----- |

¹ Indian reservation.

The average size of farms in 1900 was 183.4 acres for the state and ranged from 119.8 acres in Ada county to 265.6 acres in Owyhee. The average for the Cœur d'Alene Indian reservation was 401.4 acres, and for the Fort Hall and Lemhi reservations 86.0 and 33.4 acres, respectively.

The average value of farms for the state is \$2,422, and ranges from \$4,363 in Ada county to \$1,215 in Shoshone county. In Ada county the average value of farm land, including buildings, is \$36.40 per acre, while the average for the state is only \$13.20.

Although the increase since 1890 in the value of implements and machinery is doubtless due, in part, to a more detailed enumeration of such articles in 1900 than heretofore, the greater part of the gain is a result of the opening up of new lands and the large increase in the number of farms. The highest average values of implements and machinery per farm are found in the irrigated fruit regions of the south, and the lowest in the mountainous districts of the north.

The 5 counties in the southeastern corner of the state, Fremont, Bannock, Oneida, Bingham, and Bear Lake, reported more than one-third of the total value of live stock, though the average per acre is less there than in some other counties. Owyhee, for example, in the southwestern corner, shows an average value of \$16, per acre of farm land, for live stock.

The average expenditure per farm for labor was \$129 for the state, and ranged from \$50 in Bear Lake county to \$525 in Owyhee county.

FARM TENURE.

Table 4 gives a comparative exhibit of farm tenure for 1880, 1890, and 1900. The farms operated by tenants are divided into two groups, designated as farms operated by "cash tenants" and "share tenants." These groups comprise, respectively: (1) Farms operated by individuals who pay a rental in cash or a stated amount of labor or farm produce; (2) farms operated by individuals who pay as rental a stated share of the products. In Table 5 the tenure of farms for 1900 is given by race of farmer, the farms operated by owners being subdivided into four groups, designated as farms operated by "owners," "part owners," "owners and tenants," and "managers." These groups comprise, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1880 TO 1900.

| YEAR. | Total number of farms. | NUMBER OF FARMS OPERATED BY— | | | PER CENT OF FARMS OPERATED BY— | | |
|-----------|------------------------|------------------------------|---------------|----------------|--------------------------------|---------------|----------------|
| | | Owners. ¹ | Cash tenants. | Share tenants. | Owners. ¹ | Cash tenants. | Share tenants. |
| 1900..... | 17,471 | 15,942 | 406 | 1,123 | 91.3 | 2.3 | 6.4 |
| 1890..... | 6,603 | 6,298 | 69 | 236 | 95.4 | 1.0 | 3.6 |
| 1880..... | 1,885 | 1,796 | 32 | 57 | 95.3 | 1.7 | 3.0 |

¹Including "part owners," "owners and tenants," and "managers."

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

| RACE. | Total number of farms. | Owners. | Part owners. | Owners and tenants. | Managers. | Cash tenants. | Share tenants. |
|--------------|------------------------|---------|--------------|---------------------|-----------|---------------|----------------|
| The State.. | 17,471 | 14,605 | 816 | 164 | 357 | 406 | 1,123 |
| White..... | 16,876 | 14,060 | 806 | 151 | 357 | 384 | 1,118 |
| Colored..... | 595 | 545 | 10 | 13 | | 22 | 5 |
| Chinese..... | 23 | 2 | | | | 21 | |
| Indian..... | 563 | 536 | 9 | 13 | | | 5 |
| Negro..... | 9 | 7 | 1 | | | 1 | |

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

| The State.. | 100.0 | 83.6 | 4.7 | 0.9 | 2.1 | 2.3 | 6.4 |
|--------------|-------|------|-----|-----|-----|-----|-----|
| White..... | 100.0 | 83.3 | 4.8 | 0.9 | 2.1 | 2.3 | 6.6 |
| Colored..... | 100.0 | 91.6 | 1.7 | 2.2 | | 3.7 | 0.8 |

The number of farms operated by owners has increased rapidly since 1880, the number in 1900 being nearly nine times that reported twenty years before, and over two and a half times that reported in 1890.

The tenant class, although operating only a small percentage of the farms of the state, shows larger relative gains than owners. About two-thirds of this class in 1900 were share tenants, who for the period from 1880 to 1890 show the largest percentage of gain. During the last decade, however, cash tenants have increased more rapidly than share tenants.

Of the farms of the state, 96.6 per cent are operated by white farmers, and 3.4 per cent by colored farmers. About nine-tenths of the white farmers own all or a part of the farms they operate. Most of the colored farmers are Indians, of whom the majority are owners. Two of the 23 Chinese are owners and the rest are cash tenants. Seven of the 9 negroes are owners.

No previous census has reported the number of farms operated by "part owners," "owners and tenants," or "managers," but it is believed that the number of farms conducted by the last-named class is constantly increasing.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

| RACE OF FARMER, AND TENURE. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|-----------|------------------|-------------------------|------------------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 17,471 | 183.4 | 3,204,903 | 100.0 | \$67,271,202 | 100.0 |
| White farmers..... | 16,876 | 183.8 | 3,101,553 | 96.8 | 65,685,168 | 97.7 |
| Negro farmers..... | 9 | 122.8 | 1,105 | (¹) | 23,167 | (¹) |
| Indian farmers..... | 563 | 180.9 | 101,869 | 8.2 | 1,494,118 | 2.2 |
| Chinese farmers..... | 23 | 16.3 | 376 | (¹) | 68,749 | 0.1 |
| Owners..... | 14,605 | 164.7 | 2,405,853 | 75.1 | 43,518,565 | 72.1 |
| Part owners..... | 816 | 344.4 | 281,049 | 8.8 | 4,840,897 | 7.2 |
| Owners and tenants..... | 164 | 234.8 | 38,501 | 1.2 | 709,005 | 1.1 |
| Managers..... | 357 | 558.6 | 199,403 | 6.2 | 7,198,779 | 10.7 |
| Cash tenants..... | 406 | 181.8 | 73,795 | 2.3 | 1,635,288 | 2.4 |
| Share tenants..... | 1,123 | 183.7 | 206,302 | 6.4 | 4,368,718 | 6.5 |

¹Less than one-tenth of 1 per cent.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

| RACE OF FARMER, AND TENURE. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | Gross income (products of 1899 not fed to live stock). | |
| The State..... | \$2,031 | \$391 | \$188 | \$1,240 | \$338 | 21.8 |
| White farmers..... | 2,060 | 397 | 187 | 1,248 | 357 | 22.0 |
| Negro farmers..... | 1,842 | 205 | 156 | 371 | 844 | 32.8 |
| Indian farmers..... | 1,153 | 224 | 218 | 1,059 | 254 | 9.6 |
| Chinese farmers..... | 2,618 | 164 | 143 | 69 | 1,576 | 52.7 |
| Owners..... | 1,745 | 367 | 175 | 1,035 | 688 | 20.7 |
| Part owners..... | 3,665 | 553 | 309 | 1,405 | 1,427 | 24.1 |
| Owners and tenants..... | 2,736 | 458 | 240 | 889 | 787 | 18.2 |
| Managers..... | 6,823 | 1,048 | 538 | 11,756 | 5,845 | 29.0 |
| Cash tenants..... | 2,641 | 370 | 161 | 853 | 893 | 22.2 |
| Share tenants..... | 2,717 | 374 | 170 | 629 | 762 | 19.6 |

The average values per farm of the various forms of farm property, with the exception of the implements and machinery of Indians and the land and improvements of Chinese, are lower for farms of colored farmers than for those of white farmers.

Nearly all of the farms operated by Chinese are very intensively cultivated vegetable farms, located in the immediate vicinity of the largest markets. This accounts for the very high value of their land and for the high average and percentage of gross income derived by them. As previously stated, only two of the 23 Chinese farmers own the land they cultivate.

Although the Indians possess much larger and better stocked farms than the Chinese, their average gross income in 1899 was less than \$1.50 per acre while that for the

farms of Chinese exceeded \$90. For white farmers the average was \$4.66 per acre.

The farms conducted by managers have larger average areas and higher average values of property and products than the farms of any other group by tenure. The many large cattle ranches included in this group represent greater investments and their operation requires more capital than the average farmer can command. Men wealthy enough to own such farms rarely operate them in person.

FARMS CLASSIFIED BY AREA.

Tables 8 and 9, for farms classified by area, present facts corresponding to those given in Tables 6 and 7 for farms classified by race of farmer and by tenure.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

| AREA. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-------------------------|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State ----- | 17,471 | 183.4 | 3,204,908 | 100.0 | \$67,271,202 | 100.0 |
| Under 3 acres ----- | 349 | 2.3 | 798 | (1) | 2,692,066 | 4.0 |
| 3 to 9 acres ----- | 188 | 6.7 | 1,256 | 0.1 | 290,855 | 0.4 |
| 10 to 19 acres ----- | 237 | 13.2 | 3,626 | 0.1 | 420,483 | 0.6 |
| 20 to 49 acres ----- | 1,478 | 37.1 | 54,770 | 1.7 | 2,604,580 | 3.9 |
| 50 to 99 acres ----- | 2,306 | 76.7 | 176,764 | 5.5 | 5,140,879 | 7.6 |
| 100 to 174 acres ----- | 8,998 | 154.0 | 1,386,070 | 43.3 | 28,478,340 | 34.9 |
| 175 to 259 acres ----- | 1,348 | 215.9 | 290,985 | 9.1 | 6,297,599 | 9.4 |
| 260 to 499 acres ----- | 1,930 | 345.9 | 607,691 | 20.8 | 13,470,228 | 20.0 |
| 500 to 999 acres ----- | 436 | 658.9 | 286,417 | 8.9 | 6,170,942 | 9.2 |
| 1,000 acres and over .. | 171 | 1,989.2 | 336,726 | 10.5 | 6,705,777 | 10.0 |

¹ Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

| AREA. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State ----- | \$2,081 | \$391 | \$188 | \$1,240 | \$888 | 21.8 |
| Under 3 acres ----- | 91 | 90 | 80 | 7,458 | 2,664 | 34.5 |
| 3 to 9 acres ----- | 795 | 460 | 79 | 210 | 329 | 21.3 |
| 10 to 19 acres ----- | 791 | 304 | 76 | 404 | 361 | 22.9 |
| 20 to 49 acres ----- | 948 | 237 | 112 | 415 | 351 | 19.9 |
| 50 to 99 acres ----- | 1,276 | 297 | 145 | 511 | 483 | 21.7 |
| 100 to 174 acres ----- | 1,493 | 297 | 159 | 660 | 495 | 19.0 |
| 175 to 259 acres ----- | 2,545 | 513 | 238 | 1,377 | 1,018 | 21.8 |
| 260 to 499 acres ----- | 3,907 | 677 | 290 | 2,006 | 1,579 | 22.6 |
| 500 to 999 acres ----- | 7,778 | 1,124 | 552 | 4,700 | 3,034 | 21.4 |
| 1,000 acres and over .. | 17,270 | 2,100 | 968 | 18,832 | 10,082 | 25.7 |

The group of medium-sized farms, containing from 100 to 174 acres each, comprises more than one-half of the total number of farms and over 43 per cent of the total farm acreage.

With a few exceptions the average values of the several forms of farm property and products increase with the size of farms. The high average values of live stock and of products for farms under 3 acres are due to the fact that four-fifths of them are live-stock farms whose operators use large ranges on the public domain, but who actually own or lease less than 3 acres of land. The high average gross income for this class is due to the fact that it includes the ranges just mentioned, all the florists' establishments of the state, and a number of the city dairies. The income from these industries is determined not so much by the acreage of land used as by the capital invested in buildings, implements, and live stock, and by the amounts expended for labor and fertilizers.

The average gross incomes per acre for the various groups classified by area are as follows: Farms under 3 acres, \$1,165.19; 3 to 9 acres, \$49.26; 10 to 19 acres, \$27.32; 20 to 49 acres, \$9.46; 50 to 99 acres, \$6.31; 100 to 174 acres, \$3.22; 175 to 259 acres, \$4.72; 260 to 499 acres, \$4.57; 500 to 999 acres, \$4.62; and 1,000 acres and over, \$5.12. The low average shown for the group of farms of between 100 to 174 acres is explained by the fact that the group contains the recently entered homesteads of 160 acres each.

FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 10 and 11 the farms are classified by the principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop, and constitutes at least 40 per cent of the value of products not fed to live stock, the farm is classified as a "hay and grain" farm. Similarly if vegetables are the leading crop, constituting 40 per cent of net farm products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive 40 per cent of their income from any one class of farm products. Farms with no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

| PRINCIPAL SOURCE OF INCOME. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State ----- | 17,471 | 183.4 | 3,204,908 | 100.0 | \$67,271,202 | 100.0 |
| Hay and grain ----- | 6,141 | 197.9 | 1,215,586 | 37.9 | 22,899,295 | 34.1 |
| Vegetables ----- | 781 | 111.0 | 86,656 | 2.7 | 1,418,327 | 2.1 |
| Fruits ----- | 299 | 133.1 | 89,787 | 1.3 | 1,696,339 | 2.5 |
| Live stock ----- | 5,045 | 210.1 | 1,059,956 | 33.1 | 30,016,831 | 44.6 |
| Dairy produce ----- | 1,985 | 148.4 | 294,543 | 9.2 | 4,686,815 | 7.0 |
| Flowers and plants .. | 5 | 1.4 | 7 | (1) | 19,895 | (1) |
| Nursery products .. | 6 | 118.3 | 710 | (1) | 72,317 | 0.1 |
| Miscellaneous ----- | 3,209 | 158.2 | 507,658 | 15.8 | 6,463,883 | 9.6 |

¹ Less than one-tenth of 1 per cent.

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

| PRINCIPAL SOURCE OF INCOME. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|--------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implementations and machinery. | Live stock. | | |
| The State | \$2,081 | \$391 | \$188 | \$1,240 | \$838 | 21.8 |
| Hay and grain | 2,586 | 427 | 224 | 492 | 749 | 20.1 |
| Vegetables | 1,176 | 247 | 106 | 284 | 375 | 20.7 |
| Fruits | 4,403 | 662 | 179 | 429 | 1,012 | 17.8 |
| Live stock | 2,084 | 465 | 223 | 3,188 | 1,539 | 25.9 |
| Dairy produce | 1,880 | 313 | 136 | 582 | 326 | 13.8 |
| Flowers and plants | 2,280 | 1,600 | 65 | 34 | 607 | 15.3 |
| Nursery products | 9,679 | 1,492 | 447 | 435 | 5,951 | 49.4 |
| Miscellaneous | 1,291 | 277 | 120 | 326 | 311 | 15.4 |

For the several classes of farms the average values per acre of products not fed to live stock are as follows: Farms whose operators derive their principal income from flowers and plants, \$433.55; nursery products, \$50.28; fruits, \$7.61; live stock, \$7.33; hay and grain, \$3.78; vegetables, \$3.38; dairy produce, \$2.20; and miscellaneous, \$1.96. The wide variations in the averages and percentages of gross incomes are largely due to the fact that in computing gross incomes no deductions are made for expenses involved in operation. For florists' establishments and nurseries, the average expenditure for such items as labor and fertilizers represents a far greater percentage of the gross income than in the case of "live-stock" or "miscellaneous" farms. If it were possible to present the average net income the variations shown would be much smaller.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by reported value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|--|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State | 17,471 | 183.4 | 3,204,903 | 100.0 | \$67,271,202 | 100.0 |
| \$0 | 829 | 137.7 | 114,164 | 3.6 | 1,343,157 | 2.0 |
| \$1 to \$49 | 801 | 127.8 | 102,371 | 3.2 | 1,061,031 | 1.6 |
| \$50 to \$99 | 1,277 | 133.9 | 170,954 | 5.3 | 1,683,661 | 2.5 |
| \$100 to \$249 | 3,276 | 131.8 | 431,791 | 13.5 | 5,491,087 | 8.2 |
| \$250 to \$499 | 3,933 | 147.0 | 577,992 | 18.0 | 9,192,930 | 13.7 |
| \$500 to \$999 | 3,883 | 175.0 | 679,603 | 21.2 | 13,794,683 | 20.5 |
| \$1,000 to \$2,499 | 2,542 | 250.2 | 635,937 | 19.8 | 15,982,735 | 23.7 |
| \$2,500 and over | 930 | 529.1 | 492,091 | 15.4 | 18,721,918 | 27.8 |

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|--|---|------------|--------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implementations and machinery. | Live stock. | | |
| The State | \$2,081 | \$391 | \$188 | \$1,240 | \$838 | 21.8 |
| \$0 | 759 | 104 | 61 | 696 | ..... | ..... |
| \$1 to \$49 | 821 | 141 | 78 | 285 | 36 | 2.7 |
| \$50 to \$99 | 841 | 154 | 79 | 244 | 50 | 4.2 |
| \$100 to \$249 | 1,022 | 213 | 109 | 332 | 153 | 9.1 |
| \$250 to \$499 | 1,410 | 305 | 153 | 469 | 344 | 14.7 |
| \$500 to \$999 | 2,124 | 440 | 218 | 771 | 659 | 13.6 |
| \$1,000 to \$2,499 | 3,685 | 685 | 307 | 1,610 | 1,423 | 22.6 |
| \$2,500 and over | 7,111 | 1,172 | 534 | 11,314 | 7,003 | 34.8 |

Some of the farms with no incomes in 1899 were newly established live-stock farms reporting no sales in that year in excess of the amounts expended for animals, and growing no crops except those fed to live stock. Some were

homesteads taken up too late for cultivation that year, and from others no reports could be secured, as the persons in charge, June 1, 1900, did not operate the farms in 1899, and could give no information concerning the products of that year. A relatively larger number of this class of farms was reported by Indian than by white farmers.

LIVE STOCK.

At the request of the various live-stock associations of the country, a new classification of domestic animals was adopted for the Twelfth Census. The age grouping for neat cattle was determined in accordance with their present and prospective relations to the dairy industry and the supply of meat products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with the figures published in previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS AND RANGES, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

| LIVE STOCK. | Age in years. | ON FARMS AND RANGES. | | | NOT ON FARMS OR RANGES. |
|-------------------------------------|---------------|----------------------|------------|----------------|-------------------------|
| | | Number. | Value. | Average value. | |
| Calves | Under 1 | 86,398 | \$888,968 | \$10.23 | 1,824 |
| Stoers | 1 and under 2 | 39,646 | 781,998 | 19.72 | 381 |
| Steers | 2 and under 3 | 27,726 | 797,550 | 28.77 | 216 |
| Steers | 3 and over | 10,522 | 364,197 | 34.61 | 129 |
| Bulls | 1 and over | 6,309 | 286,442 | 45.48 | 43 |
| Heifers | 1 and under 2 | 40,398 | 762,889 | 18.88 | 407 |
| Cows kept for milk | 2 and over | 51,929 | 1,797,122 | 34.61 | 2,591 |
| Cows and heifers not kept for milk. | 2 and over | 100,606 | 2,765,853 | 27.49 | 642 |
| Colts | Under 1 | 18,212 | 136,246 | 7.48 | 401 |
| Horses | 1 and under 2 | 20,832 | 278,326 | 13.36 | 318 |
| Horses | 2 and over | 131,076 | 3,708,771 | 28.29 | 11,489 |
| Mule colts | Under 1 | 275 | 6,258 | 22.74 | 4 |
| Mules | 1 and under 2 | 209 | 3,610 | 17.28 | 5 |
| Mules | 2 and over | 1,309 | 57,679 | 44.06 | 498 |
| Asses and burros | All ages | 362 | 10,738 | 29.65 | 229 |
| Lambs | Under 1 | 1,156,065 | 2,153,766 | 1.86 | 457 |
| Sheep (ewes) | 1 and over | 1,611,630 | 4,947,888 | 3.07 | 305 |
| Sheep (rams and wethers). | 1 and over | 364,377 | 1,193,622 | 3.27 | 282 |
| Swine | All ages | 114,080 | 480,338 | 4.21 | 3,467 |
| Goats | All ages | 4,481 | 23,167 | 5.17 | 19 |
| Fowls: ¹ | | | | | |
| Chickens ² | | 516,412 | | | |
| Turkeys | | 10,211 | 203,127 | | |
| Geese | | 3,850 | | | |
| Ducks | | 9,536 | | | |
| Bees (swarms of) | | 19,240 | 64,994 | 3.38 | |
| Value of all livestock | | | 21,657,974 | | |

¹The number reported is of fowls over 3 months old. The value is of all, old and young.

²Including Guinea fowls.

The total value of all live stock on farms, June 1, 1900, was \$21,657,974. Of this amount 33.3 per cent represents the value of sheep; 8.3 per cent, that of dairy cows; 30.5 per cent, that of other neat cattle; 19.0 per cent, that of horses; and 3.9 per cent, that of all other live stock.

No reports were received concerning the value of live stock not on farms, but it is probable that such animals have higher average values than those on farms. Allowing the same averages, however, the total value of all live stock in the state, exclusive of the poultry and bees not on farms, is approximately \$22,184,015.

CHANGES IN LIVE STOCK ON FARMS.

The following table shows the changes since 1870 in the numbers of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS AND RANGES: 1870 TO 1900.

| YEAR. | Dairy cows. | Other neat cattle. | Horses. | Mules and asses. | Sheep. ¹ | Swine. |
|-------------------|-------------|--------------------|---------|------------------|---------------------|---------|
| 1900 | 51,929 | 311,605 | 170,120 | 2,155 | 1,965,467 | 114,080 |
| 1890 ² | 27,278 | 192,153 | 84,135 | 1,012 | 857,712 | 52,188 |
| 1880 ² | 12,638 | 72,029 | 24,300 | 610 | 27,326 | 14,178 |
| 1870 | 4,171 | 6,285 | 2,151 | 371 | 1,021 | 2,816 |

¹Lambs not included.

²Exclusive of animals on ranges.

In the last thirty years there have been marked increases in the numbers of all classes of live stock, the gains having been greatest for sheep and horses in that time, and for swine in the last decade. The number of dairy cows reported increased 90.4 per cent from 1890 to 1900, and of "other neat cattle," 62.2 per cent. The number of "other neat cattle" for 1900, however, includes 86,398 calves, while, in all probability, calves were not reported in the census of 1890. If the calves reported in 1900 are not included in the comparison, the gain since 1890 in the number of "other neat cattle" would be only 33,054, or 17.2 per cent.

Horses, mules, and asses have more than doubled in number in the last decade. The number of sheep reported in 1900 was about five and one-half times that reported ten years before, while swine were nearly four times as numerous as in 1890.

In comparing the poultry report for 1900 (see Table 14) with that for 1890, it should be borne in mind that in 1900 the enumerators were instructed not to report fowls less than 3 months old, while in 1890 no such limitation was made. For this reason the increases shown in the number of fowls of all kinds appear smaller than they really are. Compared with the figures for 1890, the present census shows the following gains: Geese, 166.1 per cent; chickens, 123.0 per cent; turkeys, 58.7 per cent; and ducks, 30.7 per cent.

ANIMAL PRODUCTS.

Table 16 is a summarized exhibit of the animal products of 1899.

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS IN 1899.

| PRODUCTS. | Unit of measure. | Quantity. | Value. |
|----------------------|------------------|-------------|-------------|
| Wool | Pounds | 15,474,447 | \$2,210,790 |
| Mohair and goat hair | Pounds | 11,638 | 3,989 |
| Milk | Gallons | 115,122,948 | |
| Butter | Pounds | 2,520,316 | \$1,248,197 |
| Cheese | Pounds | 185,952 | |
| Eggs | Dozens | 2,879,590 | 465,501 |
| Poultry | | | 282,438 |
| Honey | Pounds | 379,450 | 42,726 |
| Wax | Pounds | 6,550 | |
| Animals sold | | | 8,909,454 |
| Animals slaughtered | | | 626,237 |
| Total | | | 8,784,394 |

¹Includes all milk produced, whether sold, consumed, or made into butter or cheese.

²Includes the value of all milk sold or consumed and of butter and cheese made.

The value of the animal products of the state in 1899 was \$8,784,364, or 48.7 per cent of the value of all farm products, and 60.0 per cent of the value of products not fed to live stock. Of the above amount, 51.6 per cent represents the value of animals sold and animals slaughtered on farms; 25.2 per cent, that of wool; 14.2 per cent, that of dairy products; 8.5 per cent, that of poultry and eggs; and 0.5 per cent, that of mohair, goat hair, honey, and wax.

ANIMALS SOLD AND ANIMALS SLAUGHTERED.

In 1899 the receipts from sales of live animals together with the value of animals slaughtered comprised over one-half of the value of animal products. About one-half of the farmers of the state reported such sales, the average receipts per farm being \$504 from live animals and \$70 from animals slaughtered. In Lincoln county 69 farmers reported \$167,047 received from the sale of live animals, or an average of \$2,551 per farm, while the highest average value per farm of animals slaughtered, \$344, was reported by Eimore county.

WOOL.

During the past decade there has been a large increase in the production of wool in every county except Custer, and a gain for the state of six-tenths of a pound in the average weight of fleeces. In 1899 Oneida county reported the largest production, 2,044,980 pounds, or but 74,262 pounds less than the production for the entire state ten years before. Six other counties, Fremont, Owyhee, Ada, Cassia, Washington, and Bannock, ranking in the order named, each reported more than 1,200,000 pounds.

DAIRY PRODUCTS.

Of the 17,471 farmers of the state, 1,985, or 11.4 per cent, derived their principal income from dairy produce. In the last decade the production of milk has nearly trebled, and since 1880 the quantity of milk sold has increased from 15,627 gallons to 2,789,638 gallons. Since 1890 the quantity of butter made on farms has more than doubled, while that of cheese has slightly decreased.

Of the \$1,243,197 given in Table 16 as the value of all dairy products in 1899, \$694,472, or 55.9 per cent, represents the value of such products consumed on farms, and \$548,725, or 44.1 per cent, the amount received from sales. Of the latter amount, \$336,360 was received from the sale of 2,789,638 gallons of milk; \$191,501, from 987,133 pounds of butter; \$16,199, from 158,301 pounds of cheese; and \$4,665, from 5,665 gallons of cream.

POULTRY AND EGGS.

The total value of the products of the poultry industry in 1899 was \$747,972, of which amount 62.2 per cent repre-

sents the value of eggs produced and 37.8 per cent that of fowls raised. Over two million dozens more eggs were produced in 1899 than ten years before.

HONEY AND WAX.

The quantity of honey produced in 1899 was 379,450 pounds, or more than ten times the product of 1889. Oneida, Canyon, and Ada counties each produced over 50,000 pounds of honey, and more than one-half of the wax reported was produced in these three counties.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

| CLASSES. | HORSES. | | | DAIRY COWS. | | |
|----------------------------------|------------------|---------|-------------------|------------------|---------|-------------------|
| | Farms reporting. | Number. | Average per farm. | Farms reporting. | Number. | Average per farm. |
| Total..... | 15,907 | 170,120 | 10.7 | 12,928 | 51,929 | 4.0 |
| White farmers..... | 15,332 | 148,503 | 9.7 | 12,600 | 51,169 | 4.1 |
| Colored farmers..... | 575 | 21,617 | 37.6 | 328 | 760 | 2.3 |
| Owners ¹ | 14,207 | 147,008 | 10.3 | 11,567 | 46,741 | 4.0 |
| Managers..... | 306 | 10,265 | 33.5 | 232 | 1,193 | 5.1 |
| Cash tenants..... | 367 | 2,934 | 7.9 | 278 | 1,210 | 4.4 |
| Share tenants..... | 1,027 | 9,943 | 9.7 | 851 | 2,785 | 3.3 |
| Under 20 acres..... | 700 | 8,674 | 11.0 | 370 | 1,779 | 4.8 |
| 20 to 99 acres..... | 3,885 | 24,939 | 7.4 | 2,729 | 7,483 | 2.7 |
| 100 to 174 acres..... | 8,040 | 62,553 | 7.9 | 6,507 | 23,291 | 3.6 |
| 175 to 259 acres..... | 1,304 | 15,232 | 11.7 | 1,147 | 5,840 | 5.1 |
| 260 acres and over..... | 2,478 | 57,652 | 23.3 | 2,135 | 13,573 | 6.2 |
| Hay and grain..... | 5,450 | 42,434 | 7.8 | 4,368 | 13,955 | 3.2 |
| Vegetable..... | 712 | 5,851 | 8.2 | 413 | 1,015 | 2.5 |
| Fruit..... | 239 | 2,594 | 10.9 | 170 | 453 | 2.7 |
| Live stock..... | 4,932 | 93,045 | 18.9 | 4,012 | 20,134 | 5.0 |
| Dairy..... | 1,824 | 11,240 | 6.2 | 1,935 | 10,785 | 5.4 |
| Miscellaneous ² | 2,750 | 14,956 | 5.4 | 1,930 | 5,577 | 2.8 |

¹Including "part owners" and "owners and tenants."
²Including florists' establishments and nurseries.

The high average number of horses shown for colored farmers is due to the fact that the Indians, who constitute 94.6 per cent of the "colored" class, generally keep large numbers of horses on their reservations, while the fact that many of the largest stock farms in the state are operated by managers, accounts for the high average for that class of operators. The Indians report but few dairy cows and, for the most part, their horses are inferior stock.

CROPS.

The following table gives the statistics of the principal crops grown in 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

| CROPS. | Acres. | Unit of measure. | Quantity. | Value. |
|--------------------------|----------------|------------------|-----------|------------------|
| Corn | 4,582 | Bushels | 111,528 | \$55,880 |
| Wheat | 266,305 | Bushels | 5,340,180 | 2,181,958 |
| Oats | 64,739 | Bushels | 1,956,498 | 702,955 |
| Barley | 32,738 | Bushels | 969,214 | 312,730 |
| Rye | 1,304 | Bushels | 16,580 | 8,328 |
| Buckwheat | 60 | Bushels | 800 | 541 |
| Grass seed | | Bushels | 1,160 | 2,442 |
| Clover seed | | Bushels | 2,355 | 11,343 |
| Flaxseed | 17,239 | Bushels | 134,180 | 121,682 |
| Hay and forage | 513,656 | Tons | 899,154 | 4,238,935 |
| Tobacco | | Pounds | 750 | 150 |
| Hops | 63 | Pounds | 58,870 | 7,801 |
| Dry beans | 457 | Bushels | 5,856 | 9,979 |
| Dry peas | 170 | Bushels | 2,506 | 4,058 |
| Potatoes | 9,318 | Bushels | 1,095,290 | 442,489 |
| Sweet potatoes | | Bushels | 413 | 227 |
| Onions | 167 | Bushels | 24,865 | 18,709 |
| Miscellaneous vegetables | 6,165 | | | 372,606 |
| Sorghum cane | 21 | Tons | 8 | 24 |
| Sorghum sirup | | Gallons | 1,893 | 626 |
| Small fruits | 968 | | | 95,115 |
| Grapes | 1127 | Centals | 2,772 | 28,721 |
| Orchard fruits | 135,284 | | | \$365,224 |
| Nuts | | | | 328 |
| Forest products | | | | 315,821 |
| Flowers and plants | 5 | | | 2,805 |
| Seeds | 10 | | | 250 |
| Nursery products | 115 | | | 38,431 |
| Broom corn | 1 | Pounds | 300 | 15 |
| Miscellaneous | | | | 475 |
| Total | 953,556 | | | 9,267,261 |

¹ Estimated from number of vines or trees.
² Including value of raisins, wine, etc.
³ Including value of cider and vinegar.

Hay and forage contributed 45.7 per cent of the total value of crops; cereals, 34.7 per cent; vegetables, including potatoes, sweet potatoes, and onions, 9.0 per cent; fruits and nuts, 5.0 per cent; and all others, 5.6 per cent.

The average yield per acre of hay and forage was 1.8 tons, and the average value, \$4.71 per ton, and \$8.25 per acre. The acreage devoted to hay and forage was 53.9 per cent of the total acreage in crops, but yielded only 45.7 per cent of the total receipts.

The average value per acre of the other crops was as follows: Flowers and plants, \$561; nursery products, \$334; hops, \$117; onions, \$112; small fruits, \$99; miscellaneous vegetables, \$61; potatoes, \$48; grapes, \$45; orchard fruits, \$10; and cereals, \$9.

CEREALS.

The following table is an exhibit of the changes in cereal production since 1879.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS: 1879 TO 1899.

PART 1.—ACREAGE.

| YEAR. | Barley. | Buck-wheat. | Corn. | Oats. | Rye. | Wheat. |
|-------|---------|-------------|-------|--------|-------|---------|
| 1899 | 32,738 | 60 | 4,582 | 64,739 | 1,304 | 266,305 |
| 1889 | 10,004 | 16 | 1,862 | 21,997 | 1,092 | 68,704 |
| 1879 | 8,291 | | 569 | 13,197 | 354 | 22,066 |

PART 2.—BUSHELS PRODUCED.

| YEAR. | Barley. | Buck-wheat. | Corn. | Oats. | Rye. | Wheat. |
|-------|---------|-------------|---------|-----------|--------|-----------|
| 1899 | 969,214 | 800 | 111,528 | 1,956,498 | 16,580 | 5,340,180 |
| 1889 | 296,471 | 895 | 24,695 | 587,407 | 10,309 | 1,176,878 |
| 1879 | 274,750 | | 16,408 | 462,236 | 4,341 | 640,589 |

The total area devoted to cereals in 1899 was 369,788 acres; in 1889, 98,175 acres; and in 1879, 44,477 acres. About 72 per cent of the total acreage in cereals in 1899 was devoted to wheat. The area used in growing this grain in that year was more than four times that reported ten years before, and nearly twelve times the acreage used in 1879. With the exception of the production of barley in the decade 1879-1889, all other grains show large increases for each decade in both acreage and production. The acreages devoted to corn, barley, and oats have each about trebled during the last decade, while that of rye has increased about one-third. Very little buckwheat is grown, but the acreage reported for 1899 was nearly four times as great as for 1889.

Latah county reported about one-fourth of the total number of bushels of grain produced.

The 4,582 acres given in Table 19 as the area devoted to corn in 1899 is exclusive of 6,626 acres of corn, non-saccharine sorghum, and similar crops grown for forage or ensilage.

HAY AND FORAGE.

In 1900, 13,798 farmers, or 79.0 per cent of the total number, reported hay and forage. Excluding cornstalks and corn strippings, they obtained an average yield of 1.8 tons per acre. For each acre in hay and forage in 1889 there were 2.7 acres in 1899.

In 1899 the acreage and yields of the various kinds of hay and forage were as follows: Wild, salt, or prairie grasses, 140,467 acres and 160,290 tons; alfalfa or lucern, 160,029 acres and 425,706 tons; clover, 14,786 acres and 35,420 tons; other tame and cultivated grasses, 99,281 acres and 139,354 tons; grains cut green for hay, 91,654 acres and 125,043 tons; other hay and forage crops, 7,449 acres and 13,341 tons.

In Table 18 the production of cornstalks and corn strippings is included under "hay and forage," but the acreage is included under "corn," as the forage secured was only an incidental product of the corn crop.

FLAX.

Flax was grown in 1899 by 535 farmers, or 3.1 per cent of the total number in the state. Compared with 1889 the area devoted to this crop shows an increase from 8,002 acres to 17,239, and the yield, an increase from 83,409 bushels of seed to 134,180 bushels. The average yield per acre was 10.4 bushels in 1889, and 7.8 bushels in 1899. In 1899 the average area per farm devoted to this crop was 32.2 acres, and the average value of the crop, \$227. Although 4 counties reported flax, 91.9 per cent of the total acreage was in Nez Perce county. The other counties reporting were Latah, Idaho, and Bingham, ranking in the order named.

ORCHARD FRUITS.

The changes in orchard fruits since 1890 are shown in the following table.

TABLE 20.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

| FRUITS. | NUMBER OF TREES. | | BUSHELS OF FRUIT. | |
|-----------------------|------------------|--------|-------------------|--------|
| | 1900. | 1890. | 1899. | 1889. |
| Apples..... | 982,349 | 96,497 | 223,662 | 88,296 |
| Apricots..... | 15,092 | 464 | 550 | 59 |
| Cherries..... | 60,778 | 2,480 | 12,294 | 1,197 |
| Peaches..... | 79,757 | 13,639 | 17,793 | 10,584 |
| Pears..... | 128,907 | 4,062 | 25,324 | 3,542 |
| Plums and prunes..... | 585,173 | 13,963 | 164,468 | 8,419 |

The value of the orchard products of 1899 was \$365,224. The value of such products was not reported by the census of 1890, but in 1879 the reported value was only \$23,147.

The present census shows that 52.1 per cent of all fruit trees in the state are apple trees, and 31.0 per cent, plum and prune trees. Peach trees constitute but 4.2 per cent. Fruit growing is of greatest importance in the 6 counties of Ada, Canyon, Latah, Washington, Owyhee, and Nez Perce, which, in total value of orchard products, rank in the order named. These counties contain 89.0 per cent of all plum and prune trees, 85.6 per cent of all pear trees, 78.2 per cent of all cherry trees, and 74.3 per cent of all apple trees in the state.

In addition to the trees shown in Table 20, unclassified orchard trees to the number of 43,899 were reported, with a yield of 7,909 bushels of fruit.

VEGETABLES.

The value of the vegetables produced in the state in 1899, including potatoes, sweet potatoes, and onions, was \$834,031, of which amount 53.1 per cent represents the value of potatoes and sweet potatoes, and 46.9 per cent, the value of onions and miscellaneous vegetables. Aside from the land devoted to potatoes, sweet potatoes, and onions, 6,165 acres were used in the growing of miscellaneous vegetables. Of this area, 4,806 acres were included in family gardens or on farms, the vegetable products of which were not reported in detail. Of the remaining 1,359 acres, 366 were devoted to cabbages; 192, to watermelons; 149, to muskmelons; 136, to carrots; 131, to sweet corn; 111, to turnips; 97, to beets; 61, to tomatoes; and 116, to other vegetables.

SMALL FRUITS.

The total area used in growing small fruits was 957 acres, and the value of the fruit produced was \$95,115, an

average for the state of about \$99 per acre. Latah county reported 217 acres, or over one-fifth of the total area, but the largest receipts were reported by Canyon county, where they amounted to \$18,275, or \$123 per acre.

The acreage and production of the various berries were as follows: Blackberries and dewberries, 87 acres and 117,140 quarts; currants, 181 acres and 218,580 quarts; gooseberries, 150 acres and 197,540 quarts; raspberries and Logan berries, 230 acres and 257,960 quarts; strawberries, 239 acres and 379,630 quarts; and other small fruits, 70 acres and 75,260 quarts.

FLORICULTURE.

The 5 commercial florists reporting, derived \$2,330 from the sale of flowers and plants, and obtained other products valued at \$855. The capital invested was \$19,400 in land, buildings, and improvements, and \$495 in implements and live stock. Labor cost \$300, and fertilizers, \$45. The land under glass in the state was 12,620 square feet, of which the florists reported 9,848 square feet.

NURSERIES.

The 6 commercial nurserymen operated 710 acres of land in 1899, deriving \$27,868 from the sale of nursery stock, and obtaining other products valued at \$9,910, a total of \$37,778, or \$52.50 per acre. The capital invested was \$67,025 in land, buildings, and improvements, \$2,682 in implements, and \$2,610 in live stock. Their total expenditure for labor was \$6,450.

LABOR AND FERTILIZERS.

The total expenditure for labor in 1899, including the value of board furnished, was \$2,250,450, an average of \$129 per farm. The average was highest for the most intensively cultivated farms, being \$1,075 for nurseries, \$242 for live-stock farms, \$188 for fruit farms, \$123 for hay and grain farms, \$60 for florists' establishments, \$38 for vegetable farms, \$36 for dairy farms, and \$34 for miscellaneous farms. "Managers" expended on an average \$138; "cash tenants," \$127; "share tenants," \$104; and "owners," \$94. White farmers expended \$131 per farm, and colored farmers, \$69.

Fertilizers purchased in 1899 cost \$17,150, an average of less than one dollar per farm, but a sevenfold increase since 1890. The average expenditure was \$9 for florists' establishments, \$3 for vegetable farms, \$2 for fruit farms, and \$1 each for dairy, live-stock, and hay and grain farms.

INDIAN RESERVATIONS.

The Indian tribes of Idaho are the Shoshone, Bannock, and Sheepeater at Fort Hall and Lemhi reservations, the Nez Perce on the Nez Perce reservation, and the Cœur d'Alene and Spokane on the Cœur d'Alene reservation. Like most tribes of the Northwest they had no knowledge of agriculture previous to the coming of the white settlers, but lived on roots, seeds, berries, fish, and game.

All are now located on arable lands and are receiving instruction from the Government in agriculture and in

stock raising. The Cœur d'Alene and Nez Perce have made good progress and are practically self-supporting. By ceding part of their lands to the Government they obtained money to provide themselves with necessary implements and equipment. The other tribes, Shoshone, Bannock, and Sheepeaters, are dependent upon Government rations for 30 per cent of their subsistence and still do some fishing and hunting, although the more progressive among them are settling down and making commendable advancement

in agriculture. Approximately 30 per cent of Idaho Indians wear citizens' dress, and 31 per cent know enough English for ordinary conversation.

COEUR D'ALENE RESERVATION.

Coeur d'Alene reservation is located in Kootenai county, in the extreme northwestern part of Idaho. At the present time the reservation embraces an area of 404,480 acres, 240,000 acres having been ceded to the Government in 1891. About one-half of the total area is well watered and timbered and, having a rich soil, produces abundantly without the aid of irrigation.

The reservation is occupied by the Coeur d'Alene tribe, together with 99 Indians of the Upper and Middle Spokane, comprising a total population of 752. Agriculture is their principal occupation, and they are industrious and self-supporting, the money received from the sale of lands having been judiciously expended in most instances. With but few exceptions, their farms are under good fence and are well supplied with buildings and implements; their houses are frame structures, painted and fairly well furnished; their farm equipments include all necessary implements from plows to threshing machines; and they own spring wagons and good buggies and have money on deposit in several banks. All wear citizens' clothing, and approximately 20 per cent know enough English for ordinary conversation.

The total area cultivated by these few Indians is larger than that of any other tribe, with the exception of the Five Civilized tribes, and many of the Indian farms at Coeur d'Alene compare favorably with those of neighboring white men in the number of acres under cultivation. Of the 111 Indian farmers, 9 cultivated 500 acres each or over, 21 cultivated 300 acres or over, and 39 cultivated 200 acres or over. The others cultivated from 16 to 200 acres each. The land is not allotted; but possession is treated as ownership.

The acreage sown to crops in 1899 was the largest ever cultivated. The principal crops were wheat, oats, and hay, the latter consisting of both wild and tame grasses in addition to grains cut green. Over one-half of the farmers had small gardens in which vegetables of the hardier varieties were raised. A few grew small fruits and 24 reported orchard trees.

They own cattle and a good grade of American horses, purchased with their own money. In the census year a number of farmers reported small sales of live stock, while 23 reported milk, and 9, butter, with a total of 1,455 pounds.

FORT HALL RESERVATION.

Fort Hall reservation is situated in the southeastern part of Idaho, in Bannock and Bingham counties, and contains 1,350 square miles. About one-fifth of the total area is arable, three-fifths consists of hay and grazing land, and the remainder is mountain and timber land. This reserve is located in the so-called arid region of the state, where irrigation is a necessity. The bottom land of the Snake

River, which forms part of the western boundary and furnishes the water for the irrigation of the reservation and surrounding country, is chiefly valuable for its large crops of wild hay. Valley and table lands are fertile and produce abundantly when irrigated.

The tribes at Fort Hall are the Bannock and Shoshone, of Shoshonean stock, numbering in all 1,387, of whom about one-fourth are Bannock. The marks of tribal distinction, however, are fast being obliterated through intermarriage.

Previous to the coming of the white settlers these tribes lived on roots, seeds, berries, fish, and game. At present there are 159 Indian farmers, many of whom are entirely self-supporting. Approximately one-third wear citizens' clothing and about one-fourth know enough English for ordinary conversation.

The number of acres cultivated by individual Indians ranges from 5 to 100, the average being 20 to 40. The principal crops are wheat, oats, alfalfa, and wild hay. Corn can not be depended upon to mature, owing to the shortness of the season. Nearly all of the more progressive Indians have gardens and raise, for home consumption, potatoes, carrots, onions, and other vegetables of the hardier varieties. Farm products find a ready market among the neighboring cattlemen and miners.

A system of irrigation for this reservation is now in course of construction, which, when completed, will enable the Government to place every family upon irrigated land.

The stock of the reservation is well cared for by the Indians and is of a good grade, but Government supervision is necessary to prevent continual inbreeding and deterioration. During the census year the Indians sold 150,000 pounds of dressed beef to the Government. Little attention is given to dairy cows, and the few Indians who own them milk them irregularly and consume the small quantity of milk produced. Large herds of Indian ponies are still kept on this reservation and are a great detriment to the range and of little value to their owners. The Indians are beginning to recognize the greater value of their cattle, and large numbers of ponies are being sold off every year.

LEMHI RESERVATION.

Lemhi reservation, comprising an area of 100 square miles, is situated near the eastern boundary of Idaho, in Lemhi county. The surface for the most part is hilly and mountainous, less than 5,000 acres being suitable for agriculture.

The tribes at Lemhi are the Bannock, Shoshone, and Sheepeater, all of Shoshonean stock, numbering in all 486. Through long-continued intermarriage, these three bands have become practically a single tribe, and it is hard to distinguish the predominant blood.

As a tribe they are honest and peaceable, but far from being civilized. Many still live in the "tepee" a large portion of the year, and continue to lead a lazy, indifferent life, subsisting on Government rations supplemented by fish and game. The farming class, however, is making steady

improvement under the direction of two Government farmers. Their farms are gradually being enlarged, and new log houses and better fences are being constructed.

The system of irrigation on the reservation is gradually being extended and the part now in course of construction, when completed, will furnish farms for at least 30 families. At present 65 families are located on cultivable land, but owing to the shortness of the season, agriculture alone can not be depended upon for support, and stock raising, to which the reservation is better adapted, will have to be added.

The area cultivated by individual Indians ranges from 5 to 60 acres each, the principal crops being wheat, oats, clover, and timothy. Of the 68 Indians reporting, 47 had gardens, ranging in size from one-fourth of an acre to 4 acres, in which beets, carrots, cabbages, onions, and turnips were raised.

Their live stock consists entirely of Indian ponies, which are practically worthless. They are allowed to range all winter without feed and spring finds them too thin and weak to be of service when most needed.

NEZ PERCE RESERVATION.

The Nez Perce reservation, so called, is situated in the northwestern part of Idaho, in Nez Perce county, with a strip extending into Idaho and Shoshone counties. The original reservation comprised 746,651 acres; but in 1895, 542,000 acres were ceded to the Government and most of the remainder was allotted to the Indians. The allotted land is well adapted to both agriculture and graz-

ing. The soil is of good quality and yields abundantly, without irrigation, all cereals, fruits, and vegetables grown in the Northwest. A fine belt of pine, spruce, and fir timber, 30,000 acres of which have been reserved for the use of the Indians, crosses the reservation.

The Nez Perce (Pierced Noses), of Shahaptian stock, is the only tribe on this reservation, the total population of which is 1,616.

As a tribe they are an earnest, energetic, and progressive people, and are gradually dropping tribal customs for those of civilization. Although they knew nothing of agriculture when first met by the white man, they are now capable of supporting themselves by farming and stock raising. At present, however, 68 per cent of their subsistence is furnished by cash annuities.

The majority of Indian farmers cultivated from 10 to 30 acres of land in 1899, wheat, oats, barley, and hay being their principal crops. The dry, hot winds, prevalent in some sections, seriously injured the growing crops, and large tracts of wheat and barley were cut green for hay. A number of farmers reported orchards of apple, peach, pear, plum, and cherry trees. Gardens were found here and there, a few of which contained small fruits.

Most farms are supplied with range stock, and on some large herds are found. But few farmers, however, reported sales of live stock. Many dairy cows are found among the Nez Perce, 94 out of 213 farmers reporting the production of milk; but small quantities were produced, however, and no butter was made. Indian ponies are still kept in large numbers.

IRRIGATION STATISTICS.

The surface of Idaho comprises 84,290 square miles, or 53,945,600 acres, being slightly larger than the state of Kansas, and one-third larger than the whole of New England. The population in 1900 was 161,772, or about two inhabitants per square mile, as against 20 to 30 per square mile in the Eastern states. The greater part of Idaho lies well within the arid region, but a narrow prolongation in the northern part of the state adjacent to Canada extends into a comparatively humid region. This northern section, known as the Pan Handle, is a region of high altitudes, with considerable areas of plateau and tablelands having an annual rainfall of 20 inches or more. The mountains are rich in minerals. On the tablelands and benches the soil is remarkably fertile and well adapted to the cultivation of hardy cereals and fruits.

The nonirrigated counties of Idaho, including Latah, Nez Perce, Idaho, Shoshone, and Kootenai, reported 52.8 per cent of the cereal acreage of the state in 1899, and 56.9 per cent of the total production. These counties contained 88.3 per cent of the acreage in barley, 53.3 per cent of that in wheat, 40.9 per cent of that in corn, 36.6 per cent of that in oats, and 12.4 per cent of that in rye. They produced 85.8 per cent of the total barley crop, 59.0 per cent of the wheat, 40.7 per cent of the corn, 38.2 per cent of the oats, and 20.4 per cent of the rye.

The southern end of the state includes the greater part of the valley of the Snake River and its upper tributaries, and a small area drained by the Bear River.

The Snake River Valley may be described as a broad, lava-covered plain, dry, dusty, and with a dense growth of sage brush and similar woody shrubs. The surface of the lava-flow in most places is covered to a considerable depth by an alluvial deposit of silt and gravel brought down from the neighboring mountains. This, in turn, is overlaid by a soil of volcanic origin, which, when irrigated, possesses wonderful fertility. In the great central portion are vast fields of lava, some portions of which are covered by a thin sandy soil, which like most of the soil of the arid regions, is highly productive when watered. This central region is used chiefly as a winter range for sheep and cattle.

The Snake River has its source in the Yellowstone National Park, and flows in a southwesterly direction into Idaho, through a canyon which it has cut in the Snake River Mountains. Near the state line it receives a large number of mountain streams, which drain the Caribou and Snake river ranges, while in the southern part of Fremont county, its flow is augmented by that of Henry's Fork, the most important upper tributary which irrigates a large area in Fremont county. From the point of its

junction with Henry's Fork, the Snake River flows in a general southwesterly and westerly direction. In Fremont and Bingham counties, the land on both sides of the river is well watered by many large and costly canals. For a distance of 40 miles from American Falls, the river flows through broken bench lands and lava ridges in a channel varying in depth from 50 to 150 feet, until it reaches Minidoka Ferry, where it flows out upon a broad stretch of land comprising 80,000 acres on the northern side, and about 20,000 acres on the southern. All of this land could be reclaimed by the construction of a dam across the river, which would supply canals on both sides.

Twenty-eight miles below Minidoka Ferry the lava ridges and benches close in, and for 10 miles the river flows through a deep canyon. No very large area of irrigable land is found until the river reaches the vicinity of Cedars, about one-half mile from the western end of the canyon. Westward from Cedars, Snake River falls 1,600 feet in a distance of 80 miles, flowing from 400 to 1,000 feet below the surface of the surrounding country. At this point its summer flow averages about 3,000 second-feet, ranging from a low-water flow of a little less than 1,000 second-feet to a flow in ordinary floods of 20,000 second-feet. This volume of water, tumbling over cliffs, such as those at Twin Falls, 180 feet in height, and those at Shoshone Falls, 210 feet in height, and shooting down long rapids, not only adds to the picturesqueness of the country, but suggests possibilities of the development of enormous waterpower. Part of this power has been utilized at American Falls, near Pocatello, and at Swan's Ferry, south of Boise. The development of this power to its full capacity will render possible the pumping of water to elevations which can not be covered by existing canals, and the creation of many industries. Midway in this canyon a number of perennial springs pour forth a large supply of water, little of which can now be utilized, as the springs are below the level of the land which could be benefited.

From the junction of the Snake River with Henry's Fork, in Fremont county, to its confluence with the Malade River, in Lincoln county, there is no surface drainage from the northern and western portions of the Snake River Valley. The many streams which flow into it sink into the lava ridges on its northern and western boundaries, and reappear as springs along the Snake River. For a distance of 170 miles beyond the point of junction with the Malade, Snake River flows so far below the great plains and plateaus on either side that its waters can never be utilized for irrigation except in a few small valleys in the curves and bends of the stream.

Crossing the southern part of Idaho, the river swings toward the north, the canyon walls giving place to broad valleys at the Oregon state line, where it is joined by the Boise, Payette, and Weiser rivers on the east, and the Owyhee and Malheur rivers on the west. Leaving this open land the river continues northward through deep canyons, cutting off the Blue Mountains of Oregon from the characteristically named Seven Devils range of Idaho. From the mouth of the Salmon River, the Snake flows in

a deep canyon cut through the fertile, rolling, bench lands of Nez Perce county. In the broad bends of the river are small tracts of land, which by reason of favorable soil and perfect shelter, are admirably adapted to fruit raising. At Lewiston the Snake River is joined by the Clearwater River, on the lower bench lands of which irrigation is practiced to some extent in the cultivation of fruit. From this point the Snake River turns westward and flows into the state of Washington, having formed the western boundary of Idaho for over 300 miles.

For the purpose of discussing irrigation in Idaho, the state has been divided into two agricultural regions—arid and humid—the dividing line being at the southern and eastern boundaries of Idaho county. This division is somewhat arbitrary, as in the northern parts of Boise and Washington counties crops are successfully grown without irrigation, while in the northern division irrigation is carried on to some extent in Salmon and Clearwater valleys. The humid portions of the state contain vast areas of forest, and the rainfall is usually sufficient for the raising of general farm crops and fruits. The great Camas prairie of Idaho county, the high plateaus of Nez Perce, and the rolling hills of Latah, produce over one-half of the cereals raised in the state, and yield better crops of rye, barley, oats, and potatoes, than are grown in the southern irrigated counties.

The following table shows the comparative percentages of increase since 1890, in the number of farms and total acreage, and in the value of land and buildings and of products, in the arid and humid divisions of the state.

TABLE A.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF LAND AND BUILDINGS AND OF PRODUCTS, BY SPECIFIED DIVISIONS: 1890 AND 1900.

PART 1.—NUMBER OF FARMS AND ACREAGE.

| DIVISIONS. | NUMBER OF FARMS. | | | NUMBER OF ACRES. | | |
|-----------------------------|------------------|-------|-----------------------|------------------|-----------|-----------------------|
| | 1900. | 1890. | Per cent of increase. | 1900. | 1890. | Per cent of increase. |
| The State.. | 17,471 | 6,603 | 164.6 | 3,204,903 | 1,302,256 | 146.1 |
| Arid region ---- | 10,734 | 4,783 | 124.4 | 1,900,488 | 896,613 | 112.0 |
| Humid region ¹ . | 6,737 | 1,820 | 270.2 | 1,304,415 | 405,643 | 221.6 |

PART 2.—VALUE OF LAND AND BUILDINGS, AND OF PRODUCTS.

| DIVISIONS. | VALUE OF LAND AND BUILDINGS. | | | VALUE OF PRODUCTS. | | |
|-----------------------------|------------------------------|--------------|-----------------------|--------------------|-------------|-----------------------|
| | 1900. | 1890. | Per cent of increase. | 1900. | 1890. | Per cent of increase. |
| The State.. | \$42,818,183 | \$17,481,580 | 142.8 | \$18,908,788 | \$3,848,930 | 367.8 |
| Arid region ---- | 27,068,923 | 11,278,040 | 140.0 | 13,160,435 | 2,774,940 | 374.2 |
| Humid region ¹ . | 15,749,260 | 6,203,540 | 147.8 | 5,748,353 | 1,073,990 | 351.0 |

¹ The humid region consists of Idaho, Latah, Nez Perce, Kootenai, and Shoshone counties, and Coeur d'Alene Indian reservation.

The more rapid development shown for each item except "value of products," in the humid region, is explained by the fact that the methods of agriculture practiced there

were the same as in other humid parts of the country; while in the arid region, most of the settlers were forced to adapt themselves to conditions of climate and soil and methods of agriculture entirely different from any they had previously known. It was natural, therefore, that the first immigrants should find greater attractions in the sections where crops are dependent upon rainfall than in those where irrigation is necessary. It is probable that in the next decade a greater percentage of increase will be shown in the southern part of the state, as the cultivable areas there are large in comparison with those in the north.

Of the 53,945,600 acres of land surface in Idaho, 3,204,903 acres, or 5.9 per cent, were included in farms in 1900, and only 1,413,118 acres, or 2.6 per cent, were improved. Of the improved land, 1,385,596 acres are located outside of the Indian reservations. The irrigated land has an area of 602,568 acres, constituting 42.6 per cent of the total improved land.

Within the ten years from 1890 to 1900, the investments in irrigation canals and ditches increased from \$1,029,000

to \$4,168,252, or 305.0 per cent. There were 36 canals, involving a constructive expense of \$947,975, which distributed no water in 1899. Three canals, which had involved an outlay of \$480,000, were failures by reason of mismanagement. The area under the ditches not operated, which ultimately will be reclaimed, exceeds 130,000 acres. In 1890 the acres irrigated, outside of the reservations, numbered 217,005; in 1900 they numbered 602,568. In other words, by the opening of new ditches and canals between 1890 and 1900, by the enlargement of canals previously constructed, and as the result of better methods of water distribution, 385,935 acres were added to the productive area of the state. Most of this land was public domain in 1890, and comparatively valueless. At a low estimate its present value is \$12,060,406, an average of \$31.25 per acre. Thus, irrigation has in ten years increased the improved area by 37.6 per cent, and has added approximately \$12,000,000 to the farm wealth of the state. The relation of irrigation to the various agricultural operations is shown in Table B.

TABLE B.—ACREAGE AND PRODUCTION OF ALL CROPS, AND OF IRRIGATED CROPS: 1899.

| CROPS. | ACREAGE. | | | PRODUCTION. | | | |
|------------------|----------|------------|---------------------|------------------|-----------|------------|---------------------|
| | Total. | Irrigated. | Per cent irrigated. | Unit of measure. | Total. | Irrigated. | Per cent irrigated. |
| The State | 953,545 | 508,183 | 53.3 | | | | |
| Barley | 32,798 | 4,746 | 14.5 | Bushels | 969,214 | 124,307 | 12.8 |
| Corn | 4,582 | 2,585 | 56.4 | Bushels | 111,528 | 64,618 | 57.9 |
| Oats | 64,739 | 38,818 | 60.0 | Bushels | 1,955,498 | 1,171,802 | 59.9 |
| Rye | 1,304 | 997 | 76.5 | Bushels | 16,580 | 11,760 | 70.9 |
| Wheat | 266,305 | 82,708 | 31.1 | Bushels | 5,340,180 | 1,799,028 | 33.7 |
| Potatoes | 9,313 | 6,087 | 65.4 | Bushels | 1,035,290 | 661,965 | 63.9 |
| Onions | 167 | 81 | 48.5 | Bushels | 24,865 | 14,103 | 56.7 |
| Alfalfa | 160,029 | 153,385 | 95.8 | Tons | 425,706 | 416,977 | 97.9 |
| Grains cut green | 91,654 | 12,911 | 14.1 | Tons | 125,043 | 18,142 | 14.6 |
| Other hay | 261,973 | 182,806 | 69.8 | Tons | 343,376 | 261,940 | 76.2 |
| Vegetables | 16,798 | 3,343 | 49.2 | | | | |
| Small fruits | 957 | 656 | 71.7 | | | | |
| Grapes | 127 | 93 | 73.2 | Centals | 2,772 | 2,233 | 80.6 |
| Orchard fruits | 235,284 | 218,705 | 93.0 | Bushels | 452,000 | 357,458 | 79.1 |
| Flaxseed | 17,239 | 16 | 0.1 | Bushels | 134,189 | 330 | 0.1 |
| Other crops | 276 | 216 | 78.3 | | | | |

¹ Except potatoes and onions.

² Estimated from number of vines or trees.

³ Raised in northern counties.

The total number of acres of irrigated crops as given above is 508,183, while the total number of acres of land irrigated is 608,718. The difference of 100,535 acres represents approximately the acreage of pasture land irrigated and the area of land summer fallowed. It is probable that a portion of the area upon which crops were

reported as grown without irrigation, was really irrigated at some time during the year.

Table C is a comparative exhibit, by counties, of the number of irrigators and the acreages irrigated in 1899 and 1889.

TABLE C.—NUMBER OF IRRIGATORS, AND ACRES IRRIGATED, WITH PERCENTAGES OF INCREASE, BY COUNTIES: 1889 AND 1899.

| COUNTIES. | NUMBER OF IRRIGATORS. | | | ACRES IRRIGATED. | | |
|------------------------------|-----------------------|-------|--------------------|------------------|---------|--------------------|
| | 1899. | 1889. | Per cent increase. | 1899. | 1889. | Per cent increase. |
| The State ¹ | 8,987 | 4,323 | 107.9 | 602,568 | 217,005 | 177.7 |
| Ada ² | 694 | 547 | 181.4 | 48,038 | 88,919 | 148.1 |
| Canyon ³ | 845 | | | 48,514 | | |
| Bannock ⁴ | 556 | | 223.8 | 44,220 | 40,912 | 375.1 |
| Bingham ⁵ | 1,039 | 837 | | 71,129 | | |
| Fremont ⁶ | 1,827 | | 23,726 | 132,745 | 9,984 | 120.0 |
| Lemhi ⁷ | 242 | 140 | | 37,669 | 19,809 |  | 110.2 |
| Bear Lake..... | 686 | 387 | 77.3 | 43,650 | 19,844 | 128.9 |
| Blaine ⁸ | 439 | | 45.5 | 32,188 | 20,121 | 90.2 |
| Lincoln ⁹ | 172 | 420 | | 10,104 | | |
| Boise..... | 809 | 164 | 88.4 | 17,918 | 7,829 | 113.7 |
| Cassia..... | 448 | 402 | 11.4 | 37,669 | 19,809 | 183.6 |
| Custer..... | 200 | 171 | 17.0 | 18,312 | 8,570 | 128.5 |
| Elmore..... | 138 | 87 | 58.8 | 9,747 | 8,487 | 128.5 |
| Idaho..... | 87 | 36 | 141.7 | 1,065 | 463 | 2,133.8 |
| Kootenai..... | 15 | 2 | 650.0 | 192 | 9 | 128.2 |
| Nez Perce..... | 33 | 22 | 50.0 | 1,100 | 482 | 101.3 |
| Oneyda..... | 914 | 630 | 45.1 | 43,135 | 21,423 | 52.6 |
| Owyhee..... | 238 | 155 | 53.5 | 16,569 | 9,075 | |
| Shoshone..... | 17 | | | 70 | | |
| Washington..... | 558 | 323 | 82.0 | 32,477 | 16,133 | |

¹ Exclusive of Indian reservations.

² Part taken to form Canyon in 1892.

³ Organized from part of Ada in 1892.

⁴ Organized from part of Bingham in 1893.

⁵ Parts taken to form Bannock and part of Fremont in 1893.

⁶ Organized from parts of Bingham and Lemhi in 1893.

⁷ Part taken to form part of Fremont in 1893.

⁸ Organized from Alturas and part of Logan in 1895.

⁹ Organized from part of Logan in 1895.

Table D is an exhibit, by counties, of the number of irrigated farms compared with total number of farms, and of irrigated acreage compared with total improved acreage.

TABLE D.—NUMBER OF IRRIGATED FARMS COMPARED WITH TOTAL NUMBER OF FARMS, AND IRRIGATED ACREAGE COMPARED WITH TOTAL IMPROVED ACREAGE, JUNE 1, 1900.

| COUNTIES. | NUMBER OF FARMS. | | | NUMBER OF IMPROVED ACRES IN FARMS. | | |
|----------------------------------|------------------|------------|---------------------|------------------------------------|------------|---------------------|
| | Total. | Irrigated. | Per cent irrigated. | Total. | Irrigated. | Per cent irrigated. |
| The State..... | 17,471 | 9,188 | 52.6 | 1,418,118 | 608,718 | 48.1 |
| Ada..... | 769 | 694 | 90.2 | 56,317 | 48,038 | 85.3 |
| Bannock..... | 865 | 656 | 64.3 | 76,088 | 44,220 | 58.2 |
| Bear Lake..... | 761 | 686 | 90.1 | 72,014 | 43,650 | 60.6 |
| Bingham..... | 1,180 | 1,039 | 89.6 | 101,311 | 71,129 | 70.2 |
| Blaine..... | 539 | 439 | 81.4 | 42,749 | 32,188 | 75.3 |
| Boise..... | 487 | 309 | 70.7 | 28,787 | 17,918 | 62.4 |
| Canyon..... | 881 | 845 | 95.9 | 66,888 | 48,514 | 85.8 |
| Cassia..... | 477 | 448 | 93.9 | 36,156 | 37,669 | 98.7 |
| Custer..... | 215 | 200 | 93.0 | 20,875 | 18,312 | 89.9 |
| Elmore..... | 152 | 138 | 90.8 | 11,367 | 9,747 | 85.7 |
| Fremont..... | 1,500 | 1,327 | 88.5 | 120,916 | 102,745 | 85.0 |
| Idaho..... | 1,302 | 87 | 6.7 | 88,906 | 1,065 | 1.3 |
| Kootenai..... | 1,105 | 15 | 1.4 | 49,757 | 192 | 0.4 |
| Latah..... | 1,821 | | | 186,485 | | |
| Lemhi..... | 255 | 242 | 94.9 | 24,895 | 23,726 | 95.3 |
| Lincoln..... | 191 | 172 | 90.1 | 10,928 | 10,104 | 92.5 |
| Nez Perce..... | 2,144 | 33 | 1.5 | 200,455 | 1,100 | 0.5 |
| Oneyda..... | 1,270 | 914 | 72.0 | 119,484 | 43,135 | 36.1 |
| Owyhee..... | 274 | 288 | 86.9 | 18,278 | 16,569 | 80.6 |
| Shoshone..... | 249 | 17 | 6.8 | 7,133 | 70 | 1.0 |
| Washington..... | 757 | 558 | 77.7 | 59,410 | 32,477 | 54.6 |
| Coeur d'Alene ¹ | 116 | | | 20,883 | | |
| Fort Hall..... | 168 | 146 | 89.6 | 5,785 | 5,359 | 92.6 |
| Lemhi ¹ | 58 | 55 | 83.3 | 849 | 791 | 92.6 |

¹ Indian reservation.

Of the total number of farms, 52.6 per cent is irrigated, while of the acreage of improved land, 48.1 per cent is irrigated. The average number of acres of improved land in each irrigated farm is 86, of which 66 are irrigated. Sixteen farms are supplied wholly or in part by water pumped from wells, 244 acres being irrigated in this way.

Table E presents certain statistics pertaining to canals and ditches, and a comparison of areas irrigated with areas under ditch, by counties.

TABLE E.—NUMBER, LENGTH, AND COST OF CONSTRUCTION OF MAIN CANALS AND DITCHES, WITH ACREAGE UNDER DITCH, AND ACREAGE IRRIGATED, IN 1899.

| COUNTIES. | MAIN CANALS AND DITCHES. | | | NUMBER OF ACRES. | | Average area irrigated per mile of ditch, in acres. |
|------------------------------|--------------------------|------------------|-----------------------|------------------|-------------------------|---|
| | Number. | Length in miles. | Cost of construction. | Under ditch. | Irrigated from streams. | |
| The State ¹ | 1,834 | 4,977 | \$5,116,227 | 1,313,500 | 602,321 | 121 |
| Ada..... | 40 | 301 | 1,073,165 | 250,000 | 47,990 | 159 |
| Bannock..... | 129 | 405 | 191,680 | 70,000 | 44,220 | 109 |
| Bear Lake..... | 75 | 209 | 105,025 | 42,000 | 43,650 | 269 |
| Bingham..... | 68 | 466 | 940,820 | 225,000 | 71,129 | 163 |
| Blaine..... | 191 | 424 | 118,775 | 53,000 | 32,188 | 76 |
| Boise..... | 102 | 201 | 85,190 | 25,000 | 17,918 | 89 |
| Canyon..... | 36 | 267 | 745,845 | 133,000 | 48,514 | 132 |
| Cassia..... | 134 | 346 | 79,370 | 42,000 | 37,622 | 109 |
| Custer..... | 108 | 252 | 56,895 | 27,000 | 18,312 | 73 |
| Elmore..... | 78 | 129 | 189,445 | 20,000 | 9,747 | 76 |
| Fremont..... | 152 | 537 | 530,132 | 260,000 | 102,745 | 131 |
| Idaho..... | 84 | 90 | 20,800 | 2,000 | 1,065 | 12 |
| Kootenai..... | 12 | 10 | 2,185 | 400 | 192 | 19 |
| Lemhi..... | 151 | 278 | 111,165 | 28,000 | 23,726 | 87 |
| Lincoln..... | 96 | 193 | 130,050 | 27,000 | 10,104 | 52 |
| Nez Perce..... | 8 | 15 | 98,035 | 13,000 | 1,030 | 69 |
| Oneyda..... | 80 | 288 | 219,744 | 55,000 | 43,135 | 160 |
| Owyhee..... | 134 | 269 | 297,135 | 28,000 | 16,490 | 61 |
| Shoshone..... | 17 | 5 | 1,000 | 100 | 70 | 14 |
| Washington..... | 144 | 297 | 123,821 | 48,000 | 32,477 | 139 |

¹ Exclusive of Indian reservations.

No reports were secured concerning the cost of irrigation ditches in the Indian reservations, and the statistics presented in Table E relate only to the canals and ditches in counties outside these reservations. The number of acres of irrigated land for each mile of ditch is 121, while the number of acres under ditch for each mile is 271. The present number of ditches, if furnished with sufficient water and properly managed, would, therefore, more than double the cultivable area. The average cost of constructing the ditches was about \$1,028 per mile, \$3.79 per acre of land under ditch, and \$8.46 per acre of land actually irrigated in the year 1899. An explanation of the high average per acre for all land irrigated is to be found in the fact that some of the ditches included in the tabulation were not completed early enough in 1899 to aid in maturing crops for that year; while from others, because of mismanagement, no adequate returns have been received for the large sums expended in their construction. The average cost of construction, per acre irrigated, of wisely planned and economically constructed ditches, does not vary much from the average cost of water right. The term "water right," as used in Table F, means the first cost, per acre, to the irrigator, of putting water on the land, exclusive of the cost of maintenance of the ditch, or

of annual water rental. The average cost of water right, per acre, for Idaho was \$6.91.

The following table gives the average cost of water right and annual maintenance, and the average value of farms, per acre, by counties:

TABLE F.—AVERAGE VALUE PER ACRE OF IRRIGATED AND UNIRRIGATED FARMS AND FARM LAND, JUNE 1, 1900, AND AVERAGE COST PER ACRE OF WATER RIGHT AND OF ANNUAL MAINTENANCE IN 1899.

| COUNTIES. | AVERAGE VALUE PER ACRE. | | | | | AVERAGE COST PER ACRE. | |
|------------------------------|--------------------------------|------------|--------------|-------------------|--------------|------------------------|---------------------|
| | Farms, exclusive of buildings. | | | Land under ditch. | | Water right. | Annual maintenance. |
| | All. | Irrigated. | Unirrigated. | Irrigated. | Unirrigated. | | |
| The State ¹ | \$11.15 | \$12.94 | \$9.11 | \$31.25 | \$9.51 | \$6.91 | \$0.24 |
| Ada..... | 31.33 | 32.55 | 6.09 | 50.50 | 12.08 | 15.70 | 0.79 |
| Bannock..... | 7.55 | 9.00 | 4.07 | 21.82 | 8.03 | 4.08 | 0.11 |
| Bear Lake..... | 10.49 | 9.87 | 4.00 | 25.25 | 7.57 | 2.46 | 0.21 |
| Bingham..... | 12.11 | 12.87 | 2.99 | 21.74 | 6.17 | 11.38 | 0.36 |
| Blaine..... | 7.51 | 8.06 | 2.51 | 19.85 | 4.90 | 3.50 | 0.14 |
| Boise..... | 6.79 | 7.95 | 3.00 | 20.77 | 5.93 | 3.62 | 0.20 |
| Canyon..... | 20.57 | 20.92 | 4.02 | 65.86 | 16.55 | 14.88 | 0.20 |
| Cassia..... | 10.73 | 10.83 | 2.04 | 31.00 | 3.50 | 2.08 | 0.15 |
| Custer..... | 6.34 | 7.55 | 1.46 | 15.93 | 4.00 | 5.10 | 0.13 |
| Elmore..... | 10.07 | 10.23 | 1.49 | 30.00 | 10.00 | 4.00 | 0.19 |
| Fremont..... | 11.65 | 12.67 | 2.42 | 20.00 | 8.00 | 4.95 | 0.14 |
| Idaho..... | 9.35 | 12.00 | 9.03 | 54.00 | 22.50 | 20.00 | 1.25 |
| Kootenai..... | 4.26 | 7.13 | 6.25 | 43.50 | 20.00 | 10.00 | 0.60 |
| Latah..... | 13.12 | | 13.12 | | | | |
| Lemhi..... | 10.74 | 11.01 | 2.08 | 26.00 | 6.00 | 4.63 | 0.25 |
| Lincoln..... | 12.02 | 12.51 | 1.11 | 39.75 | 9.25 | 8.00 | 0.26 |
| Nez Perce..... | 10.23 | 24.93 | 10.00 | 200.00 | 25.00 | 31.00 | 1.50 |
| Oneida..... | 11.02 | 12.16 | 7.30 | 34.25 | 10.00 | 4.18 | 0.20 |
| Owyhee..... | 7.56 | 7.76 | 2.61 | 30.00 | 6.50 | 5.33 | 0.60 |
| Shoshone..... | 6.03 | 19.99 | 5.30 | 30.00 | 15.00 | 10.00 | 0.15 |
| Washington..... | 12.20 | 14.03 | 4.16 | 48.00 | 10.00 | 3.87 | 0.16 |

¹Exclusive of Indian reservations.

The average value per acre of land under ditch not yet prepared for irrigation, though within reach of ditches, is \$9.51, while that of irrigated land is \$31.25. The difference—\$21.74 per acre—represents the value added by irri-

gation. This difference would have been greater and the cost per irrigated acre somewhat less if all the ditches had been in operation and successfully managed.

Of the 17,471 farms in the state, including those in the Indian reservations, 9,188 are irrigated and 8,283 are unirrigated. The acres in the irrigated farms number 1,677,398 and in the unirrigated, 1,529,585. The value of all land in the irrigated farms, not including buildings, is \$21,850,135 and in the unirrigated farms, \$13,636,233. The value of all buildings on irrigated farms is \$4,338,425, and on unirrigated farms, \$2,493,390. Of the total number of farms, those irrigated constitute 52.6 per cent. Their corresponding percentage of the total acreage is 52.3 per cent; that of the value of land and improvements, exclusive of buildings, 61.6 per cent; buildings, 63.5 per cent; implements and machinery, 63.0 per cent; and products, 68.6 per cent.

The average size of all farms is 133.4 acres, and that of irrigated farms, 182.5 acres, while the average area of irrigated land in each irrigated farm is 66 acres. For farms making use of irrigation, the average value of the products of 1899 not fed to live stock was \$7.29 per acre. The average value per acre of products not fed to live stock on unirrigated farms was \$3.74, or nearly double that for similar farms in Arizona.

The average value of land, exclusive of buildings, is, for all farms, \$11.15; for unirrigated farms, \$9.11; and for irrigated farms, \$12.94. The average value of irrigated land per acre is \$31.25, while that for the best irrigated land, suitable for the growing of fruit, ranges from \$60 to \$500 per acre.

The total value of all crops produced on irrigated land in 1899 was \$5,440,962. The values of the several irrigated crops were: Hay and forage, \$3,219,156; cereals, \$1,275,858; vegetables, \$544,314; orchard fruits, \$291,007; small fruits, \$38,190; and other crops, \$72,437.

Twelfth Census of the United States.

CENSUS BULLETIN.

No. 186.

WASHINGTON, D. C.

June 12, 1902.

AGRICULTURE.

INDIAN TERRITORY.

HON. WILLIAM R. MERRIAM,

Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture in Indian Territory, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes also the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The Twelfth Census was the first to collect statistics of agriculture in Indian Territory. Owing to the floating character of the population, the peculiarities and uncertainties of land tenure, and the disposition on the part of many settlers to regard with suspicion any attempted investigation of their property holdings, the enumeration was attended with unusual difficulties. The information obtained by the enumerators was supplemented, therefore, by reports from special agents and by correspondence, and the figures published in this bulletin are believed to present a fairly complete statement of the agricultural resources of the territory.

The farms of Indian Territory, June 1, 1900, numbered 45,505, and were valued at \$46,863,440. Of this amount, \$7,675,190, or 16.4 per cent, represents the value of buildings, and \$39,188,250, or 83.6 per cent, the value of the land and improvements other than buildings. On the

same date the value of farm implements and machinery was \$3,939,480, and of live stock, \$41,378,695. These values, added to that of farms, give \$92,181,615, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on farms, are referred to in this bulletin as "animal products." The total value of such products, together with the value of all crops, is termed "total value of farm products." This value for 1899 was \$27,672,002, of which \$10,777,571, or 38.9 per cent, represents the value of animal products, and \$16,894,431, or 61.1 per cent, the value of crops, including forest products cut or produced on farms.

The "gross farm income" is obtained by deducting from the total value of farm products the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$4,434,010, leaving \$23,237,992 as the "gross farm income." The ratio which this latter amount bears to the "total value of farm property" is referred to as the "percentage of gross income upon investment." For Indian Territory, in 1899, it was 25.2 per cent.

As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

The statistics presented in this bulletin will be treated in greater detail in the report on agriculture in the United States. The present publication is designed to present a summarized advance statement for Indian Territory.

Very respectfully,

L. G. Powers.

Chief Statistician for Agriculture.

AGRICULTURE IN INDIAN TERRITORY.

GENERAL STATISTICS.

The total land area of Indian Territory is 31,000 square miles, or 19,840,000 acres, of which 7,269,081 acres, or 36.6 per cent, are included in farms.

The territory consists mainly of fertile, well-watered, rolling prairies, with much timber and many river bottoms. In the east the surface is broken by the foothills of the Ozark Mountains, from which it rises gradually to the table-lands in the northwest and to the Arbuckle Mountains in the southwest.

The wide river bottoms are subject to spring overflows, and have a deep alluvial soil. They are inclosed between hills spreading back to the uplands. In the east, where the rainfall is sufficient, the uplands are fairly productive; in the northwest, however, they are dry and sterile.

PRINCIPAL FARM STATISTICS.

Table 1 gives, for the territory and for each nation and reservation, the number and size of farms, the value of farm property and products, and the expenditure for labor.

TABLE 1.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURE IN 1899 FOR LABOR, BY NATIONS AND RESERVATIONS.

| NATIONS AND RESERVATIONS. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | Value of products not fed to live stock. | Expenditure for labor. |
|---|------------------|-----------------|-----------------|-----------|---|-------------|---------------------------|--------------|--|------------------------|
| | Total. | With buildings. | Total. | Improved. | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The Territory ----- | 45,505 | 44,857 | 7,269,081 | 3,062,193 | \$39,188,250 | \$7,675,190 | \$3,939,480 | \$41,878,695 | \$23,237,992 | \$1,315,870 |
| Cherokee ¹ ----- | 13,537 | 13,367 | 1,816,719 | 1,165,061 | 9,422,670 | 2,802,480 | 1,304,130 | 9,560,802 | 7,137,885 | 469,030 |
| Chickasaw ¹ ----- | 16,374 | 16,121 | 3,246,187 | 1,111,631 | 18,127,010 | 2,254,750 | 1,528,010 | 17,954,830 | 9,174,760 | 542,920 |
| Choctaw ¹ ----- | 9,962 | 9,850 | 693,655 | 404,159 | 4,230,510 | 1,399,800 | 633,250 | 5,011,153 | 3,552,010 | 120,740 |
| Creek ¹ ----- | 4,240 | 4,159 | 1,393,882 | 298,858 | 5,944,940 | 943,400 | 340,930 | 8,245,040 | 2,892,376 | 152,470 |
| Modoc, Shawnee, and Ottawa ² ----- | 214 | 213 | 23,232 | 16,001 | 253,850 | 49,460 | 18,150 | 78,893 | 94,683 | 1,470 |
| Quapaw and Peoria ² ----- | 367 | 354 | 51,457 | 37,119 | 691,420 | 123,020 | 59,570 | 198,121 | 220,548 | 15,550 |
| Seminole ¹ ----- | 530 | 513 | 22,512 | 16,672 | 306,570 | 56,010 | 37,160 | 247,176 | 92,353 | 1,400 |
| Seneca and Wyandotte ² ----- | 281 | 280 | 21,087 | 12,692 | 211,280 | 46,270 | 18,280 | 82,750 | 73,377 | 3,200 |

¹ Indian nation.

² Indian reservation.

The total number of farms, June 1, 1900, was 45,505, comprising 7,269,081 acres. Of this area, 3,062,193 acres, or 42.1 per cent, were improved, and 4,206,888 acres, unimproved. The average size of farms was 159.7 acres, ranging from 42.5 acres in the Seminole nation to 329.2 acres in the Creek nation.

The total value of farm property was \$92,181,615. Of this amount, \$41,878,695, or 44.9 per cent, represents the value of live stock; \$39,188,250, or 42.5 per cent, that of land and improvements other than buildings; \$7,675,190, or 8.3 per cent, that of buildings; and \$3,939,480, or 4.3 per cent, that of implements and machinery. The value of the farm products of 1899 was \$27,672,002. The average value of farms, including land, improvements, and buildings, ranged from \$565 in the Choctaw nation to \$2,219 in the Quapaw reservation, and for the territory, was \$1,030. The value of implements and machinery averaged \$87 per farm, ranging from \$64 in the Choctaw nation to \$162 in the Quapaw reservation. Live stock had an average value of \$909 per farm. For the Seminole nation and the Modoc and Seneca reservations it was less than

\$500 per farm, but in the Creek nation it was \$1,945, the highest average shown.

FARM TENURE.

In Table 2 the tenure of farms for 1900 is given by race of farmer for farms operated by "owners," "part owners," "owners and tenants," "managers," "cash tenants," and "share tenants." These groups comprise, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part but receiving for supervision or labor a share of the products; (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners; (5) farms operated by individuals who pay a cash rental or a stated amount of labor or farm produce; and (6) farms operated by individuals who pay as rental a share of the products.

TABLE 2.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

| RACE. | Total number of farms. | Owners. | Part owners. | Owners and tenants. | Managers. | Cash tenants. | Share tenants. |
|---------------|------------------------|---------|--------------|---------------------|-----------|---------------|----------------|
| The Territory | 45,505 | 10,536 | 477 | 156 | 235 | 8,883 | 25,218 |
| White | 35,451 | 3,075 | 329 | 71 | 194 | 8,542 | 23,240 |
| Negro | 4,037 | 2,187 | 51 | 28 | 14 | 289 | 1,625 |
| Indian | 5,957 | 5,274 | 94 | 57 | 27 | 52 | 453 |

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

| The Territory | 100.0 | 23.2 | 1.1 | 0.3 | 0.5 | 19.5 | 55.4 |
|---------------|-------|------|-----|-----|-----|------|------|
| White | 100.0 | 8.7 | 0.9 | 0.2 | 0.5 | 24.1 | 65.6 |
| Negro | 100.0 | 53.4 | 1.3 | 0.7 | 0.3 | 7.1 | 37.2 |
| Indian | 100.0 | 88.5 | 1.6 | 1.0 | 0.4 | 0.9 | 7.6 |

Of the total number of farms, 77.9 per cent are operated by white farmers, 13.1 per cent by Indians, and 9.0 per cent by negroes. The Indians and negroes are nearly all owners, but the white farmers are usually tenants, as the land can not generally be transferred in fee.

The land in Indian Territory is held by the several Indian nations, but the title is being gradually extinguished and transferred to citizens. To assist in accomplishing this end is the present work of the Dawes Indian Commission. Under the decisions, and by the direction of that commission, land is being allotted in severalty to the citizens of the various nations, and while the citizens may not alienate their holdings by sale, they may legally lease the lands to others for agricultural purposes. As a consequence, the allotted lands are more commonly cultivated by those to whom they have been leased than by those to whom they are allotted. These renters, who constitute the greater number of the cash and share tenants reported, are principally white men.

The individuals reported by the enumerators as owners are of three classes. They are recognized by the Dawes Commission and by the courts as citizens of the several Indian nations, and are individuals to whom land has been allotted in severalty. The three classes are as follows: (1) Individuals of unquestioned Indian blood or descent. These were reported by the enumerators as Indian farm owners providing they operated any portion of their allotted holdings. (2) Former negro slaves of Indians and the descendants of such slaves. Prior to the war the Indians of the territory owned considerable numbers of negro slaves. Upon emancipation, these slaves in most of the tribes, were adopted as citizens. They and their descendants, whether of pure negro blood or the children of intermarriages with Indians or whites, are now citizens. They have been allotted land in severalty, and when operating any part of the same were reported as owners. (3) Whites, who, at various times, by act of the legislatures of the several Indian nations, have been legally adopted as citizens, and others, who have estab-

lished their claim to recognition as citizens by fraudulent means. Both classes have been allotted land the same as Indian and negro citizens. In addition to the whites of these two classes, who were reported as owners by the enumerators, there were enumerated a few white owners to whom the Quapaw tribe transferred land in fee simple before such transfer was forbidden by act of Congress.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 3 and 4 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

| RACE OF FARMER, AND TENURE. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The Territory | 45,505 | 159.7 | 7,269,081 | 100.0 | \$92,181,615 | 100.0 |
| White farmers | 35,451 | 166.7 | 5,910,810 | 81.3 | 72,564,746 | 78.7 |
| Negro farmers | 4,037 | 88.2 | 361,457 | 5.0 | 4,391,830 | 4.8 |
| Indian farmers | 5,957 | 167.3 | 996,784 | 13.7 | 15,225,039 | 16.5 |
| Owners | 10,536 | 178.4 | 1,827,369 | 25.1 | 25,848,973 | 28.0 |
| Part owners | 477 | 1,246.9 | 594,768 | 8.2 | 6,018,588 | 6.5 |
| Owners and tenants | 156 | 182.4 | 28,458 | 0.4 | 335,985 | 0.4 |
| Managers | 235 | 4,658.1 | 1,094,661 | 15.1 | 10,420,193 | 11.3 |
| Cash tenants | 8,883 | 191.5 | 1,701,288 | 23.4 | 21,652,334 | 23.5 |
| Share tenants | 25,218 | 80.2 | 2,022,587 | 27.8 | 27,905,592 | 30.3 |

TABLE 4.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

| RACE OF FARMER, AND TENURE. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The Territory | \$861 | \$169 | \$87 | \$909 | \$511 | 25.2 |
| White farmers | 879 | 152 | 89 | 927 | 529 | 25.8 |
| Negro farmers | 550 | 111 | 51 | 360 | 309 | 28.8 |
| Indian farmers | 971 | 309 | 97 | 1,178 | 541 | 21.2 |
| Owners | 992 | 302 | 106 | 1,058 | 502 | 20.4 |
| Part owners | 4,527 | 523 | 203 | 7,360 | 2,891 | 22.9 |
| Owners and tenants | 749 | 286 | 104 | 1,014 | 741 | 31.4 |
| Managers | 17,591 | 1,221 | 278 | 25,248 | 9,613 | 21.7 |
| Cash tenants | 995 | 134 | 93 | 1,216 | 579 | 23.7 |
| Share tenants | 535 | 108 | 72 | 392 | 359 | 32.5 |

The average area of the farms of white and Indian farmers is very near the Government allowance of 160 acres, but for farms operated by negroes, it is only about one-half as great. The highest average values of farm property are found among the Indian farmers, but the per cent of gross income is lower for their farms than for any

others. Of the groups by tenure, farms operated by managers show by far the largest average area and the highest values. Of their 235 farms, 160 were live-stock farms; 37 were hay and grain farms; and 29 were cotton plantations. The live-stock farms of this group include the largest and most valuable ranges in the territory, which accounts for the very high average values shown.

FARMS CLASSIFIED BY AREA.

Tables 5 and 6 present the principal statistics for farms classified by area.

TABLE 5.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

| AREA. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|----------------------|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The Territory | 45,505 | 159.7 | 7,269,081 | 100.0 | \$92,181,615 | 100.0 |
| Under 3 acres | 312 | 1.0 | 925 | (1) | 1,248,675 | 1.4 |
| 3 to 9 acres | 1,462 | 5.9 | 8,609 | 0.1 | 596,003 | 0.6 |
| 10 to 19 acres | 4,200 | 14.4 | 60,560 | 0.8 | 1,702,937 | 1.8 |
| 20 to 49 acres | 16,631 | 31.8 | 529,611 | 7.3 | 11,124,146 | 12.1 |
| 50 to 99 acres | 9,875 | 65.9 | 650,717 | 8.9 | 11,774,795 | 12.8 |
| 100 to 174 acres | 6,404 | 133.4 | 854,559 | 11.8 | 11,170,519 | 12.1 |
| 175 to 259 acres | 2,337 | 210.9 | 492,840 | 6.8 | 6,415,215 | 7.0 |
| 260 to 499 acres | 2,275 | 344.4 | 783,495 | 10.8 | 8,872,581 | 9.6 |
| 500 to 999 acres | 1,137 | 621.4 | 706,562 | 9.7 | 7,814,150 | 7.9 |
| 1,000 acres and over | 872 | 3,648.8 | 3,181,778 | 43.8 | 31,967,705 | 34.7 |

¹ Less than one-tenth of 1 per cent.

TABLE 6.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

| AREA. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|----------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | Gross income (products of 1899 not fed to live stock). | |
| The Territory | \$861 | \$169 | \$37 | \$309 | \$511 | 25.2 |
| Under 3 acres | 49 | 133 | 36 | 8,768 | 621 | 15.6 |
| 3 to 9 acres | 67 | 110 | 30 | 201 | 117 | 28.8 |
| 10 to 19 acres | 125 | 78 | 31 | 176 | 148 | 36.6 |
| 20 to 49 acres | 266 | 89 | 43 | 266 | 233 | 34.9 |
| 50 to 99 acres | 519 | 131 | 78 | 464 | 378 | 31.7 |
| 100 to 174 acres | 830 | 191 | 109 | 624 | 516 | 23.6 |
| 175 to 259 acres | 1,223 | 278 | 171 | 1,073 | 782 | 28.5 |
| 260 to 499 acres | 1,719 | 410 | 207 | 1,564 | 815 | 20.9 |
| 500 to 999 acres | 2,390 | 545 | 256 | 2,742 | 1,324 | 20.6 |
| 1,000 acres and over | 15,704 | 1,097 | 381 | 19,478 | 7,036 | 19.2 |

The group of farms containing 1,000 acres and over comprises more than two-fifths of the total farm area, and over one-third of the total value of farm property. Nearly three-fourths of the farms of this class are live-stock farms. The comparatively large number of farms of between 20 and 49 acres each is accounted for by the fact that a large

percentage of the numerous cotton farms of the territory fall within the limits of this group.

With a few exceptions, the average values of the several forms of farm property and products increase with the size of the farm. The high average value of live stock for farms under 3 acres is due to the fact that two-thirds of them are operated by ranchmen who use large areas of the public domain, but actually own or lease less than 3 acres of land. The high average gross incomes, per farm and per acre, for this group are due to the fact that they include these ranges and, in addition, several city dairies and truck farms. The incomes from these industries are determined not so much by the acreage of land owned or rented as by the extent of the range used, the capital invested in buildings, implements, and live stock, and the amounts expended for labor and fertilizers.

The average gross incomes per acre for the various groups classified by area are as follows: Farms under 3 acres, \$595.85; 3 to 9 acres, \$19.92; 10 to 19 acres, \$10.28; 20 to 49 acres, \$7.33; 50 to 99 acres, \$5.74; 100 to 174 acres, \$3.87; 175 to 259 acres, \$3.71; 260 to 499 acres, \$2.37; 500 to 999 acres, \$2.13; 1,000 acres and over, \$1.93.

FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 7 and 8 farms are classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is classified as a "hay and grain" farm; similarly, if vegetables are the leading crop, constituting 40 per cent of the net farm products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same principle. "Miscellaneous" farms are those whose operators do not derive 40 per cent of their income from any one class of farm products. Farms which yielded no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 7.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

| PRINCIPAL SOURCE OF INCOME. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The Territory | 45,505 | 159.7 | 7,269,081 | 100.0 | \$92,181,615 | 100.0 |
| Hay and grain | 14,956 | 140.3 | 2,097,875 | 28.9 | 23,671,961 | 25.7 |
| Vegetables | 484 | 64.1 | 31,035 | 0.4 | 533,373 | 0.6 |
| Fruits | 143 | 110.4 | 15,782 | 0.2 | 224,195 | 0.2 |
| Live stock | 10,207 | 381.7 | 3,896,028 | 53.6 | 49,642,044 | 53.9 |
| Dairy produce | 338 | 104.0 | 40,338 | 0.5 | 807,268 | 0.9 |
| Tobacco | 8 | 64.5 | 516 | (1) | 16,081 | (1) |
| Cotton | 17,723 | 59.3 | 1,050,958 | 14.5 | 15,899,309 | 17.2 |
| Sugar | 32 | 126.7 | 4,054 | 0.1 | 44,663 | 0.1 |
| Nursery products | 7 | 58.0 | 406 | (1) | 11,363 | (1) |
| Miscellaneous | 1,557 | 84.8 | 132,094 | 1.8 | 1,330,692 | 1.4 |

¹ Less than one-tenth of 1 per cent.

TABLE 8.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

| PRINCIPAL SOURCE OF INCOME. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|-------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implementments and machinery. | Live stock. | | |
| The Territory | \$861 | \$169 | \$87 | \$909 | \$511 | 25.2 |
| Hay and grain | 825 | 178 | 104 | 476 | 415 | 26.2 |
| Vegetables | 599 | 166 | 72 | 266 | 412 | 37.4 |
| Fruits | 683 | 315 | 97 | 473 | 556 | 35.5 |
| Live stock | 1,730 | 277 | 116 | 2,741 | 972 | 20.0 |
| Dairy produce | 621 | 300 | 88 | 1,072 | 400 | 19.2 |
| Tobacco | 1,421 | 103 | 82 | 404 | 839 | 41.7 |
| Cotton | 444 | 100 | 59 | 294 | 354 | 39.4 |
| Sugar | 678 | 146 | 69 | 504 | 492 | 35.2 |
| Nursery products | 623 | 631 | 112 | 258 | 2,905 | 178.9 |
| Miscellaneous | 418 | 107 | 52 | 278 | 230 | 26.9 |

For the several classes of farms the average values per acre of products not fed to live stock are as follows: Farms whose operators derived their principal income from nursery products, \$50.09; tobacco, \$13.00; vegetables, \$6.43; cotton, \$5.97; fruits, \$5.04; sugar, \$3.88; dairy produce, \$3.84; hay and grain, \$2.96; miscellaneous, \$2.71; and live stock, \$2.55. In computing these averages the total area of the farms of each group is used, and not the acreage devoted to the crop from which the principal income is derived. The wide variations in the averages and percentages of gross income are due, in part, to the fact that in computing gross income no deductions are made for expenditures. For nurseries the average expenditure for labor represents a greater percentage of the gross income than in the case of "live stock" and "miscellaneous" farms. If it were possible to present the average net income, the variations shown would be much smaller.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 9 and 10 present data relating to farms classified by the reported value of products not fed to live stock.

TABLE 9.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|--|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The Territory | 45,505 | 159.7 | 7,269,081 | 100.0 | \$92,181,615 | 100.0 |
| \$0 | 808 | 586.0 | 473,527 | 6.5 | 5,912,275 | 6.4 |
| \$1 to \$49 | 2,551 | 65.8 | 167,747 | 2.3 | 1,689,880 | 1.9 |
| \$50 to \$99 | 3,382 | 60.7 | 205,337 | 2.8 | 2,496,440 | 2.7 |
| \$100 to \$249 | 11,619 | 65.1 | 756,240 | 10.4 | 9,415,350 | 10.2 |
| \$250 to \$499 | 14,005 | 82.3 | 1,152,896 | 15.9 | 15,671,940 | 17.0 |
| \$500 to \$999 | 8,963 | 148.5 | 1,331,359 | 18.3 | 18,187,700 | 19.7 |
| \$1,000 to \$2,499 | 3,391 | 323.5 | 1,096,895 | 15.1 | 14,539,680 | 15.8 |
| \$2,500 and over | 786 | 2,652.7 | 2,035,030 | 28.7 | 24,265,300 | 26.3 |

TABLE 10.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|--|---|------------|-------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implementments and machinery. | Live stock. | | |
| The Territory | \$861 | \$169 | \$87 | \$909 | \$511 | 25.2 |
| \$0 | 1,779 | 100 | 41 | 5,897 | | |
| \$1 to \$49 | 558 | 67 | 31 | 211 | 23 | 3.5 |
| \$50 to \$99 | 303 | 86 | 39 | 310 | 63 | 9.3 |
| \$100 to \$249 | 360 | 97 | 45 | 303 | 143 | 17.6 |
| \$250 to \$499 | 502 | 129 | 70 | 418 | 300 | 26.8 |
| \$500 to \$999 | 930 | 208 | 120 | 771 | 581 | 28.6 |
| \$1,000 to \$2,499 | 1,899 | 423 | 224 | 1,742 | 1,208 | 28.2 |
| \$2,500 and over | 12,615 | 1,139 | 447 | 16,775 | 9,910 | 32.1 |

For 808 farms, comprising 6.5 per cent of the total farm land, no products, except those fed to live stock, were reported for 1899. More than half of these farms, on June 1, 1900, were in charge of share tenants, many of whom did not operate the farms the preceding year, and consequently could give no information concerning

the products. The large average size and low value per acre of the land and improvements, together with the very high average value of live stock per farm, indicate that many of these farms were in reality tracts of grazing land leased for short periods of time by ranchmen, who reported to the enumerators the value of all live stock on hand, June 1, 1900, but had no knowledge of the products of the preceding year. To this extent, the figures, as presented, fall short of giving a complete statement of farm income in 1899. Other farms with no income were homesteads taken up in the spring of 1900 or too late in 1899 for cultivation that year.

LIVE STOCK.

At the request of the various live-stock associations of the country a new classification of domestic animals was adopted for the Twelfth Census. The age grouping for neat cattle was determined by their present and prospective relations to the dairy industry and to the supply of meat products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with previous census reports.

Table 11 presents a summary of live-stock statistics.

TABLE 11.—DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

| LIVE STOCK. | Age in years. | ON FARMS. | | | NOT ON FARMS. |
|-------------------------------------|---------------|-----------|-------------|----------------|---------------|
| | | Number. | Value. | Average value. | Number. |
| Calves | Under 1 | 296,035 | \$2,094,135 | \$9.87 | 6,538 |
| Steers | 1 and under 2 | 155,398 | 2,249,419 | 14.48 | 1,926 |
| Steers | 2 and under 3 | 194,281 | 4,131,108 | 21.26 | 405 |
| Steers | 3 and over | 354,520 | 9,644,850 | 27.20 | 434 |
| Bulls | 1 and over | 12,148 | 463,966 | 38.04 | 134 |
| Heifers | 1 and under 2 | 49,784 | 1,398,859 | 14.03 | 1,534 |
| Cows kept for milk | 2 and over | 110,687 | 2,653,501 | 23.97 | 8,075 |
| Cows and heifers not kept for milk. | 2 and over | 336,441 | 7,002,835 | 20.81 | 1,151 |
| Colts | Under 1 | 20,054 | 213,041 | 10.62 | 756 |
| Horses | 1 and under 2 | 19,253 | 324,049 | 16.83 | 582 |
| Horses | 2 and over | 178,302 | 5,686,628 | 31.89 | 18,797 |
| Mule colts | Under 1 | 4,289 | 92,494 | 21.57 | 96 |
| Mules | 1 and under 2 | 5,059 | 174,130 | 34.48 | 111 |
| Mules | 2 and over | 47,510 | 2,612,151 | 54.98 | 8,081 |
| Asses and burros | All ages | 1,262 | 117,940 | 93.45 | 176 |
| Lambs | Under 1 | 4,357 | 7,128 | 1.64 | 163 |
| Sheep (ewes) | 1 and over | 8,318 | 19,747 | 2.37 | 68 |
| Sheep (rams and wethers). | 1 and over | 4,380 | 11,119 | 2.57 | 117 |
| Swine | All ages | 650,255 | 1,906,200 | 2.93 | 23,954 |
| Goats | All ages | 10,529 | 21,538 | 2.05 | 420 |
| Fowls: ¹ | | | | | |
| Chickens ² | | 1,960,535 | | | |
| Turkeys | | 92,509 | 515,384 | | |
| Geese | | 77,216 | | | |
| Ducks | | 88,069 | | | |
| Bees (swarms of) | | 18,227 | 88,425 | 2.11 | |
| Value of all live stock | | | 41,378,695 | | |

¹ The number reported is of fowls over 8 months old. The value is of all, old and young.

² Including Guinea fowls.

The total value of live stock on farms and ranges, June 1, 1900, was \$41,378,695. Of this amount, 65.2 per cent represents the value of neat cattle other than dairy cows; 15.0 per cent, that of horses; 7.0 per cent, that of mules; 6.4 per cent, that of dairy cows; 4.6 per cent, that of

swine; 1.3 per cent, that of poultry; and 0.5 per cent, that of all other live stock.

No reports were secured of the value of live stock not on farms, but it is probable that such animals have higher average values than those on farms. Allowing the same averages, however, the value of live stock not on farms would be \$1,232,322. Exclusive of poultry and bees not on farms, the value of all live stock in the territory, June 1, 1900, was approximately \$42,611,000.

ANIMAL PRODUCTS.

Table 12 is a summarized statement of the animal products of 1899.

TABLE 12.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED, ON FARMS IN 1899.

| PRODUCTS. | Unit of measure. | Quantity. | Value. |
|----------------------|------------------|-------------|-------------|
| Wool | Pounds | 50,711 | \$7,499 |
| Mohair and goat hair | Pounds | 760 | 125 |
| Milk | Gallons | 126,493,856 | |
| Butter | Pounds | 5,105,715 | \$1,504,747 |
| Cheese | Pounds | 1,227 | |
| Eggs | Dozens | 6,949,640 | 625,418 |
| Poultry | | | 647,844 |
| Honey | Pounds | 156,100 | 19,091 |
| Wax | Pounds | 6,190 | |
| Animals sold | | | 6,415,707 |
| Animals slaughtered | | | 1,557,139 |
| Total value | | | 10,777,671 |

¹ Includes all milk produced, whether sold, consumed, or made into butter or cheese.

² Includes the value of milk sold or consumed, and of butter and cheese made.

The value of the animal products of the territory in 1899 was \$10,777,671, or 38.9 per cent of the value of all farm products, and 46.4 per cent of the gross farm income. Of the above amount, 74.0 per cent represents the value of animals sold and animals slaughtered on farms; 14.0 per cent, that of dairy products; 11.8 per cent, that of poultry and eggs; and 0.2 per cent, the value of wool, mohair, goat hair, honey, and wax.

ANIMALS SOLD AND ANIMALS SLAUGHTERED.

The value of animals sold and animals slaughtered on farms in 1899 was \$7,972,846, or 28.8 per cent of the value of all farm products. Sales of live animals were reported by 20,005 farmers, or 44.6 per cent of all reporting live stock, the average receipts per farm of those selling live stock being \$320.71. Of all farmers reporting live stock, 28,473, or 63.5 per cent, reported animals slaughtered, the average value per farm being \$54.69.

In obtaining these reports, the enumerators were instructed to secure from each farm operator a statement of the amount received from sales in 1899, less the amount paid for animals purchased during the same year.

DAIRY PRODUCE.

Of the \$1,504,747 given in Table 12 as the value of dairy produce, \$1,342,573, or 89.2 per cent, represents the value of such produce consumed on farms, and

\$162,174, or 10.8 per cent, the receipts from sales. Of the latter amount, \$103,077 was received from the sale of 648,091 pounds of butter; \$58,246 from 482,082 gallons of milk; \$818 from 2,515 gallons of cream; and \$38 from 331 pounds of cheese.

The production of milk in 1899 was 26,493,855 gallons; of butter, 5,105,715 pounds; and of cheese, 1,227 pounds. Sales of all dairy products are light, amounting to about ten per cent of the quantities produced. The Cherokee and Chickasaw nations, respectively, lead in both production and sales.

POULTRY AND EGGS.

More than ninety per cent of all farms reporting live stock reported domestic fowls. Of the total value of poultry products, 50.9 per cent represents the value of poultry, and 49.1 per cent, that of eggs.

HONEY AND WAX.

Less than seven per cent of the farmers of the state report apian products. More than 90 per cent of all honey and wax reported in the territory was produced in the Cherokee, Choctaw, and Chickasaw nations.

WOOL, MOHAIR, AND GOAT HAIR.

The Cherokee and Choctaw nations contained 407 of the 584 farms reporting wool, with three-fifths of the total production, and 7 of the 12 reports of goat hair were from the Cherokee nation.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 13 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 13.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

| CLASSES. | HORSES. | | | DAIRY COWS. | | |
|----------------------------------|------------------|---------|-------------------|------------------|---------|-------------------|
| | Farms reporting. | Number. | Average per farm. | Farms reporting. | Number. | Average per farm. |
| Total..... | 40,810 | 217,699 | 5.3 | 31,639 | 110,687 | 3.5 |
| White farmers..... | 81,856 | 157,844 | 4.9 | 25,900 | 88,561 | 3.4 |
| Colored farmers..... | 8,354 | 60,355 | 6.7 | 5,739 | 22,123 | 3.8 |
| Owners ¹ | 10,233 | 82,468 | 8.1 | 7,602 | 81,864 | 4.2 |
| Managers..... | 210 | 7,291 | 34.7 | 158 | 1,370 | 8.7 |
| Cash tenants..... | 8,037 | 40,126 | 5.0 | 6,880 | 26,001 | 3.9 |
| Share tenants..... | 22,330 | 87,819 | 3.9 | 17,019 | 50,352 | 2.9 |
| Under 20 acres..... | 4,791 | 17,664 | 3.7 | 2,944 | 8,466 | 2.9 |
| 20 to 99 acres..... | 23,629 | 84,590 | 3.7 | 18,110 | 56,838 | 3.1 |
| 100 to 174 acres..... | 6,035 | 34,370 | 5.7 | 4,930 | 18,106 | 3.7 |
| 175 to 259 acres..... | 2,245 | 17,909 | 7.7 | 2,010 | 8,115 | 4.0 |
| 260 acres and over..... | 4,110 | 61,766 | 15.0 | 3,665 | 19,072 | 5.2 |
| Hay and grain..... | 13,770 | 63,538 | 4.8 | 9,728 | 30,106 | 3.1 |
| Vegetables..... | 422 | 1,405 | 3.3 | 229 | 619 | 2.7 |
| Fruit..... | 126 | 781 | 6.2 | 97 | 306 | 3.2 |
| Live stock..... | 9,819 | 90,885 | 9.3 | 8,491 | 37,300 | 4.4 |
| Dairy..... | 388 | 2,181 | 5.6 | 388 | 6,237 | 16.1 |
| Cotton..... | 15,474 | 53,315 | 3.4 | 11,623 | 32,611 | 2.8 |
| Miscellaneous ² | 1,411 | 6,599 | 4.0 | 1,103 | 3,508 | 3.2 |

¹Including "part owners" and "owners and tenants."
²Including tobacco and sugar farms, and nurseries.

CROPS.

The following table gives the statistics of the principal crops in 1899.

TABLE 14.—ACREAGES, QUANTITIES, AND VALUES OF PRINCIPAL FARM CROPS IN 1899.

| CROPS. | Acres. | Unit of measure. | Quantity. | Value. |
|-------------------------------|------------------|------------------|------------|-------------|
| Corn..... | 1,181,433 | Bushels..... | 30,709,420 | \$6,999,018 |
| Wheat..... | 247,247 | Bushels..... | 2,203,780 | 1,121,259 |
| Oats..... | 169,357 | Bushels..... | 4,423,810 | 689,053 |
| Barley..... | 181 | Bushels..... | 3,610 | 1,010 |
| Rye..... | 159 | Bushels..... | 1,140 | 649 |
| Broom corn..... | 397 | Pounds..... | 147,020 | 7,018 |
| Kafir corn..... | 1,953 | Bushels..... | 26,299 | 6,579 |
| Flaxseed..... | 2,785 | Bushels..... | 15,060 | 12,060 |
| Grass seed..... | | Bushels..... | 853 | 583 |
| Hay and forage..... | 400,393 | Tons..... | 483,939 | 1,139,079 |
| Cotton seed..... | | Tons..... | 159,492 | 597,123 |
| Cotton..... | 442,065 | Bales..... | 151,850 | 4,809,929 |
| Tobacco..... | 213 | Pounds..... | 97,030 | 10,284 |
| Peanuts..... | 123 | Bushels..... | 3,148 | 2,648 |
| Dry beans..... | 165 | Bushels..... | 1,777 | 1,928 |
| Castor beans..... | 73 | Bushels..... | 224 | 207 |
| Dry peas..... | 284 | Bushels..... | 3,138 | 2,834 |
| Potatoes..... | 7,683 | Bushels..... | 632,465 | 251,237 |
| Sweet potatoes..... | 1,064 | Bushels..... | 80,364 | 41,191 |
| Onions..... | 214 | Bushels..... | 32,475 | 27,477 |
| Miscellaneous vegetables..... | 11,987 | | | 506,322 |
| Sugar cane..... | 35 | Tons..... | 229 | 338 |
| Sorghum cane..... | 6,639 | Tons..... | 14,932 | 41,068 |
| Sorghum sirup..... | | Gallons..... | 97,381 | 29,211 |
| Small fruits..... | 578 | | | 28,704 |
| Grapes..... | 146 | Centals..... | 2,330 | 46,380 |
| Orchard fruits..... | 13,755 | | | 186,598 |
| Nuts..... | | | | 382 |
| Forest products..... | | | | 203,779 |
| Flowers and plants..... | (⁰) | | | 70 |
| Seeds..... | (⁰) | | | 10 |
| Nursery products..... | 33 | | | 18,827 |
| Miscellaneous..... | 39 | | | 830 |
| Total..... | 2,455,242 | | | 16,894,481 |

¹Exclusive of 13,363 tons, valued at \$181,365, sold in seed cotton and included with the cotton.

²Sold as cane.

³Estimated from number of vines or trees.

⁴Including value of raisins, wine, etc.

⁵Including value of cider, vinegar, etc.

⁶Less than 1 acre.

The acreage devoted to corn constituted 47.5 per cent of the total area in crops and yielded 41.4 per cent of the total receipts, while cotton, although occupying but 17.8 per cent of the total acreage, yielded 32.0 per cent of the total receipts. The only other crop occupying more than 10 per cent of the total area in crops was hay and forage, which took up 16.1 per cent of the acreage, but yielded only 6.8 per cent of the total value. Wheat, occupying a little less than 10 per cent of the acreage, made up only 6.6 per cent of the total value; oats and other minor cereal crops, 5.3 per cent of the total value; vegetables, including potatoes, sweet potatoes, and onions, 4.9 per cent; forest products, 1.2 per cent; fruits and nuts, 1.0 per cent; and all other products, 0.8 per cent.

COTTON.

No accurate statistics of cotton production in Indian Territory are available for a date earlier than 1899, but reliable estimates indicate a rapid increase in acreage and in production.

In 1899, 25,322 farmers reported an area of 442,065 acres in cotton, or 14.4 per cent of the total improved farm land, and an average of 17.5 acres per farm raising the crop. From this land 77,864,522 pounds of cotton were produced, an average yield of 3,075 pounds per farm,

176 pounds per acre of the area producing cotton, 2,512 pounds per square mile, and 199 pounds per capita for the whole territory.

The total value of this cotton, including the value of the cottonseed, was \$5,407,052, an average value of \$213.53 per farm and \$12.23 per acre devoted to the crop.

In the production of cotton the Chickasaw, Choctaw, Cherokee, and Creek nations, ranking in the order named, reported in the aggregate 99.4 per cent of the total acreage.

CEREALS.

The total cereal yield in 1899 was 37,341,760 bushels, and the total value, \$9,010,989. The total area under cereals was 1,589,483 acres, of which 74.3 per cent was devoted to corn; 15.6 per cent, to wheat; and 10.1 per cent, to barley, rye, and oats. Cherokee nation reported 40.4 per cent of the entire acreage; Chickasaw nation, 37.3 per cent; Choctaw nation, 11.3 per cent; Creek nation, 7.9 per cent; and the other nations, 3.1 per cent.

The acreage and production of the principal cereals in 1899 were as follows: Corn, 1,181,439 acres and 30,709,420 bushels; wheat, 247,247 acres and 2,203,780 bushels; oats, 160,457 acres and 4,423,810 bushels; barley, 181 acres and 3,610 bushels; and rye, 159 acres and 1,140 bushels.

There were 105 farmers who reported 1,963 acres in Kafir corn, yielding 26,299 bushels, valued at \$6,579. The Cherokee nation alone reported 22,545 bushels, valued at \$5,462.

HAY AND FORAGE.

In 1900, 8,786 farmers, or 19.3 per cent of the total number, reported hay and forage crops. Exclusive of cornstalks and corn strippings, an average yield of 1.2 tons per acre was obtained. The total area in hay and forage for 1899 was 400,393 acres, 89.0 per cent of this acreage, or 356,186 acres, being used in the production of 393,963 tons of wild, salt, and prairie grasses. In 1899 the acreages and yields of the various other kinds of hay and forage were as follows: Millet and Hungarian grasses, 16,835 acres and 28,728 tons; alfalfa or lucern, 946 acres and 2,545 tons; clover, 153 acres and 244 tons; other tame and cultivated grasses, 2,311 acres and 2,739 tons; grains cut green for hay, 4,009 acres and 6,600 tons; crops grown for forage, 19,903 acres and 45,790 tons; and cornstalks, 3,909 acres and 3,330 tons.

In Table 14 the production of cornstalks is included under "hay and forage," but the acreage is included under "corn," as the forage secured was an incidental product of the corn crop.

ORCHARD FRUITS.

Orchard fruits were reported in 1900 by 3,337 farmers, only 7.3 per cent of the total number in the territory. The total number of trees reported was 1,081,299, of which 677,068, or 62.6 per cent, were apple trees; 329,736, or 30.5 per cent, peach; 31,933, or 3.0 per cent, plum and prune; 19,704, or 1.8 per cent, cherry; 16,445, or 1.5

per cent, pear; 2,160, or 0.2 per cent, apricot; and 4,209, or 0.4 per cent, unclassified trees.

The production of the various fruits in 1899 was* as follows: Apples, 222,565 bushels; peaches, 48,730; plums and prunes, 4,051; pears, 2,971; cherries, 1,455; apricots, 76; and miscellaneous fruits, 969 bushels.

The Cherokee nation leads both in the number of trees and in the value of fruit produced, reporting about five-sixths of the total number of apple trees, nearly one-half of the peach trees, and more than one-half the total value of orchard products.

SMALL FRUITS.

The total area used in the cultivation of small fruits in 1899 was 578 acres, distributed among 265 farms, and the value of the fruits grown was \$28,704, or an average of \$108.32 per farm. Of the total area 502 acres were in strawberries, the production of which was 473,250 quarts. The acreages and productions of the other berries were as follows: Blackberries and dewberries, 63 acres and 68,560 quarts; raspberries and Logan berries, 8 acres and 12,650 quarts; gooseberries, 2 acres and 1,700 quarts; and other berries, 3 acres and 2,920 quarts.

The Cherokee nation reported 86.0 per cent of the total acreage in small fruits and 76.0 per cent of their total value.

VEGETABLES.

The value of all vegetables grown in 1899, including potatoes, sweet potatoes, and onions, was \$826,227. Aside from the 8,961 acres in potatoes, sweet potatoes, and onions, 11,987 acres were used in the growing of miscellaneous vegetables. Of this area, the products of 8,692 acres were not reported in detail. Of the remaining 3,295 acres, 2,266 were devoted to watermelons; 434, to cabbages; 178, to muskmelons; 171, to tomatoes; 103, to cucumbers; 94, to sweet corn; and 49, to other vegetables.

SUGAR CANE.

The census shows that in 1899, 25 farmers raised 35 acres of sugar cane, from which they sold 229 tons of cane for \$886. No sugar or sirup was reported. The entire quantity of cane reported was grown in the Choctaw, Chickasaw, and Cherokee nations, the first two named reporting 88.6 per cent of the total acreage.

SORGHUM CANE.

Sorghum cane was cultivated in 1899 by 2,329 farmers, who reported 6,689 acres, or an average of 2.9 acres per farm. From this area, 14,932 tons of cane were sold for \$41,068, and from the remaining product there were manufactured 97,381 gallons of sirup, valued at \$29,211. The total value of sorghum-cane products in 1899 was \$70,279, an average of \$30.18 for each farm reporting. The leading nation in acreage was the Cherokee, with the Chickasaw second. These two nations furnished 72.6 per cent of the total acreage, 72.7 per cent of the total production of cane, and 71.1 per cent of the total production of sirup.

TOBACCO.

The census shows that in 1899 tobacco was grown in Indian Territory by 586 farmers, who obtained from 213 acres a yield of 97,030 pounds, valued at \$10,284. The average area for each farm reporting was less than one-half of an acre, the average yield per acre was 455.5 pounds, and the average value per pound, 10.6 cents.

Tobacco was cultivated in every nation and reservation of the territory, the Cherokee nation leading, with 144 acres, or 67.6 per cent of the entire area, and 68,250 pounds, or 70.3 per cent of the entire production.

NURSERIES.

The 7 commercial nurserymen reporting, occupied 406 acres, and in 1899 derived \$18,067 from the sale of nursery products and \$2,270 from other products—a total gross income of \$20,337, or an average of \$50.09

per acre. The capital invested in land, buildings, and improvements was \$8,780; in implements, \$786; and in live stock, \$1,803. No florists' establishments were reported.

FARM LABOR.

The total expenditure for labor on farms in 1899, including the value of the board furnished, was \$1,315,870, an average of \$29 per farm. The average was highest on the most intensively cultivated farms, being \$190 for nurseries, \$56 for live-stock farms, \$46 for vegetable farms, \$39 for fruit farms, \$37 for sugar farms, \$31 for hay and grain farms, \$20 for dairy farms, \$13 for cotton farms, and \$8 for miscellaneous farms. "Managers" expended on an average, \$425; "owners," \$36; "cash tenants," \$33; and "share tenants," \$18. White farmers expended \$30 per farm, and Indian and negro farmers, \$24.

CENSUS BULLETIN.

No. 187.

WASHINGTON, D. C.

June 12, 1902.

AGRICULTURE.

NEVADA.

HON. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture in the state of Nevada, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes also the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of Nevada, June 1, 1900, numbered 2,184, and were valued at \$15,615,710. Of this amount, \$2,340,090, or 15.0 per cent, represents the value of buildings, and \$13,275,620, or 85.0 per cent, the value of the land and improvements other than buildings. On the same date the value of farm implements and machinery was \$888,560, and that of live stock, \$12,169,565. These values, added to that of farms, give \$28,673,835, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on farms, are referred to in this bulletin as "animal products." The total value of such products, together with the value of all crops, is termed "total value of farm products." This value for 1899 was \$6,758,337, of which amount \$3,870,768, or 57.3 per cent, represents the value of animal products, and \$2,887,569, or 42.7 per cent, the

value of crops, including forest products cut or produced on farms. The total value of farm products for 1899 exceeds that for 1889 by \$4,052,677, or 149.8 per cent. A part of this increase is doubtless due to a more detailed enumeration in 1900 than in 1890.

The "gross farm income," is obtained by deducting from the total value of farm products the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$1,573,170, leaving \$5,185,167 as the gross farm income. The ratio which this latter amount bears to the "total value of farm property" is referred to as the "percentage of gross income upon investment." For Nevada in 1899 it was 18.1 per cent.

As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

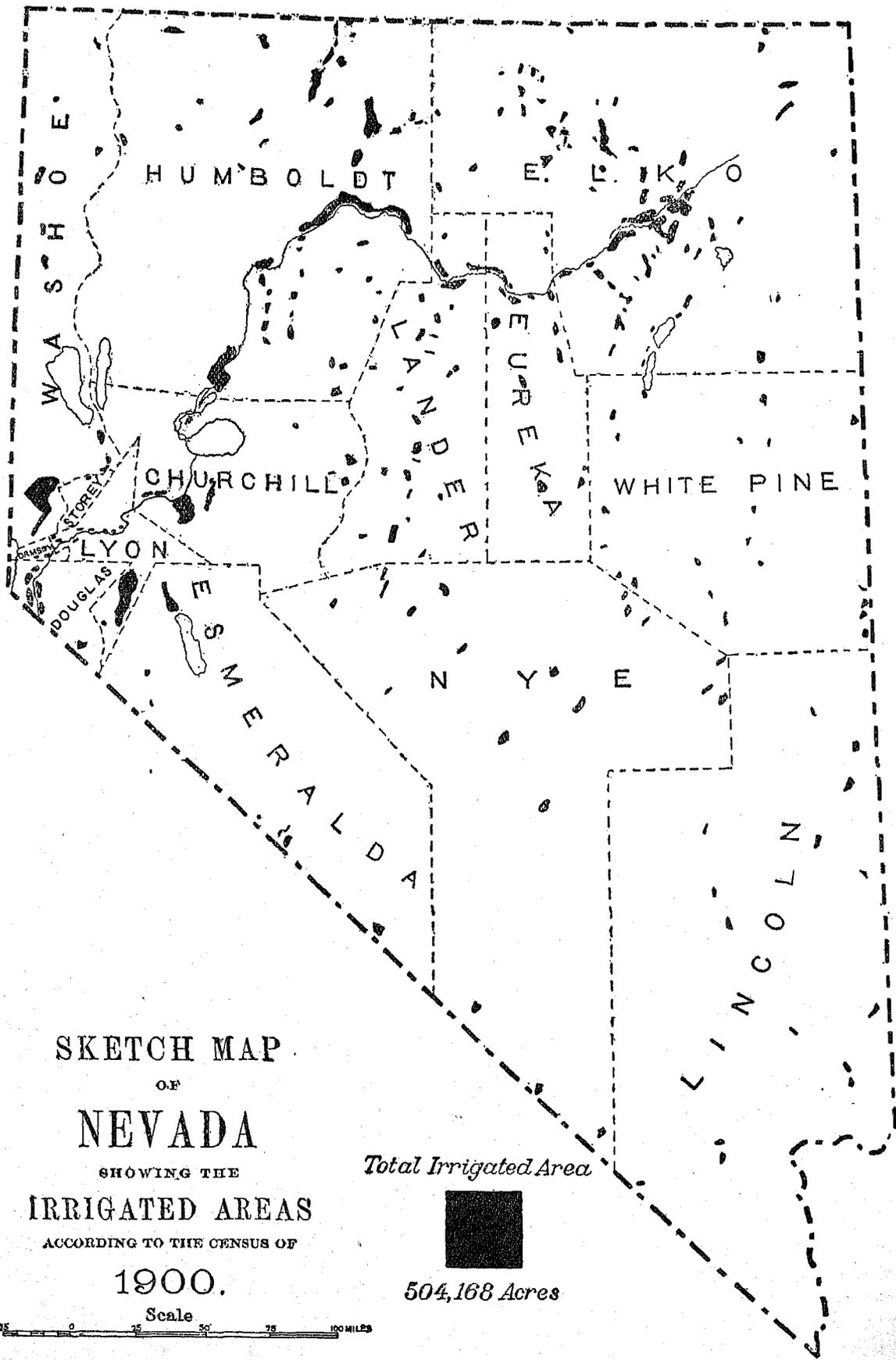
Special reports as to the dimensions and cost of the leading irrigation ditches and canals, the area of land irrigated, methods for the artificial application of water to the growing crops, and other facts relating to irrigation, were obtained by correspondence with farmers, engineers, and others. This correspondence was under the joint direction of Mr. F. H. Newell, chief hydrographer of the Geological Survey, acting as expert special agent for the division of agriculture, and Mr. Clarence J. Blanchard.

The statistics presented in this bulletin will be treated in greater detail in the report on agriculture in the United States. The present publication is designed to present a summarized advance statement for Nevada.

Very respectfully,



Chief Statistician for Agriculture.

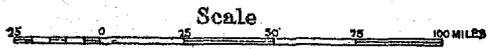


SKETCH MAP
 OF
NEVADA
 SHOWING THE
IRRIGATED AREAS
 ACCORDING TO THE CENSUS OF
1900.

Total Irrigated Area



504,168 Acres



AGRICULTURE IN NEVADA.

GENERAL STATISTICS.

The total land area of Nevada is 109,740 square miles, or 70,233,600 acres, of which 2,565,647 acres, or 3.7 per cent, are included in farms.

The state is situated in the western portion of the Great Basin, and has a mean elevation of about 5,500 feet above sea level. It is traversed from north to south by numerous high parallel mountain ranges separated by valleys ranging in width from 5 to 25 miles, and having in some instances a length of 50 miles.

The principal rivers, the Humboldt, Carson, Truckee, and Walker, flow into lakes which have no outlets, and there are many smaller streams, which flow for a few miles and then disappear. Many of the small lakes evaporate completely during the summer. Throughout the state there is an abundance of springs, many of which are alkaline.

The atmosphere of the state is very dry—the mean annual rainfall being only 8.25 inches.

The soil in the valleys is very rich and needs only irrigation to render it highly productive. The pursuit of agriculture proper is, however, more or less subordinated in Nevada to stock raising, the relative importance of the live-stock industry of the state being shown by the fact that the animal products, together with the hay and forage and other products fed to live stock comprise 80.6 per cent of the total value of farm products.

NUMBER AND SIZE OF FARMS.

The following table gives, by decades since 1860, the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE 1.—FARMS AND FARM ACREAGE: 1860 TO 1900.

| YEAR. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | | Per cent of farm land improved. |
|-----------|------------------|---------------------------|-----------|-------------|----------|---------------------------------|
| | | Total. | Improved. | Unimproved. | Average. | |
| 1900..... | 2,184 | 2,565,647 | 572,946 | 1,992,701 | 1,174.7 | 22.3 |
| 1890..... | 1,277 | 1,661,416 | 723,052 | 938,364 | 1,301.0 | 43.5 |
| 1880..... | 1,404 | 530,862 | 344,428 | 186,439 | 378.1 | 64.9 |
| 1870..... | 1,036 | 208,510 | 92,644 | 115,866 | 201.3 | 44.4 |
| 1860..... | 91 | 56,118 | 14,132 | 41,986 | 616.7 | 25.2 |

While the population of Nevada was at its maximum in 1880, and has declined steadily since that date, there has been an increase in the number of farms for each decade, except 1880 to 1890, when a decrease of 9.0 per cent was shown. In the last decade the increase was 71.0 per cent. The total acreage, however, shows a continuous increase, the rate of gain for the last decade being 54.4 per cent. The average size of farms decreased in the decade, 1860 to 1870, but afterwards increased rapidly on account

of the addition of large areas of grazing land from the public domain to the farm acreage. The decrease in the last decade indicates a division of farm holdings and a more intensive cultivation of the soil.

The decreases in the acreage and percentage of improved land shown for the last decade are probably due to the use of a more strict definition of the term "improved" by the Twelfth than by any previous census. The increased acreages in crops indicate that there has been little, if any, actual loss in improved area. This view is sustained by the fact that the decreases are reported from counties where hay, forage, and live stock are the principal products.

FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year, beginning with 1860.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF PRODUCTS: 1860 TO 1900.

| YEAR. | Total value of farm property. | Land, improvements, and buildings. | Implements and machinery. | Live stock. | Farm products. ¹ |
|-------------------------|-------------------------------|------------------------------------|---------------------------|--------------|-----------------------------|
| 1900..... | \$28,673,835 | \$15,615,710 | \$838,560 | \$12,169,565 | \$6,758,337 |
| 1890..... | 18,678,710 | 12,339,410 | 537,480 | 5,801,820 | 2,705,660 |
| 1880..... | 9,186,862 | 5,408,325 | 378,788 | 3,399,749 | 2,855,449 |
| 1870 ² | 3,094,672 | 1,485,505 | 163,713 | 1,445,449 | ³ 1,659,713 |
| 1860..... | 491,059 | 302,340 | 11,081 | 177,638 | |

¹ For year preceding that designated.

² Values for 1870 were reported in depreciated currency. To reduce to specie basis of other years they must be diminished one-fifth.

³ Includes betterments and additions to live stock.

Since 1860 the total value of farm property has increased \$28,182,776, and in the last decade \$9,995,125, or 53.5 per cent. In the same decade the gain in value of farms was \$3,276,300, or 26.6 per cent; in that of implements and machinery, \$351,080, or 65.3 per cent; and in that of live stock, \$6,367,745, or 109.8 per cent. The value of farm products for 1899 was \$4,052,677, or 149.8 per cent greater than in 1889. A portion of this increase, and of that noted for implements and machinery, is doubtless the result of a more detailed enumeration in 1900 than heretofore. Among the items of farm products enumerated in 1900, but not in 1890, is the value of animals sold and animals slaughtered on farms, which for Nevada in 1899 amounted to \$2,530,449, more than half the total gain.

COUNTY STATISTICS.

Table 3 presents the general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

| COUNTIES. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | Value of products not fed to live stock. | EXPENDITURES. | |
|---------------------------------|------------------|-----------------|-----------------|-----------|---|---------------|---------------------------|----------------|--|---------------|--------------|
| | Total. | With-buildings. | Total. | Improved. | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | Labor. | Fertilizers. |
| The State ----- | 2, 184 | 2, 068 | 2, 565, 647 | 572, 946 | \$13, 275, 620 | \$2, 340, 090 | \$888, 560 | \$12, 169, 565 | \$5, 185, 167 | \$1, 836, 650 | |
| Churchill ----- | 77 | 76 | 56, 491 | 30, 188 | 412, 800 | 78, 400 | 33, 770 | 492, 416 | 220, 772 | 39, 490 | |
| Douglas ----- | 117 | 117 | 63, 151 | 27, 069 | 912, 050 | 248, 250 | 55, 990 | 255, 745 | 259, 477 | 35, 570 | |
| Elko ----- | 898 | 379 | 885, 411 | 170, 142 | 3, 124, 500 | 442, 940 | 222, 100 | 4, 378, 653 | 1, 352, 226 | 291, 000 | |
| Esmeralda ----- | 37 | 32 | 22, 798 | 6, 610 | 183, 950 | 87, 000 | 14, 440 | 131, 205 | 98, 104 | 25, 800 | |
| Eureka ----- | 68 | 68 | 173, 961 | 23, 303 | 794, 910 | 131, 420 | 37, 250 | 550, 242 | 199, 312 | 68, 150 | |
| Humboldt ----- | 241 | 232 | 649, 452 | 139, 143 | 2, 766, 180 | 278, 090 | 149, 680 | 2, 684, 804 | 938, 595 | 825, 230 | |
| Lander ----- | 69 | 69 | 36, 824 | 23, 800 | 647, 090 | 75, 670 | 37, 490 | 553, 668 | 238, 103 | 64, 590 | |
| Lincoln ----- | 229 | 201 | 37, 531 | 13, 094 | 409, 850 | 95, 890 | 36, 280 | 262, 019 | 182, 738 | 49, 680 | |
| Lyon ----- | 168 | 164 | 99, 666 | 33, 958 | 917, 450 | 163, 960 | 59, 240 | 365, 380 | 348, 407 | 98, 780 | |
| Nye ----- | 90 | 80 | 46, 253 | 16, 143 | 286, 600 | 42, 270 | 30, 040 | 584, 211 | 152, 329 | 31, 820 | |
| Ormsby ----- | 50 | 48 | 8, 433 | 2, 357 | 130, 480 | 52, 620 | 15, 500 | 27, 396 | 54, 818 | 13, 660 | |
| Storey ----- | 23 | 22 | 1, 665 | 710 | 39, 680 | 8, 260 | 2, 910 | 18, 729 | 23, 331 | 7, 140 | |
| Washoe ----- | 331 | 315 | 339, 051 | 49, 643 | 2, 195, 460 | 599, 030 | 151, 870 | 1, 468, 494 | 894, 917 | 248, 690 | |
| White Pine ----- | 163 | 151 | 85, 075 | 34, 448 | 417, 430 | 83, 840 | 35, 240 | 433, 567 | 217, 931 | 41, 010 | |
| Duck Valley ¹ ----- | 27 | 27 | 2, 690 | 1, 227 | 11, 430 | 2, 420 | 2, 820 | 9, 646 | 1, 852 | | |
| Pyramid Lake ¹ ----- | 33 | 29 | 488 | 198 | 7, 290 | 1, 410 | 1, 360 | 6, 162 | 1, 438 | 1, 040 | |
| Walker River ¹ ----- | 68 | 53 | 1, 707 | 913 | 18, 470 | 8, 820 | 2, 580 | 7, 228 | 5, 767 | | |

¹ Indian reservation.

In all counties except Nye, the number of farms has increased rapidly since 1890. Douglas, Lincoln, and Storey counties reported more than twice as many in 1900 as ten years before, and in Humboldt, Lyon, and Ormsby counties the gains were nearly as great. The farm acreage has increased in every county except White Pine, where it has decreased one-third; in Douglas, Lincoln, Lyon, and Storey counties it has more than doubled.

A lower value of land and buildings than in 1890 is reported for Esmeralda, Nye, and White counties. For the state the average value of farms in 1900 is \$7,150, ranging from approximately \$2,000 in Lincoln and Storey counties to more than \$10,000 in Eureka, Humboldt, and Lander counties, the last three containing large live-stock farms.

All counties but White Pine show an increased value for implements and machinery. The largest relative gains were in Douglas, Storey, Ormsby, and Lincoln counties. The value of live stock for the state has more than doubled, Ormsby and White Pine counties alone showing decreases. The highest values per farm are reported from the two northern counties of Elko and Humboldt.

The average expenditure per farm for labor was \$634.91, and varied from less than \$300 in Lincoln, Ormsby, and White Pine counties to more than \$900 in Eureka, Humboldt, and Lander counties. The highest averages are

reported from counties containing large numbers of extensive stock ranges.

FARM TENURE.

Table 4 gives a comparative statement of farm tenure for 1880, 1890, and 1900. The farms operated by tenants are divided into two groups, designated as farms operated by "cash tenants" and by "share tenants." These groups comprise, respectively: (1) Farms operated by individuals who pay a rental in cash or a stated amount of labor or farm produce; (2) farms operated by individuals who pay as rental a stated share of the products.

In Table 5 farms of specified tenures are classified for 1900 according to race of farmer, and "farms operated by owners" are subdivided into four groups designated as farms operated by "owners," "part owners," "owners and tenants," and "managers." These groups comprise, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1890 TO 1900.

| YEAR. | Total number of farms. | NUMBER OF FARMS OPERATED BY— | | | PER CENT OF FARMS OPERATED BY— | | |
|-----------|------------------------|------------------------------|---------------|----------------|--------------------------------|---------------|----------------|
| | | Owners. ¹ | Cash tenants. | Share tenants. | Owners. ¹ | Cash tenants. | Share tenants. |
| 1900..... | 2,184 | 1,935 | 162 | 87 | 88.6 | 7.4 | 4.0 |
| 1890..... | 1,277 | 1,181 | 50 | 46 | 92.5 | 3.9 | 3.6 |
| 1880..... | 1,404 | 1,268 | 63 | 73 | 90.3 | 4.5 | 5.2 |

¹ Including "part owners," "owners and tenants," and "managers."

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

| RACE. | Total number of farms. | Owners. | Part owners. | Owners and tenants. | Managers. | Cash tenants. | Share tenants. |
|--------------|------------------------|---------|--------------|---------------------|-----------|---------------|----------------|
| The State .. | 2,184 | 1,649 | 143 | 17 | 126 | 162 | 87 |
| White..... | 2,011 | 1,489 | 143 | 17 | 125 | 151 | 86 |
| Colored..... | 173 | 160 | | | 1 | 11 | 1 |
| Chinese..... | 15 | 5 | | | | 10 | |
| Indian..... | 155 | 153 | | | 1 | | 1 |
| Negro..... | 3 | 2 | | | | 1 | |

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

| The State .. | 100.0 | 75.5 | 6.5 | 0.8 | 5.8 | 7.4 | 4.0 |
|--------------|-------|------|------------------|------------------|-----|-----|-----|
| White..... | 100.0 | 74.0 | 7.1 | 0.9 | 6.2 | 7.5 | 4.3 |
| Colored..... | 100.0 | 92.5 | (¹) | (¹) | 0.6 | 6.3 | 0.6 |

¹ Less than one-tenth of 1 per cent.

Between 1890 and 1900 the number of farms operated by owners increased 754, or 63.8 per cent, while the total number of rented farms increased nearly threefold. Of the latter class, those operated by "cash tenants" have increased more rapidly, indicating a growing sentiment on the part of both landlord and tenant in favor of the cash-payment system, and greater independence and financial responsibility on the part of the tenant class.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

| RACE OF FARMER, AND TENURE. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|-----------|------------------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State .. | 2,184 | 1,174.7 | 2,565,647 | 100.0 | \$23,673,835 | 100.0 |
| White farmers..... | 2,011 | 1,272.1 | 2,558,120 | 99.7 | 28,531,068 | 99.5 |
| Negro farmers..... | 3 | 555.0 | 1,605 | 0.1 | 40,719 | 0.1 |
| Indian farmers..... | 155 | 36.4 | 5,635 | 0.2 | 81,149 | 0.3 |
| Chinese farmers..... | 15 | 19.1 | 287 | (¹) | 20,899 | 0.1 |
| Owners..... | 1,649 | 565.7 | 932,782 | 36.3 | 15,824,390 | 55.2 |
| Part owners..... | 143 | 3,638.6 | 520,304 | 20.3 | 2,759,013 | 9.6 |
| Owners and tenants..... | 17 | 498.9 | 8,397 | 0.8 | 122,512 | 0.4 |
| Managers..... | 126 | 7,954.8 | 1,002,307 | 39.1 | 8,094,953 | 28.2 |
| Cash tenants..... | 162 | 392.6 | 63,597 | 2.5 | 1,245,887 | 4.4 |
| Share tenants..... | 87 | 439.8 | 88,260 | 1.5 | 627,100 | 2.2 |

¹ Less than one-tenth of 1 per cent.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

| RACE OF FARMER, AND TENURE. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|--------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implementations and machinery. | Live stock. | | |
| The State .. | \$6,079 | \$1,071 | \$407 | \$5,572 | \$2,374 | 18.1 |
| White farmers..... | 6,565 | 1,158 | 437 | 6,028 | 2,567 | 18.1 |
| Negro farmers..... | 8,133 | 817 | 105 | 4,468 | 411 | 3.0 |
| Indian farmers..... | 255 | 40 | 50 | 179 | 62 | 11.9 |
| Chinese farmers..... | 670 | 137 | 118 | 469 | 813 | 58.4 |
| Owners..... | 4,429 | 950 | 340 | 3,877 | 1,848 | 19.3 |
| Part owners..... | 9,153 | 1,283 | 555 | 8,303 | 4,068 | 21.1 |
| Owners and tenants..... | 3,161 | 722 | 485 | 2,839 | 1,513 | 21.0 |
| Managers..... | 28,199 | 2,839 | 1,294 | 31,864 | 9,130 | 14.2 |
| Cash tenants..... | 4,238 | 852 | 302 | 2,249 | 1,653 | 21.5 |
| Share tenants..... | 4,165 | 865 | 331 | 1,847 | 1,294 | 18.0 |

Of the farms of the state, 92.1 per cent are operated by white farmers, and 7.9 per cent by colored farmers, nine-tenths of whom are Indians. The high percentage of gross income for Chinese farmers is due to the fact that the farms operated by them are nearly all intensively cultivated vegetable farms. The farms of managers show the highest average value of products, but the percentage of gross income is smaller than for the other groups, because of the high average valuation of land, buildings, and live stock.

Farms operated by "managers" have the largest average area, 7,954.8 acres, and those operated by "cash tenants" the smallest, 392.6 acres. Of the 327 farms, each containing 1,000 acres or over, 173 are operated by "owners;" 67, by "managers;" 55, by "part owners;" 19, by "cash tenants;" 10, by "share tenants;" and 3, by "owners and tenants." Most of the farms of this group are live-stock farms.

FARMS CLASSIFIED BY AREA.

Tables 8 and 9 present the principal statistics for farms classified by area.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

| AREA. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|---------------------------|------------------|---------------------------|-----------|------------------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State .. | 2,184 | 1,174.7 | 2,565,647 | 100.0 | \$23,673,835 | 100.0 |
| Under 3 acres..... | 60 | 0.7 | 44 | (¹) | 312,921 | 1.1 |
| 3 to 9 acres..... | 76 | 8.3 | 628 | (¹) | 91,427 | 0.3 |
| 10 to 19 acres..... | 99 | 13.2 | 1,304 | 0.1 | 159,732 | 0.6 |
| 20 to 49 acres..... | 231 | 32.8 | 7,586 | 0.3 | 430,339 | 1.5 |
| 50 to 99 acres..... | 217 | 73.8 | 16,013 | 0.6 | 760,945 | 2.7 |
| 100 to 174 acres..... | 407 | 146.6 | 59,634 | 2.3 | 2,305,786 | 8.0 |
| 175 to 259 acres..... | 174 | 216.5 | 37,666 | 1.5 | 1,290,431 | 4.5 |
| 260 to 499 acres..... | 331 | 364.8 | 120,761 | 4.7 | 3,139,297 | 10.9 |
| 500 to 999 acres..... | 262 | 637.0 | 179,984 | 7.0 | 3,504,760 | 12.2 |
| 1,000 acres and over..... | 327 | 6,550.4 | 2,141,977 | 83.5 | 16,678,147 | 55.2 |

¹ Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

| AREA. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|---------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State..... | \$6,079 | \$1,071 | \$407 | \$5,572 | \$2,874 | 18.1 |
| Under 3 acres..... | 70 | 107 | 90 | 4,888 | 1,532 | 23.4 |
| 3 to 9 acres..... | 512 | 348 | 60 | 283 | 804 | 25.3 |
| 10 to 19 acres..... | 687 | 482 | 107 | 388 | 906 | 19.0 |
| 20 to 49 acres..... | 882 | 294 | 122 | 615 | 383 | 20.6 |
| 50 to 99 acres..... | 1,747 | 507 | 194 | 1,059 | 770 | 21.9 |
| 100 to 174 acres..... | 3,149 | 721 | 246 | 1,549 | 1,086 | 19.2 |
| 175 to 259 acres..... | 4,043 | 1,119 | 358 | 1,896 | 1,570 | 21.2 |
| 260 to 499 acres..... | 4,529 | 1,127 | 388 | 3,440 | 2,054 | 21.7 |
| 500 to 999 acres..... | 6,872 | 1,167 | 510 | 5,028 | 2,872 | 21.5 |
| 1,000 acres and over..... | 22,525 | 2,785 | 1,142 | 24,552 | 8,064 | 16.8 |

The group of farms, each containing from 100 to 174 acres, comprises a greater part of the total number than any other, showing the frequency of quarter-section holdings, but the group, "1,000 acres and over," contains more than four-fifths of the total acreage, and over half of the value of farm property in the state.

In general the average values of the several classes of farm property and products increase with the size of the farms, while the gross incomes per acre bear an inverse ratio to the size of farms. The high average value of live stock, and large gross income shown for farms under 3 acres, are due to the fact that five-sixths of them are live-stock farms, whose operators use large areas of the public domain but actually own or lease less than 3 acres of land. Some of them are market gardens and city dairies, the gross incomes from which are relatively high, as they are determined not so much by the acreage of owned or rented land used, as by the capital invested in buildings, implements, and live stock, and by the amount expended for labor.

The average gross incomes per acre for the various groups classified by area are as follows: Farms under 3 acres, \$2,089.77; 3 to 9 acres, \$36.78; 10 to 19 acres, \$23.23; 20 to 49 acres, \$11.67; 50 to 99 acres, \$10.43; 100 to 174 acres, \$7.40; 175 to 259 acres, \$7.25; 260 to 499 acres, \$5.63; 500 to 1,000 acres, \$4.18; 1,000 acres and over, \$1.23.

FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 10 and 11, the farms are classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is classified as a "hay and grain farm." Similarly, if vegetables are the leading crop, constituting 40 per cent of the gross farm income, it is a "vegetable" farm. The farms of the other groups are classi-

fied in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive 40 per cent of their farm income from any one class of products. Farms which yielded no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

| PRINCIPAL SOURCE OF INCOME. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| | | The State..... | 2,134 | 1,174.7 | 2,565,647 | 100.0 |
| Hay and grain..... | 642 | 472.3 | 303,216 | 11.8 | 6,050,835 | 21.1 |
| Vegetables..... | 132 | 232.1 | 50,633 | 1.2 | 589,849 | 2.1 |
| Fruits..... | 18 | 122.6 | 2,207 | 0.1 | 88,396 | 0.3 |
| Live stock..... | 986 | 2,159.3 | 2,085,837 | 81.3 | 10,812,047 | 37.3 |
| Dairy produce..... | 228 | 429.0 | 97,817 | 8.8 | 1,795,262 | 6.3 |
| Miscellaneous..... | 198 | 232.0 | 45,937 | 1.8 | 397,846 | 1.4 |

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

| PRINCIPAL SOURCE OF INCOME. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State..... | \$6,079 | \$1,071 | \$407 | \$5,572 | \$2,874 | 18.1 |
| Hay and grain..... | 6,416 | 1,216 | 523 | 1,269 | 1,814 | 19.3 |
| Vegetables..... | 2,838 | 606 | 203 | 772 | 1,399 | 31.3 |
| Fruits..... | 3,369 | 692 | 165 | 685 | 863 | 17.6 |
| Live stock..... | 7,422 | 1,097 | 408 | 11,065 | 3,522 | 17.6 |
| Dairy produce..... | 4,692 | 1,275 | 372 | 1,598 | 1,114 | 14.1 |
| Miscellaneous..... | 2,399 | 589 | 222 | 1,019 | 830 | 19.6 |

For the several classes of farms, the average values per acre of products not fed to live stock are as follows: Farms whose operators derive their principal income from fruits, \$7.04; vegetables, \$6.03; hay and grain, \$3.84; miscellaneous products, \$3.58; dairy produce, \$2.60; and live stock, \$1.63. In computing these averages the total area of the farms of each group is used and not the acreage devoted to the crop from which the principal income is derived.

The variations shown in the averages and percentages of gross income are largely due to the fact that in computing gross income no deductions are made for expenditures. For fruit and vegetable farms the average expenditure for labor represents a far larger percentage of the gross income than in the case of "hay and grain," "live-stock," or "miscellaneous" farms. If it were possible to present the average net incomes, the variations would be comparatively slight.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by reported value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|--|------------------|---------------------------|-----------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 2,184 | 1,174.7 | 2,565,647 | 100.0 | \$28,678,885 | 100.0 |
| \$0..... | 95 | 258.9 | 24,600 | 1.0 | 425,850 | 1.5 |
| \$1 to \$49..... | 91 | 68.2 | 6,207 | 0.2 | 118,740 | 0.4 |
| \$50 to \$99..... | 80 | 252.4 | 20,190 | 0.8 | 116,160 | 0.4 |
| \$100 to \$249..... | 203 | 792.3 | 160,844 | 6.3 | 550,660 | 1.9 |
| \$250 to \$499..... | 298 | 814.3 | 98,875 | 3.7 | 1,122,870 | 3.9 |
| \$500 to \$999..... | 372 | 410.1 | 152,571 | 5.9 | 2,876,840 | 10.0 |
| \$1,000 to \$2,499..... | 577 | 486.5 | 280,713 | 10.9 | 5,070,170 | 17.7 |
| \$2,500 and over..... | 468 | 8,908.6 | 1,826,847 | 71.2 | 18,402,745 | 64.2 |

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|--|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State..... | \$6,079 | \$1,071 | \$407 | \$5,572 | \$2,374 | 18.1 |
| \$0..... | 1,102 | 254 | 105 | 3,022 | 74 | 5.7 |
| \$1 to \$49..... | 638 | 150 | 62 | 455 | 88 | 6.1 |
| \$50 to \$99..... | 818 | 171 | 94 | 569 | 175 | 6.5 |
| \$100 to \$249..... | 1,050 | 312 | 121 | 1,230 | 358 | 9.6 |
| \$250 to \$499..... | 1,654 | 511 | 161 | 1,408 | 781 | 10.1 |
| \$500 to \$999..... | 3,311 | 822 | 273 | 3,327 | 1,599 | 18.2 |
| \$1,000 to \$2,499..... | 4,489 | 1,080 | 409 | 2,809 | 8,153 | 20.7 |
| \$2,500 and over..... | 18,204 | 2,445 | 973 | 17,700 | | |

Many of the farms reporting no income for 1899 were homesteads taken up too late for cultivation during that year. Some were stock farms operated by Indians who reported large numbers of horses, but no sales in 1899. There were some farms, also, from which no reports of the products of 1899 could be secured, as the persons in charge, June 1, 1900, did not operate the farms in 1899, and could give no information concerning the products of that year. To this extent the reports fall short of giving the total value of the farm products of 1899.

LIVE STOCK.

At the request of the various live-stock associations of the country, a new classification of domestic animals was adopted for the census of 1900. The age grouping for neat cattle was determined by their present and prospective relations to the dairy industry and the supply of meat

products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with the figures published in previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—DOMESTIC ANIMALS, FOWLS, AND BEES, ON FARMS AND RANGES, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS OR RANGES.

| LIVE STOCK. | Age in years. | ON FARMS AND RANGES. | | | NOT ON FARMS OR RANGES. |
|---|--------------------|----------------------|------------|----------------|-------------------------|
| | | Number. | Value. | Average value. | |
| Calves..... | Under 1..... | 81,051 | \$851,851 | \$10.51 | 196 |
| Steers..... | 1 and under 2..... | 41,108 | 796,890 | 19.38 | 52 |
| Steers..... | 2 and under 3..... | 29,508 | 804,642 | 27.27 | 68 |
| Steers..... | 3 and over..... | 12,863 | 431,342 | 33.53 | 20 |
| Bulls..... | 1 and over..... | 5,896 | 384,406 | 64.20 | 10 |
| Heifers..... | 1 and under 2..... | 44,867 | 792,272 | 17.62 | 48 |
| Cows kept for milk..... | 2 and over..... | 13,606 | 462,681 | 34.01 | 572 |
| Cows and heifers not kept for milk..... | 2 and over..... | 153,888 | 3,749,667 | 24.45 | 126 |
| Colts..... | Under 1..... | 10,778 | 56,208 | 5.22 | 72 |
| Horses..... | 1 and under 2..... | 11,001 | 102,188 | 9.29 | 84 |
| Horses..... | 2 and over..... | 58,515 | 1,118,852 | 19.09 | 3,146 |
| Mule colts..... | Under 1..... | 607 | 8,716 | 14.36 | |
| Mules..... | 1 and under 2..... | 440 | 9,169 | 20.84 | |
| Mules..... | 2 and over..... | 1,745 | 67,716 | 38.81 | 340 |
| Asses and burros..... | All ages..... | 256 | 23,886 | 112.84 | 41 |
| Lambs..... | Under 1..... | 318,788 | 678,919 | 2.12 | 18 |
| Sheep (ewes)..... | 1 and over..... | 484,674 | 1,330,152 | 2.79 | 17 |
| Sheep (rams and wethers)..... | 1 and over..... | 133,677 | 468,794 | 3.48 | 36 |
| Swine..... | All ages..... | 15,174 | 75,712 | 4.99 | 491 |
| Goats..... | All ages..... | 4,633 | 12,948 | 2.79 | 19 |
| Fowls: ¹ | | | | | |
| Chickens ² | | 100,661 | | | |
| Turkeys..... | | 8,618 | | | |
| Geese..... | | 280 | 55,826 | | |
| Ducks..... | | 2,379 | | | |
| Bees (swarms of)..... | | 5,692 | 20,131 | 3.54 | |
| Value of all livestock..... | | | 12,169,565 | | |

¹ The number reported is of fowls over 3 months old. The value is of all, old and young.

² Including Guinea fowls.

The total value of live stock on farms and ranges, June 1, 1900, was \$12,169,565, of which 68.0 per cent represents the value of neat cattle; 19.3 per cent, that of sheep; 10.4 per cent, that of horses; and 2.3 per cent, that of all other live stock.

No reports were secured of the value of live stock not on farms and ranges, but it is probable that such animals have higher average values than farm or range animals. Allowing the same averages, however, the total value of all live stock not on farms and ranges, exclusive of poultry and bees, is approximately \$110,000.

CHANGES IN LIVE STOCK KEPT ON FARMS AND RANGES.

The following table shows the changes since 1860 in the number of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS AND RANGES: 1860 TO 1900.

| YEAR. | Dairy cows. | Other neat cattle. | Horses. | Mules and asses. | Sheep. ¹ | Swine. |
|-----------|-------------|--------------------|---------|------------------|---------------------|--------|
| 1900..... | 18,606 | 371,586 | 80,295 | 3,043 | 568,251 | 15,174 |
| 1890..... | 9,273 | 201,627 | 55,785 | 1,723 | 273,469 | 7,373 |
| 1880..... | 13,519 | 158,302 | 32,087 | 1,263 | 138,696 | 9,080 |
| 1870..... | 6,174 | 25,342 | 7,620 | 990 | 11,018 | 8,235 |
| 1860..... | 947 | 4,624 | 541 | 134 | 876 | 3,571 |

¹ Lambs not included.

A marked increase between 1890 and 1900 is shown for all classes of live stock, the numbers of sheep and swine having more than doubled. With the exception of a decrease in the number of dairy cows in the decade from 1880 to 1890, and fluctuations in the number of swine, the increases have been constant and rapid since 1860.

In comparing the poultry report of 1900 (see Table 14) with that of the Eleventh Census, it should be borne in mind that in 1900 the enumerators were instructed not to report fowls less than 3 months old, while in 1890 no such restriction was made. This explains, to a great extent, the apparent decreases in the numbers of turkeys and ducks of 13.7 per cent and 12.5 per cent, respectively. Notwithstanding the limitation above mentioned, an increase of 67.6 per cent in the number of geese, and of 61.9 per cent in the number of chickens, is shown.

ANIMAL PRODUCTS.

Table 16 is a summarized statement of the products of the animal industry.

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS, IN 1899.

| PRODUCTS. | Unit of measure. | Quantity. | Value. |
|---------------------------|------------------|------------|-----------|
| Wool..... | Pounds..... | 4,342,500 | \$692,403 |
| Mohair and goat hair..... | Pounds..... | 10,590 | 3,672 |
| Milk..... | Gallons..... | 14,446,071 | \$433,391 |
| Butter..... | Pounds..... | 569,523 | |
| Cheese..... | Pounds..... | 94,082 | 122,522 |
| Eggs..... | Dozens..... | 589,490 | |
| Poultry..... | | | 71,175 |
| Honey..... | Pounds..... | 178,650 | 17,156 |
| Wax..... | Pounds..... | 8,380 | |
| Animals sold..... | | | 2,260,221 |
| Animals slaughtered..... | | | 270,228 |
| Total..... | | | 3,870,768 |

¹ Comprises all milk produced, whether sold, consumed, or made into butter or cheese.

² Comprises the value of milk sold or consumed, and of butter and cheese made.

The value of animal products in 1899 was \$3,870,768, or 57.3 per cent of the value of all farm products and 74.7 per cent of the gross farm income. Of the total value given, 65.4 per cent represents the value of animals sold and animals slaughtered on farms; 18.0 per cent, that of wool and mohair; 11.2 per cent, that of dairy products; 5.0 per cent, that of poultry and eggs; and 0.4 per cent, that of honey and wax.

ANIMALS SOLD AND ANIMALS SLAUGHTERED ON FARMS.

In 1899, 1,160 farmers received \$2,260,221 from the sale of live animals, an average of \$1,948 per farm reporting. On 1,172 farms animals were slaughtered for food, their value being \$270,228, an average of \$231 per farm. The value of animals sold and animals slaughtered on farms comprised 48.8 per cent of the gross farm income for all farms, and represents the most important branch of stock raising and the leading agricultural industry of the state.

In obtaining reports of receipts from sales of live animals, the enumerators were instructed to secure from each farm operator a statement of the amount received from sales in 1899, less the amount paid for animals purchased during the same year.

WOOL AND MOHAIR.

The rapid development of the wool-growing industry in Nevada is shown by the following statistics. In 1859, 330 pounds of wool were grown; in 1869, 27,029 pounds; in 1879, 655,012 pounds; in 1889, 1,450,868 pounds; and in 1899, 4,842,500 pounds. The average weight of fleeces was 4.9 pounds in 1879, 5.9 pounds in 1889, and 7.8 pounds in 1899, indicating an improvement in the grade of sheep kept.

The wool grown in 1899 was reported by 199 farmers, and was worth \$692,403, an average of \$3,479 per farm. The three counties of Elko, Humboldt, and Washoe reported 66.0 per cent of the entire product.

DAIRY PRODUCE.

The production of milk increased 1,914,019 gallons, or 75.6 per cent, from 1889 to 1899; that of butter, 79,866 pounds, or 16.3 per cent; and that of cheese, 42,875 pounds, or 83.7 per cent. Of the 94,082 pounds of cheese reported for 1899, 78,156, or 83.1 per cent, were reported by 4 farms in Douglas county.

Of the \$433,391 given in Table 16 as the value of all dairy products in 1899, \$164,012, or 37.8 per cent, represents the value of such products consumed on farms, and \$269,379, or 62.2 per cent, the amount realized from sales. Of the latter amount, \$187,962 was derived from the sale of 1,353,062 gallons of milk; \$71,707, from 328,937 pounds of butter; \$8,862, from 88,227 pounds of cheese; and \$848, from 673 gallons of cream.

POULTRY AND EGGS.

The total value of the products of the poultry industry in 1899 was \$193,697, of which amount 36.7 per cent represents the value of fowls raised and 63.3 per cent the value of eggs produced. Nearly 418,765 dozen more eggs were produced in 1899 than in 1889, the rate of increase being about 245.3 per cent.

HONEY AND WAX.

The quantity of honey produced in 1899 was 178,650 pounds, a gain of 90,093 pounds, or 101.7 per cent, over the production of 1889. The quantity of wax produced increased 19.6 per cent.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

| CLASSES. | HORSES. | | | DAIRY COWS. | | |
|---------------------|------------------|---------|-------------------|------------------|---------|-------------------|
| | Farms reporting. | Number. | Average per farm. | Farms reporting. | Number. | Average per farm. |
| Total | 2,082 | 80,295 | 38.6 | 1,684 | 13,606 | 8.1 |
| White farmers | 1,018 | 77,899 | 40.6 | 1,674 | 13,541 | 8.1 |
| Colored farmers | 164 | 2,396 | 14.6 | 10 | 65 | 6.5 |
| Owners ¹ | 1,724 | 57,225 | 33.2 | 1,404 | 11,156 | 7.9 |
| Managers | 118 | 16,665 | 141.2 | 90 | 962 | 10.7 |
| Cash tenants | 156 | 4,743 | 30.4 | 122 | 1,045 | 8.6 |
| Share tenants | 84 | 1,662 | 19.8 | 68 | 443 | 6.5 |
| Under 20 acres | 192 | 2,386 | 12.4 | 90 | 841 | 3.8 |
| 20 to 99 acres | 429 | 4,094 | 9.5 | 307 | 1,440 | 4.7 |
| 100 to 174 acres | 386 | 8,006 | 20.7 | 816 | 2,506 | 7.9 |
| 175 to 259 acres | 171 | 3,588 | 21.0 | 151 | 1,325 | 8.8 |
| 260 acres and over | 904 | 62,221 | 68.8 | 820 | 7,994 | 9.7 |
| Hay and grain | 609 | 10,282 | 16.8 | 469 | 2,709 | 5.8 |
| Vegetable | 127 | 1,811 | 14.3 | 78 | 860 | 4.6 |
| Fruit | 12 | 117 | 9.8 | 9 | 26 | 2.9 |
| Live stock | 929 | 62,083 | 66.8 | 770 | 6,606 | 8.6 |
| Dairy | 219 | 3,039 | 13.9 | 228 | 3,122 | 13.7 |
| Miscellaneous | 186 | 3,013 | 16.2 | 130 | 783 | 6.0 |

¹Including "part owners" and "owners and tenants."

The high average number of horses shown for farms operated by managers, is due to the fact that many of the largest stock farms are included in that group. Few of the colored farmers, who are almost all Indians, report any dairy cows, but practically all report horses.

CROPS.

The following table gives the statistics of the principal crops in 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

| CROPS. | Acres. | Unit of measure. | Quantity. | Value. |
|--------------------------|------------------|------------------|-----------|-----------|
| Corn | 580 | Bushels | 14,614 | \$11,736 |
| Wheat | 18,537 | Bushels | 450,812 | 263,351 |
| Oats | 4,786 | Bushels | 151,176 | 67,160 |
| Barley | 7,043 | Bushels | 224,085 | 126,748 |
| Rye | 129 | Bushels | 1,929 | 1,548 |
| (Clover seed) | | Bushels | 157 | 988 |
| Hay and forage | 292,134 | Tons | 419,812 | 2,066,496 |
| Hops | (¹) | Pounds | 100 | 10 |
| Dry beans | 33 | Bushels | 536 | 1,303 |
| Dry pease | 4 | Bushels | 85 | 92 |
| Potatoes | 2,235 | Bushels | 861,188 | 194,619 |
| Sweet potatoes | 5 | Bushels | 923 | 1,057 |
| Onions | 105 | Bushels | 30,535 | 24,945 |
| Sugar beets | 2 | Tons | 2 | 10 |
| Miscellaneous vegetables | 819 | | | 73,836 |
| Sorghum sirup | 230 | Gallons | 1,465 | 733 |
| Small fruits | 53 | | | 8,786 |
| Grapes | 3112 | Centals | 2,376 | 45,856 |
| Orchard fruits | 31,791 | Bushels | 15,287 | 10,433 |
| Tropical fruits | 29 | Pounds | 15,270 | 323 |
| Nuts | | | | 140 |
| Forest products | | | | 26,150 |
| Flowers and plants | (¹) | | | 25 |
| Nursery products | 5 | | | 65 |
| Cotton | 26 | Pounds | 9,000 | 1,179 |
| Miscellaneous | | | | 30 |
| Total | 328,458 | | | 2,887,569 |

¹ Less than 1 acre.

² Acreage of sorghum cane.

³ Estimated from number of vines or trees.

⁴ Including value of raisins, wine, etc.

⁵ Including value of cider and vinegar.

Of the total value of crops in 1899, hay and forage contributed 71.6 per cent; cereals, 16.3 per cent; vegetables, including potatoes, sweet potatoes, and onions, 10.2 per cent; fruits and nuts, 0.9 per cent; and all other products, 1.0 per cent.

The average values per acre of the various crops were as follows: Onions, \$237.57; small fruits, \$165.77; miscellaneous vegetables, \$90.15; potatoes, \$87.08; cereals, \$15.14; and orchard fruits, \$5.83.

CEREALS.

The following table is a statement of the changes in cereal production since 1859.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS: 1859 TO 1899.

PART 1.—ACREAGE.

| YEAR. ¹ | Barley. | Buck-wheat. | Corn. | Oats. | Rye. | Wheat. |
|--------------------|---------|-------------|-------|-------|------|--------|
| 1899 | 7,043 | | 580 | 4,786 | 129 | 18,537 |
| 1889 | 8,081 | | 274 | 3,490 | 54 | 3,631 |
| 1879 | 19,399 | | 487 | 5,937 | | 3,674 |

¹No statistics of acreage were secured prior to 1879.

PART 2.—BUSHELS PRODUCED.

| | | | | | | |
|------|---------|-----|--------|---------|-------|---------|
| 1899 | 224,085 | | 14,614 | 151,176 | 1,929 | 450,812 |
| 1889 | 237,192 | | 6,540 | 99,126 | 502 | 81,486 |
| 1879 | 513,470 | | 12,891 | 186,860 | | 69,298 |
| 1869 | 295,452 | 985 | 9,660 | 55,916 | 310 | 228,866 |
| 1859 | 1,597 | | 460 | 1,082 | 98 | 3,631 |

The total area devoted to cereals in 1899 was 31,075 acres; in 1889, 15,530 acres; and in 1879, 29,497 acres. The fact that the year 1889 was especially unfavorable to cereals accounts in part for the large decreases during the decade, 1879 to 1889, and also for the large increases shown for the last decade.

In the last twenty years there has been a general rearrangement in the relative rank of the various grains. In 1879 and 1889 barley led in both acreage and production, while in 1899 the land devoted to wheat constituted nearly sixty per cent of the total acreage in cereals.

Over one-half the wheat harvested in the state in 1899 was grown in Humboldt county. In this county, 10,435 acres were devoted to cereals, with a production valued at \$142,159. Over half the barley grown in the state in 1899 was produced in Douglas and Humboldt counties; while Elko and Douglas yielded almost three-fourths of the oats. Most of the rye was grown in White Pine county, and nearly all the corn in Lincoln and Nye counties. The acreage given in Table 19 as the area devoted to corn in 1899, is exclusive of 136 acres of corn, nonsaccharine sorghum, and similar crops grown for forage or ensilage.

HAY AND FORAGE.

Hay and forage occupied 88.9 per cent of the land devoted to crops, and yielded 71.6 per cent of the total value of crops. The average yield was 1.4 tons per acre, and the average values \$4.92 per ton and \$7.07 per acre.

To the total area and production of hay and forage, given in Table 18, wild, salt, or prairie grasses contributed 165,059 acres and 159,400 tons, 38.0 per cent of the total production and an average of nearly 1 ton per acre of the area devoted to these species of grasses. Alfalfa or lucern contributed 96,725 acres and 224,331 tons; 53.4 per cent of the total and an average of 2.3 tons per acre, and other hay and forage crops, 30,350 acres and 36,081 tons.

ORCHARD FRUITS.

The changes in orchard fruits since 1890 are shown in the following table.

TABLE 20.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

| FRUITS. | NUMBER OF TREES. | | BUSHELS OF FRUIT. | |
|-----------------------|------------------|--------|-------------------|--------|
| | 1900. | 1890. | 1899. | 1888. |
| Apples..... | 83,393 | 27,167 | 10,760 | 30,083 |
| Apricots..... | 1,121 | 279 | 280 | 76 |
| Cherries..... | 2,212 | 828 | 114 | 78 |
| Peaches..... | 9,136 | 3,993 | 2,568 | 1,423 |
| Pears..... | 6,214 | 748 | 903 | 811 |
| Plums and prunes..... | 14,358 | 1,025 | 542 | 670 |

The total number of fruit trees in the state more than trebled in the last decade, increasing from 33,543 to 117,104. Although the increase was general in all classes, the greater part was contributed by apple trees, which constituted 71.6 per cent of all orchard trees in 1900 and furnished 67.3 per cent of the total gain since 1890. The largest relative gain, however, was that in the number of plum and prune trees, the proportion of which increased from less than 3 per cent of all orchard trees in 1890 to about 12 per cent in 1900, the absolute number being more than fourteen times as great in the latter as in the former year.

Of the total number of classified trees in 1900, 71.6 per cent were apple trees; 12.3 per cent, plum and prune; 7.9 per cent, peach; 5.3 per cent, pear; 1.9 per cent, cherry; and 1.0 per cent, apricot.

The value of orchard products, including the value of 6,580 pounds of dried and evaporated fruits, amounted in 1899 to \$10,433, of which Lincoln county contributed more than one-third. The greatest numbers of orchard trees were reported from Washoe and Lyon counties, and the largest production of fruit from Humboldt.

In addition to the trees given in Table 20, 670 unclassi-

fied fruit trees were reported with a yield of 125 bushels of fruit.

VEGETABLES.

The total area devoted to vegetables, including potatoes, sweet potatoes, and onions, in 1899 was 3,164 acres. Of this, 70.8 per cent was used in the cultivation of potatoes, which were raised by nearly one-half the farmers in the state, Lyon and Washoe counties reporting 40.5 per cent of the acreage and 55.4 per cent of the total yield.

Of the 819 acres used in the cultivation of miscellaneous vegetables, the products of 610 acres were not reported in detail. The remaining 209 acres were devoted to vegetables as follows: 75, to cabbages; 36, to sweet corn; 20, to tomatoes; 15, to watermelons; 11, to carrots; and 46, to other vegetables.

SMALL FRUITS.

The total area used in the cultivation of small fruits in 1899 by the 150 farmers reporting them was 53 acres, an average of nearly 0.4 of an acre per farm. The acreage and production of the several varieties of berries were as follows: Currants, 16 acres and 25,670 quarts; strawberries, 14 acres and 16,440 quarts; gooseberries, 8 acres and 13,690 quarts; raspberries and Logan berries, 7 acres and 11,220 quarts; blackberries and dewberries, 4 acres and 5,410 quarts; and other berries, 4 acres and 4,430 quarts.

LABOR.

The total expenditure for labor on farms in 1899, including the value of board furnished, was \$1,386,650, an average of \$635 per farm. The average was \$375 for livestock farms, \$561 for hay and grain farms, \$386 for vegetable farms, \$318 for dairy farms, and \$116 for fruit farms. "Managers" expended on an average \$3,410; "owners," \$437; "cash tenants," \$372; and "share tenants," \$302. White farmers expended \$686 per farm, and colored farmers, \$41.

INDIAN RESERVATIONS.

The Indian tribes of Nevada are the Paiute,¹ Western Shoshone, and a few scattering bands of other tribes, all of Shoshonean stock. They live for the most part on three reservations, Pyramid Lake, Walker River, and Duck Valley; the Paiute, on the first two, and the Western Shoshone, on the last.

None of these tribes tilled the soil before they were instructed by the Government, although other Shoshonean tribes of the Southwest had a knowledge of agriculture previous to the coming of the white settler. The Indians are quiet, industrious, and willing workers. They carry on agriculture and stock raising, especially for neighboring ranch men, and are proficient in most varieties of farm labor, but some are still dependent upon Government rations.

DUCK VALLEY RESERVATION.

Duck Valley reservation, embracing an area of 488 square miles, is situated in the extreme northern part of

Nevada, in Elko county, and extends into Idaho. The larger part of the area is mountain land naturally adapted to grazing, being well watered and covered with nutritious grasses. Duck Valley proper, watered by the Owyhee River, comprises about one-fourth of the entire area of the reservation and has 40,000 acres of arable land, if it could be irrigated. On account of the altitude (6,000 feet), and the short, uncertain seasons and insufficient water, agriculture is attended with only partial success. Frosts sometimes occur in June and August.

The tribes on this reservation are the Paiute and Shoshone, numbering in all 439. As stock men and haymakers, they are very proficient, and are also in great demand as sheep shearers. A few carry on agriculture and stock raising for themselves. Government rations, which constitute about 30 per cent of their subsistence, are issued regularly, in limited quantities to all Indians, and are being grad-

¹ Also known as Paviotso.

ually decreased until the tribes shall have become self-supporting.

The water supply for irrigation is very unreliable. The streams, which depend upon the amount of snow deposited on the neighboring mountains, are swollen beyond their banks in the springtime, but are very low during the irrigation period. With the amount of water now on hand, less than 5,000 acres can be cultivated.

Alfalfa, which yields two crops each year, and wild hay are raised most extensively in Duck Valley, and barley and wheat constitute the crop of cereals. Wheat, sown in the fall, matures in July and seldom requires irrigation more than once or twice a year.

The Indians, as yet, have given but little attention to stock raising. Indian ponies constitute their wealth and a few own large herds. An attempt is being made to sell the ponies and buy cattle instead in order to give the Indians a start in stock raising, which must eventually furnish their means of subsistence. The hay lands produce a crop sufficient to maintain several thousand head of cattle.

PYRAMID LAKE RESERVATION.

Pyramid Lake reservation, situated in the extreme western part of Nevada, in Washoe county, contains an area of 503½ square miles. The larger part is taken up by Pyramid Lake, which gives its name to the reservation. The lake extends 38.12 miles in its extreme length and averages 12 miles in width. The land is arid and a large part is mountainous, less than 20,000 acres being available for agriculture. The soil is alkaline but produces well with plenty of water. The mountainous portion is naturally adapted to stock raising, being well watered by melting snow, and would furnish good feed for cattle and sheep.

The reservation is inhabited by the Paiute, of Shoshonean stock, numbering 705. They take kindly to farming and stock raising and are practically self-supporting, Government rations constituting but 5.0 per cent of their subsistence. Many find employment on ranches and cattle ranges of neighboring white men who are dependent upon them for labor.

The irrigation facilities are wholly inadequate to the needs of these Indians and are also very unreliable, not more than one-third of the available land being watered. The uncertainty of the water supply and consequent failure of crops has so discouraged them that they prefer to work for white farmers rather than to cultivate their own land. Efforts are being put forth to improve and extend the present system; and the contemplated improvements, when completed, will bring an additional 3,000 acres under cultivation, and should place the band on a self-supporting agricultural basis.

Barley and alfalfa are the principal crops raised and clover and wild grasses are cured for hay. With plenty

of water, alfalfa will yield two and even three crops each year. A few farmers raised a small quantity of potatoes but no other garden produce was reported. The number of acres cultivated by the Indian farmers varies from 2 to 27, being usually less than 10 acres. No allotments have been made, but the land is parceled out to those who will work it.

The Pyramid Lake Indians own little live stock. Indian ponies constitute their chief possession; a few, however, have horses of a somewhat better grade.

WALKER RIVER RESERVATION.

Walker River reservation lies in the west central part of Nevada, in Esmeralda county, a portion extending into Lyon and Churchill counties. It embraces an area of 498½ square miles, of which 176 is occupied by Walker Lake, 22 miles long and 8 miles wide. Of the land area, two-thirds is arid, rough mountain and timber land, but the remainder is suitable for agriculture or grazing. The reservation is traversed for 22 miles by Walker River and the land upon its borders is rich and easily irrigated. Bench land, although not so fertile as the river bottoms, produces fairly well when irrigated, while mesa and mountain lands afford ample feed for stock.

The Indians at Walker River are the Paiute, numbering 392. Like the band at Pyramid Lake they are industrious and slowly progressing toward civilization. They make good farmers, stockmen, and general laborers and take more interest in working for white men than in farming for themselves. The irrigable land is insufficient to support them and they are also very much in need of agricultural implements, two great drawbacks to their progress. The methods employed in farming, with the exception of haymaking, are very primitive, due more to a lack of implements than to ignorance of methods.

Alfalfa is the principal crop and, when well irrigated, three cuttings can be made each year; wheat and barley are also grown. Individual Indians cultivate as high as 50 acres, but the majority, less than 20. Their sowing is so arranged that the harvest will not interfere with their obtaining employment during the harvest season of their white neighbors. The agricultural land is not allotted, but is parceled out to those who show a desire to cultivate it.

Some interest is taken in stock raising. The horses are pony stock, and many Indians still seem to think that the pony is a necessity to their welfare. These ponies are a detriment to the range, trampling out the grass, and are also a useless expense, as in the winter months they consume hay which should be fed to marketable stock. On account of the natural facilities for stock raising and the precarious conditions attending tillage of the soil, more attention should be given to the former industry. The Indians take an interest in raising stock and will doubtless improve the character of their breeds.

IRRIGATION STATISTICS.

NATURAL FEATURES.

The state of Nevada is usually thought to include the driest and most desert-like part of the arid region. It lies within the western part of the Great Interior Basin, from which no rivers escape to the sea. On the west of the Great Basin, a short distance beyond the boundary of the state, is the high mountain range known as Sierra Nevada, which stands as a barrier against the rain-bearing winds from the west; on the east is the Wasatch range, which extends north and south across the state of Utah. Thus the state of Nevada lies in a broad depression between two great natural walls, and slopes gradually toward the south, the upper or northern portion of the basin having an average altitude of about 5,000 feet, and the lower or southern end descending below the sea level in places.

But the Great Basin is by no means a single broad valley or desert. On the contrary, it is broken by irregular mountain masses which rise abruptly from the nearly level plains. These plains are, for the most part, the bottoms of ancient lakes in which thick deposits of gravel, sand, and clay have accumulated, burying the bases of the mountains. There are two great systems of these ancient lakes, that on the east including what is left of Lake Bonneville, and that on the west, the ancient Lake La Hontan. The Great Salt Lake of Utah is the shrunken remnant of Bonneville, and Lakes Winnemucca, Pyramid, Humboldt, Carson, and Walker are depressions in the bottom of old Lake La Hontan.

Rivers which flow throughout the year may be regarded as exceptional in Nevada. Infrequent storms, striking the mountains, give rise to torrents which rush down the steep slopes, cut narrow canyons, and pile debris out on the desert into which the waters sink. Thus there are almost innumerable torrent and intermittent streams issuing from the small but lofty mountain ranges of the Great Basin. Some of these stream channels unite to form the principal river of the state, the Humboldt, which, by the vast extent of its drainage basin, and the number of these intermittent tributaries, succeeds in becoming a fairly persistent stream throughout its course. It crosses the northern part of the state and finally discharges an occasional flood into the depression known as Humboldt Lake. This depression is alternately a stretch of open water and an alkaline plain. When there is an unusually wet season, the lake overflows into what is known as Carson Sink, or vice versa when Carson River is at flood height.

The other important rivers of the state are the Truckee, Carson, and Walker, which receive a continual supply from the snow-capped peaks of the Sierra Nevadas. These mountains are located in the state of California, and the rivers rising in them cross the state line, and lose their waters in the broad, arid plains of the state, except in times of floods, when they reach the lakes or sinks which mark the lowest point of the drainage basin.

NEED OF IRRIGATION.

Owing to the enormous area of the state, and to its small and scattered supply of water, which is obtained largely from springs, the ranches or farms, except in the extreme western portion, are at considerable distances from each other and still further from the market. Transportation is expensive, and sufficient produce is not raised to supply local demands. Tilling the soil is of necessity an adjunct to stock raising. In the broad, arid valleys of the state, and among the rugged hills, wherever a spring occurs, some ranchman has bought or taken up 40 acres or more, sufficient to cover the source of the water. Owing to this, he can practically control thousands of acres of grazing land. This state of affairs and the difficulty of transportation have combined not only to deter immigration, but to encourage emigration, thus leaving in the state practically only the mining population.

IRRIGATED DISTRICTS.

The principal irrigated areas are along the Humboldt River, and on the western edge of the state in the lowlands traversed by the three California rivers mentioned. At various points, also, near the mouths of canyons in the desert ranges, are ranches where small amounts of water from the intermittent streams have been used for irrigation.

The division of Nevada into drainage districts is comparatively simple if no attempt is made to define their outlines accurately. Except the portion in the immediate vicinity of the Humboldt River, the greater part of the state may be eliminated from consideration, as there is practically no surface drainage. Each small stream may be separately considered as receiving water from a particular mountain peak. It is therefore sufficient in the classification of the irrigated lands to consider the country along the Humboldt, and the area adjacent to the California state line, and to group all the miscellaneous irrigated areas of the state into a third class.

POSSIBLE EXTENSIONS OF IRRIGATION FACILITIES.

A greater agricultural development would be rendered possible by the construction of reservoirs along the Humboldt River and its tributaries, and also at the headwaters of the Truckee, Carson, and Walker rivers. As the last three rivers mentioned rise in California, interstate problems would be involved in the latter undertaking, but it is highly probable that the Government could build works to reclaim large areas of land, thus making possible homestead settlement on the lands now valueless. The reservoir site which has attracted the greatest amount of public attention is Lake Tahoe, at the head of Truckee River, where it has been shown that, by means of a suitable dam, water sufficient for the irrigation of thousands of acres could be retained. The drainage area tributary to the lake is, however, small compared to the surface of open water,

and like others of the arid region, it is possible that this lake is too large for the most economical storage.

In addition to the reservoir sites now occupied in part by well-known lakes, there are scattered throughout the mountains many localities adapted to the conservation of water. These are mainly valleys, in some cases formerly occupied by glaciers, and later by small lakes which in the course of time have cut an outlet through the lower rims. A comparatively small expenditure of labor and capital would close these outlets, and by this means bodies of water of considerable size could be held. As the rain and snow fall on the higher mountains aggregate annually from 30 to 40 inches or more, this would be sufficient to replenish such reservoirs.

Water from wells and springs has an exceptionally large value in Nevada on account of the general scarcity of surface waters. There are numerous springs which come out along the edges of valleys and among the foothills. Few attempts have been made to obtain artesian water, and a systematic study of the existing geological conditions is

needed, as the drilling of deep wells so far has given little knowledge of the underground conditions, other than that water could not be had at the depths to which the particular wells have been drilled.

RESULTS OF IRRIGATION.

Of the 70,233,600 acres of land comprised in Nevada, only 2,565,647 acres, or 3.7 per cent, are included in farms, and only 572,946 acres, or 0.8 per cent of the total area of the state, are improved. Of the improved land, 570,608 acres are outside of the Indian reservations. In demonstration of the fact that agriculture is almost wholly dependent upon irrigation to produce crops, it should be noted that 504,168 acres, or 88.0 per cent of the total improved area, were irrigated in 1899. A careful study of agricultural development shows that the only progress in this direction has been that which followed the construction and extension of irrigation enterprises along water courses, and the building of reservoirs to store the flood waters heretofore wasted.

TABLE A.—ACREAGE AND PRODUCTION OF ALL CROPS, AND OF IRRIGATED CROPS IN 1899.

| CROPS. | ACREAGE. | | | PRODUCTION. | | | |
|---|--------------------|--------------------|---------------------|------------------|---------|------------|---------------------|
| | Total. | Irrigated. | Per cent irrigated. | Unit of measure. | Total. | Irrigated. | Per cent irrigated. |
| The State ----- | 323,453 | 323,352 | 98.4 | | | | |
| Corn ----- | 580 | 580 | 100.0 | Bushels ----- | 14,614 | 14,614 | 100.0 |
| Wheat ----- | 18,537 | 18,246 | 98.4 | Bushels ----- | 450,812 | 448,802 | 99.6 |
| Oats ----- | 4,786 | 4,786 | 100.0 | Bushels ----- | 151,176 | 151,176 | 100.0 |
| Barley ----- | 7,043 | 6,982 | 99.1 | Bushels ----- | 224,035 | 223,743 | 99.9 |
| Rye ----- | 129 | 104 | 80.6 | Bushels ----- | 1,929 | 1,880 | 97.5 |
| Wild, salt, or prairie grasses ----- | 165,059 | 160,821 | 97.4 | Tons ----- | 159,400 | 157,340 | 98.7 |
| Millet and Hungarian grasses ----- | 84 | 84 | 100.0 | Tons ----- | 132 | 132 | 100.0 |
| Alfalfa or lucern ----- | 96,725 | 96,665 | 99.9 | Tons ----- | 224,331 | 224,201 | 99.9 |
| Clover ----- | 1,021 | 981 | 96.1 | Tons ----- | 1,324 | 1,309 | 98.9 |
| Other tame and cultivated grasses ----- | 26,957 | 26,587 | 98.6 | Tons ----- | 30,778 | 30,543 | 99.2 |
| Grains cut green for hay ----- | 2,152 | 2,140 | 99.4 | Tons ----- | 3,708 | 3,692 | 99.7 |
| Forage crops ----- | 136 | 136 | 100.0 | Tons ----- | 144 | 144 | 100.0 |
| Potatoes ----- | 2,235 | 2,231 | 99.8 | Bushels ----- | 361,185 | 361,035 | 99.9 |
| Onions ----- | 105 | 105 | 100.0 | Bushels ----- | 30,535 | 30,535 | 100.0 |
| Miscellaneous vegetables ¹ ----- | 824 | 824 | 100.0 | | | | |
| Grapes ----- | ² 112 | ² 112 | 100.0 | Centals ----- | 2,870 | 2,876 | 100.0 |
| Orchard fruits ----- | ² 1,791 | ² 1,791 | 100.0 | Bushels ----- | 15,287 | 15,287 | 100.0 |
| Other crops ----- | 182 | 177 | 97.8 | | | | |

¹Including sweet potatoes.

²Estimated from number of vines or trees.

The total number of acres of irrigated crops as given above is 323,352, while the total number of acres of land irrigated is 504,168. The difference, 180,816 acres, represents approximately the area of pasture land irrigated.

Nearly 5,000 acres of hay are reported as grown without irrigation, but it is probable that a large portion of this area was really irrigated by flooding at least once in the year.

TABLE B.—NUMBER, LENGTH, AND COST OF CONSTRUCTION OF MAIN CANALS AND DITCHES, WITH ACREAGE UNDER DITCH, AND ACREAGE IRRIGATED FROM STREAMS, IN 1899.

| COUNTIES. | MAIN CANALS AND DITCHES. | | | NUMBER OF ACRES. | | Average area irrigated per mile of ditch, in acres. |
|------------------------|--------------------------|------------------|-----------------------|------------------|-------------------------|---|
| | Number. | Length in miles. | Cost of construction. | Under ditch. | Irrigated from streams. | |
| The State ¹ | 1,498 | 2,859 | \$1,583,927 | 747,930 | 504,084 | 176 |
| Churchill | 31 | 195 | 40,791 | 89,110 | 29,528 | 219 |
| Douglas | 109 | 190 | 43,713 | 83,764 | 25,857 | 136 |
| Elko | 398 | 669 | 249,460 | 240,573 | 156,444 | 284 |
| Esmeralda | 43 | 44 | 22,916 | 11,202 | 6,181 | 140 |
| Eureka | 67 | 117 | 69,115 | 80,148 | 21,828 | 197 |
| Humboldt | 237 | 455 | 466,334 | 175,336 | 124,925 | 275 |
| Lander | 117 | 261 | 49,595 | 50,610 | 18,787 | 72 |
| Lincoln | 72 | 83 | 32,814 | 18,867 | 9,961 | 120 |
| Lyon | 43 | 139 | 145,273 | 61,510 | 32,422 | 163 |
| Nye | 93 | 193 | 43,750 | 22,739 | 12,666 | 66 |
| Ormsby | 26 | 25 | 8,650 | 1,735 | 1,514 | 61 |
| Storey | 18 | 83 | 7,400 | 950 | 671 | 20 |
| Washoe | 72 | 270 | 292,400 | 49,950 | 43,884 | 137 |
| White Pine | 172 | 182 | 61,716 | 31,395 | 19,366 | 106 |

¹ Exclusive of Indian reservations.

The total amount invested in ditches in Nevada, June 1, 1900, was approximately \$1,533,927. The total value of the irrigated products of 1899 was \$2,853,149. No reports were secured concerning the cost of irrigation ditches in the Indian reservations. The number of acres of irrigated land for each mile of ditch reported is 176, as compared with 124 in Arizona. The number of acres under ditch for each mile is 262; in Arizona it is 592. The average cost of construction was about \$536.53 per mile, \$2.05 per acre of land under ditch, and \$3.04 for land actually irrigated in 1899. The exceedingly low cost of ditch construction is due to the conservative manner in which the irrigation systems have been constructed and their comparatively simple character, as well as to the few failures which have followed the attempts to reclaim areas of arid land. The ditches, as a rule, have been wisely planned and economically constructed and the cost of maintenance per irrigated acre did not average 18 cents.

TABLE C.—NUMBER OF IRRIGATORS AND ACRES IRRIGATED IN 1889 AND 1899, WITH PERCENTAGES OF INCREASE, BY COUNTIES.

| COUNTIES. | NUMBER OF IRRIGATORS. | | | NUMBER OF ACRES IRRIGATED. | | |
|------------|------------------------|-------|-----------------------|----------------------------|---------|-----------------------|
| | 1899. | 1889. | Per cent of increase. | 1899. | 1889. | Per cent of increase. |
| | The State ¹ | 1,906 | 1,167 | 63.3 | 504,168 | 224,403 | 124.7 |
| Churchill | 71 | 43 | 65.1 | 29,533 | 9,688 | 204.8 |
| Douglas | 116 | 26 | 346.2 | 25,861 | 4,250 | 508.5 |
| Elko | 364 | 250 | 45.6 | 156,446 | 56,805 | 177.9 |
| Esmeralda | 35 | 29 | 20.7 | 6,181 | 4,527 | 36.5 |
| Eureka | 67 | 38 | 50.0 | 21,831 | 6,344 | 244.1 |
| Humboldt | 230 | 116 | 98.3 | 124,959 | 56,680 | 120.5 |
| Lander | 68 | 62 | 30.8 | 18,803 | 7,857 | 139.3 |
| Lincoln | 203 | 95 | 113.7 | 9,962 | 4,400 | 126.4 |
| Lyon | 161 | 87 | 85.1 | 32,422 | 17,777 | 82.4 |
| Nye | 80 | 82 | 32.4 | 12,666 | 8,366 | 51.4 |
| Ormsby | 39 | 26 | 50.0 | 1,563 | 1,497 | 4.4 |
| Storey | 21 | 1 | 2,000.0 | 690 | 120 | 475.0 |
| Washoe | 313 | 221 | 41.6 | 43,885 | 28,631 | 53.3 |
| White Pine | 148 | 101 | 46.5 | 19,366 | 17,961 | 7.8 |

¹ Exclusive of Indian reservations.
² Irrigated from streams, 504,034 acres; from wells, 134 acres.
³ Decrease.

A glance at the percentages of Tables 1 and C discloses the intimate relation between the growth of irrigation and the general development of agriculture. The number of farms outside of Indian reservations increased in ten years 61.4 per cent; the number of irrigators, 63.3 per cent; and the irrigated area, 124.7 per cent.

TABLE D.—NUMBER OF IRRIGATED FARMS COMPARED WITH TOTAL NUMBER OF FARMS, AND IRRIGATED ACREAGE COMPARED WITH TOTAL IMPROVED ACREAGE: JUNE 1, 1900.

| COUNTIES. | NUMBER OF FARMS. | | | NUMBER OF IMPROVED ACRES IN FARMS. | | |
|------------------------|------------------|------------|---------------------|------------------------------------|------------|---------------------|
| | Total. | Irrigated. | Per cent irrigated. | Total. | Irrigated. | Per cent irrigated. |
| The State ¹ | 2,061 | 1,906 | 92.5 | 576,608 | 504,168 | 88.4 |
| Churchill | 77 | 71 | 92.2 | 80,188 | 29,533 | 97.8 |
| Douglas | 117 | 116 | 99.1 | 27,069 | 25,861 | 95.5 |
| Elko | 398 | 364 | 91.5 | 170,142 | 156,446 | 92.0 |
| Esmeralda | 37 | 35 | 94.6 | 6,610 | 6,181 | 93.5 |
| Eureka | 68 | 57 | 83.8 | 23,303 | 21,831 | 93.7 |
| Humboldt | 241 | 230 | 95.4 | 139,143 | 124,959 | 89.8 |
| Lander | 69 | 68 | 98.6 | 23,800 | 18,803 | 79.0 |
| Lincoln | 229 | 203 | 88.6 | 13,094 | 9,962 | 76.1 |
| Lyon | 168 | 161 | 95.8 | 33,958 | 32,422 | 95.5 |
| Nye | 90 | 80 | 88.9 | 16,143 | 12,666 | 78.5 |
| Ormsby | 50 | 39 | 78.0 | 2,357 | 1,563 | 66.3 |
| Storey | 23 | 21 | 91.3 | 710 | 690 | 27.2 |
| Washoe | 331 | 313 | 94.6 | 40,643 | 43,885 | 88.4 |
| White Pine | 163 | 148 | 90.8 | 34,443 | 19,366 | 56.2 |

¹ Exclusive of Indian reservations.

Table D gives certain statistics of irrigation by counties, exclusive of Indian reservations. Of the farms, 92.5 per cent is irrigated, while of the improved land, 88.4 per cent is irrigated. The average number of acres of improved land in each irrigated farm is nearly 300, of which 265 are irrigated.

TABLE E.—AVERAGE VALUE PER ACRE OF IRRIGATED AND UNIRRIGATED FARMS AND FARM LAND, AND AVERAGE COST PER ACRE OF WATER RIGHT AND OF ANNUAL MAINTENANCE.

| COUNTIES. | AVERAGE VALUE PER ACRE. | | | | | AVERAGE COST. | |
|------------------------|--------------------------------|------------|--------------|--------------|--------------|---------------|---------------------|
| | Farms, exclusive of buildings. | | | Arable land. | | Water right. | Annual maintenance. |
| | All. | Irrigated. | Unirrigated. | Irrigated. | Unirrigated. | | |
| The State ¹ | \$5.17 | \$5.35 | \$1.87 | \$28.47 | \$2.50 | \$2.86 | \$0.18 |
| Churchill | 7.31 | 7.39 | 4.24 | 16.56 | 1.25 | 1.28 | 0.12 |
| Douglas | 13.88 | 13.52 | 6.79 | 45.20 | 7.50 | 1.68 | 0.60 |
| Elko | 3.53 | 3.56 | 2.05 | 14.65 | 1.25 | 1.55 | 0.13 |
| Esmeralda | 8.07 | 8.07 | | 26.60 | 1.25 | 3.70 | 0.09 |
| Eureka | 4.57 | 4.59 | 3.14 | 25.92 | 1.25 | 3.01 | 0.15 |
| Humboldt | 4.26 | 4.28 | 3.03 | 37.11 | 3.50 | 8.89 | 0.11 |
| Lander | 7.45 | 7.45 | 3.33 | 25.84 | 1.25 | 2.11 | 0.10 |
| Lincoln | 10.92 | 11.29 | 6.35 | 28.41 | 5.00 | 2.75 | 0.50 |
| Lyon | 9.21 | 9.24 | 2.84 | 25.11 | 1.25 | 3.95 | 0.28 |
| Nye | 6.20 | 6.40 | 1.60 | 20.47 | 1.25 | 3.54 | 0.18 |
| Ormsby | 15.47 | 17.18 | 11.60 | 58.87 | 5.00 | 4.75 | 0.35 |
| Storey | 23.83 | 24.58 | 5.00 | 80.00 | 2.50 | 9.15 | 0.40 |
| Washoe | 6.48 | 8.02 | 0.92 | 62.25 | 5.00 | 6.60 | 0.27 |
| White Pine | 4.91 | 5.36 | 2.20 | 15.85 | 1.25 | 3.03 | 0.56 |

¹ Exclusive of Indian reservations.

In the above table it will be noted that the average value per acre of land on unirrigated farms in several counties very nearly equals that on irrigated farms. This will be

understood when it is explained that this value does not represent that of the land alone, but includes a very valuable water right, either a spring, or the sole right to all the water in a mountain stream. Owning this water supply, the ranchman practically controls all the grazing land in a valley and a large area extending back into the mountains. This is public domain for which no rental is paid. It is the water which makes the land valuable, though no land is irrigated.

The average value of land under ditch not yet prepared for irrigation is \$2.50 per acre, while that of good irrigated land is \$28.47 per acre. The difference, \$25.97, is the average value per acre added by irrigation.

Of the 2,184 farms in the state, including those in the Indian reservations, 2,026 are irrigated and 158 are unirrigated. The value of all land in the irrigated farms, not including buildings, is \$13,033,210, and of the unirrigated, it is \$242,410. The value of all buildings on irrigated farms is \$2,289,190, and for the unirrigated, \$50,900.

The irrigated farms are 92.8 per cent of the total num-

ber in the state. The corresponding percentage of the acres in irrigated farms to the total farm acreage of the state is 95.0 per cent; that of the value of land and improvements, exclusive of buildings, is 98.2 per cent; that of buildings, 97.8 per cent; that of implements and machinery, 97.6 per cent; that of live stock, 94.1 per cent; and of the total value of farm property, 96.4 per cent. The average size of all farms, exclusive of the holdings of Indians, is 1,242 acres; the average size of irrigated farms is 1,276 acres; and the average amount of irrigated land on each irrigated farm is 265 acres. In 1889 the average number of irrigated acres on each irrigated farm was 192. Outside of Indian reservations, the average value per acre of land, exclusive of buildings, for all farms is \$5.17; for unirrigated farms, \$1.87; for irrigated farms, \$5.35. The average value of irrigated land per acre is \$28.47, while that of the best irrigated land, suitable for growing alfalfa, is from \$50 to \$150. Irrigated fruit land is even more valuable.

CENSUS BULLETIN.

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JUNE 12, 1902.

MANUFACTURES.

COLLARS AND CUFFS.

Hon. WILLIAM R. MERRIAM,

Director of the Census.

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of collars and cuffs in the United States during the census year, prepared, under my direction, by Mr. Arthur L. Hunt, of the Census Office.

The manufacture of collars and cuffs is now for the first time made the subject of a special report by the Census Office, although the industry has been of commercial importance in the United States for over half a century. The statistics included in the report were collected, as in previous censuses, upon the schedule used for the general statistics of manufactures, but in view of the comparative importance of this industry, it was decided to supplement the canvass made by the enumerators and local special agents, and to give the industry more detailed treatment than is given to manufacturing industries in general, or than this industry has received heretofore.

As explained in the text, the statistics here presented pertain exclusively to establishments engaged primarily in the manufacture of collars and cuffs, and do not include the returns for establishments which manufacture collars and cuffs in connection with the manufacture of shirts, and therefore the number of dozens of shirts reported represent only such as are manufactured as a subsidiary product in the collar and cuff industry.

There was no separate classification for establishments engaged in the manufacture of collars and cuffs,

the returns being included either under "shirts" or "furnishing goods, men's," and, in the preparation of this report, some difficulty was encountered in determining the number of establishments for which the value of collars and cuffs represented the predominating product. For this reason, the totals given in this report may not include the returns for every collar and cuff establishment, as such. Nevertheless, the figures may be taken as fairly representing the totals for the industry.

Owing to the fact that there was no separate classification for the industry, no statistics are available for 1890, for purposes of comparison.

Acknowledgement is due Mr. Arthur M. Wight, secretary of the Chamber of Commerce of Troy, and Mr. Dewitt Clinton, librarian of the Young Men's Association of Troy, for valuable assistance and suggestions in the preparation of the text for the accompanying report.

The statistics are presented in 11 tables: Table 1 is a summary for 1900; Table 2 shows the establishments classified by the numbers of wage-earners employed, by states, for 1900; Table 3 shows the statistics of capital for 1900; Table 4 shows the wage-earners for 1900; Table 5 shows the miscellaneous expenses for 1900; Table 6 shows the cost of materials for 1900; Table 7 shows the kinds, quantity, and value of products for 1900; Table 8 shows the statistics for Troy, N. Y., and for New York state, in comparison with the totals for the United States; Table 9 shows the statistics for cities of New York exclusive of Troy; Table 10 shows the

imports, for consumption, of collars and cuffs, composed in whole or in part of linen, from 1890 to 1900, inclusive; and Table 11 shows the detailed statistics for the industry in 1900.

The reports show a capital of \$10,216,817 invested in the manufacture of collars and cuffs in the 57 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations engaged in this industry. The value of the products is returned as \$15,769,132, to produce which involved an outlay of \$583,087 for salaries of officials, clerks, etc.; \$5,658,969 for wages; \$1,128,887 for miscellaneous expenses, including rent, taxes, etc.; and \$6,011,456 for materials used, mill supplies, freight, and fuel. It is not to be assumed, how-

ever, that the difference between the aggregate of these sums and the value of the products is in any sense indicative of the profits in the manufacture of collars and cuffs during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the factory. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



Chief Statistician for Manufactures.

COLLARS AND CUFFS.

By ARTHUR L. HUNT.

The statistics presented in the following tables relate to establishments engaged in the manufacture of collars and cuffs, composed in whole or in part of linen, during the census year ending May 31, 1900. There was no separate classification for the manufacture of so-called linen collars and cuffs, the returns being included under one of two classifications, "shirts," or "furnishing goods, men's," and it was necessary to withdraw the schedules from these classifications in order to show separate data. Therefore, it is impossible to show comparative statistics for this industry for previous censuses.

In this connection it should be stated that the statistics presented in this report pertain exclusively to establishments engaged primarily in the manufacture of collars and cuffs, and reporting the same as their predominating product, and do not include returns from establishments engaged principally in the manufacture of shirts and men's furnishing goods, but manufacturing collars and cuffs as a subsidiary product. The number of dozens of shirts reported represents only such as were manufactured in connection with the collar and cuff industry. Owing to the fact that there was no separate classification for the industry, there was some difficulty encountered in the preparation of this report in presenting the entire number of establishments for which the value of collars and cuffs represented the predominating product. For this reason, the totals given in this report may not include the returns for every collar and cuff establishment, as such. Nevertheless, the figures given may be taken as fairly representing the totals for the industry.

Table 1 presents the principal features of the industry as returned for 1900.

TABLE 1.—SUMMARY: 1900.

| | |
|--|--------------|
| Number of establishments | 57 |
| Capital | \$10,216,317 |
| Salaries, clerks, etc., number | 508 |
| Salaries | \$583,087 |
| Wage-earners, average number | 17,115 |
| Total wages | \$5,058,969 |
| Men, 16 years and over, number | 2,391 |
| Wages | \$1,115,685 |
| Women, 16 years and over, number | 14,543 |
| Wages | \$4,515,856 |
| Children, under 16 years, number | 181 |
| Wages | \$27,428 |
| Miscellaneous expenses | \$1,128,887 |
| Cost of materials used | \$6,011,556 |
| Value of products | \$15,769,132 |

The industry became of commercial importance some years previous to 1850, and its growth since that date is demonstrated by reference to the number of establishments, capital invested, number of wage-earners, and

the value of the products, as given in Table 1. The size and general character of the establishments may be inferred from a computation of the averages for the above items. The average capital per establishment was \$179,234; the average number of wage-earners, 300, distributed as follows: Men, 42; women, 255; and children, 3; and the average value of product \$276,651. These averages indicate that in general the establishments engaged in this industry were of goodly proportions. This fact is further shown by Table 2, which is a summary of the establishments, grouped according to the number of wage-earners employed.

TABLE 2.—ESTABLISHMENTS CLASSIFIED BY NUMBER OF WAGE-EARNERS EMPLOYED, BY STATES: 1900.

| | United States. | New York. | All other states. ¹ |
|----------------------------------|----------------|-----------|--------------------------------|
| Total number of establishments.. | 57 | 54 | 3 |
| No employees | | | |
| Under 5 | 5 | 5 | |
| 5 to 20 | 8 | 6 | 2 |
| 21 to 50 | 11 | 11 | |
| 51 to 100 | 7 | 7 | |
| 101 to 250 | 8 | 7 | 1 |
| 251 to 500 | 7 | 7 | |
| 501 to 1,000 | 6 | 6 | |
| Over 1,000 | 5 | 5 | |

¹ Includes establishments distributed as follows: Pennsylvania, 2; Vermont, 1.

Table 2 indicates that there was but one large establishment outside of the state of New York. The largest number, 11, was reported for the class employing 21 to 50 wage-earners. There were 8 establishments in each of the classes, 5 to 20, and 101 to 250; 7 each in the classes 51 to 100, and 251 to 500; 6 in the class, 501 to 1,000; and 5 employing over 1,000 wage-earners.

The firm and limited partnership form of organization predominates in this industry. Of the total number of establishments, 29, or 50.9 per cent were operated by firms or limited partnerships; 20, or 35.1 per cent, were conducted by individuals; and 8, or 14 per cent, were operated by incorporated companies.

Table 3 is a summary of the statistics of capital, with the per cent of each item to the total, for 1900.

TABLE 3.—CAPITAL: 1900.

| | Amount. | Per cent of total. |
|--|--------------|--------------------|
| Total | \$10,216,317 | 100.0 |
| Land | 303,347 | 3.0 |
| Buildings | 1,113,140 | 10.9 |
| Machinery, tools, and implements | 964,363 | 9.4 |
| Cash and sundries | 7,835,467 | 76.7 |

The sum reported for cash and sundries, including cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, constituted the principal item of capital, and formed 76.7 per cent of the total. The large per cent which this item formed of the total is due to the nature of the industry. Manufacturers are under the necessity of purchasing large quantities of cloth at the various seasons in order to keep abreast of the almost numberless changes in styles and designs. This, together with the numerous other items included under this subdivision, made it by far the largest item of capital. The value of machinery, tools, and implements, land, and buildings, all formed comparatively small per cents of the total. The use of machines has supplanted hand labor in nearly every department of the industry, not only in the factory but also in the laundry, and the value of machinery, tools, and implements in 1900 formed a

larger per cent of the total than did the value of buildings. A number of companies rented their works, as is evidenced by Table 5, and this fact is partially accountable for the comparatively small valuation of land and buildings. Furthermore, the nature of the business is such that but little heavy machinery is required, and factories may be many stories in height, obviating the necessity of much ground space; and as there is not much vibration to the machinery, the buildings are not necessarily of expensive construction. The figures given in Table 3 do not represent the capital stock of the establishments, but simply the actual value of the plants, together with the amounts required for working capital. It appears that to produce \$1 of gross products required 65 cents of capital.

Table 4 shows the total number of wage-earners, with wages, the number of men, women, and children, with wages, and the per cent of each to the total number for 1900.

TABLE 4.—WAGE-EARNERS: 1900.

| TOTAL, ALL CLASSES. | | MEN, 16 YEARS AND OVER. | | | WOMEN, 16 YEARS AND OVER. | | | CHILDREN, UNDER 16 YEARS. | | |
|---------------------|-------------|-------------------------|--------------------|-------------|---------------------------|--------------------|-------------|---------------------------|--------------------|----------|
| Average number. | Wages. | Average number. | Per cent of total. | Wages. | Average number. | Per cent of total. | Wages. | Average number. | Per cent of total. | Wages. |
| 17,115 | \$5,658,969 | 2,391 | 14.0 | \$1,115,685 | 14,543 | 85.0 | \$4,515,856 | 181 | 1.0 | \$27,428 |

The general character of the industry relative to wage-earners is shown in Table 4. As indicated therein, the industry gives employment to few children. Collar and cuff making, with the exception of the cutting, upon which the men are engaged, is done mostly by women. It should be stated in this connection that the great majority of wage-earners are employed by the piece, and consequently any deductions regarding the average rate of wages from the figures presented in Table 4 would be inaccurate and misleading.

The making by home workers of some part of the collar or cuff is a peculiar and interesting phase of the manufacture. Since the inception of the industry, much of the work has been done at the homes of families, the members of which were either unable, on account of household duties, to take employment in a factory, or were unwilling to do so. It is stated that there is not a town within a radius of 30 miles of Troy, N. Y., wherein a portion of the female population is not engaged in some part of collar and cuff manufacture. It is estimated that at least one-half of the population of Lansingburg, which is now a part of Troy, are directly dependent on collars, cuffs, and shirts for labor. In West Troy, Bath, and Greenbush, large numbers of females are engaged at home on collar work. Albany also receives large quantities of work to be distributed to women and girls residing within the city limits.

The work sent to these places is usually "turning" and "pasting," as this work must be carefully handled on its return, whereas if sent to more distant places the "turning" would be valueless on account of being pressed out of shape. The people of more distant points are employed mostly in "buttonholing." This work goes to Salem, Greenwich, and Cambridge, in Washington county; as far as Chatham, in Columbia county; and to Pittstown, Valley Falls, Hoosic Falls, Sandlake, Grafton, Stephentown, and various villages between these places. Transportation of the goods to and from the factories is effected either by stage drivers or by carriers who collect the work and come to town to deliver it.

The personnel of the operatives in the factories of Troy is much above the average. The women and girls employed are bright and intelligent, and nearly all of them are natives of Troy or of the immediate vicinity. They seem to have collars and cuffs bred in the bone, and many of them have been trained for years to perfect some little detail of collar or cuff making which may give to that make a superiority that is characteristic of the brand. To these facts may be attributed, to a large extent, the localization of the industry in and about Troy.

Table 5 shows the several items of miscellaneous expenses, with the per cent of each to the total, for 1900.

TABLE 5.—MISCELLANEOUS EXPENSES: 1900.

| | Amount. | Per cent of total. |
|--|-------------|--------------------|
| Total | \$1,128,887 | 100.0 |
| Rent of works | 78,588 | 7.0 |
| Taxes, not including internal revenue | 14,188 | 1.2 |
| Rent of offices, insurance, interest, repairs, advertising, and other sundries | 672,829 | 59.6 |
| Contract work | 363,282 | 32.2 |

The successful manufacture of collars and cuffs necessitates the expenditure of large sums for advertising purposes. Further, nearly all of the large establishments maintain offices in several of the larger cities of the country. Quite naturally, then, the amount paid for rent of offices and all other sundries not elsewhere reported, including advertising, formed the major part of miscellaneous expenses. That the amount paid for contract work constituted nearly one-third of the total reported for miscellaneous expenses is a noteworthy fact and is characteristic of the industry. This item does not include the amounts paid to home workers for piecework, as described in connection with Table 4.

Table 6 is a summary of the quantity and cost of the different materials, with the per cent of each item to the total quantity and cost, for 1900.

TABLE 6.—QUANTITY AND COST OF MATERIALS: 1900.

| | Square yards. | Cost. | Per cent of total | |
|--|---------------|-------------|-------------------|-------|
| | | | Quantity. | Cost. |
| Total | | \$6,011,556 | | 100.0 |
| Cloth | 60,817,101 | 5,251,237 | 100.0 | 87.4 |
| Cotton | 57,602,200 | 4,255,930 | 94.7 | 70.8 |
| Linen | 3,214,901 | 995,307 | 5.3 | 16.6 |
| Buttons, thread, ribbon, tape, etc. | | 199,240 | | 3.3 |
| Fuel | | 64,862 | | 1.1 |
| Rent of power and heat | | 8,941 | | 0.1 |
| Mill supplies | | 50,459 | | 0.8 |
| All other materials | | 306,955 | | 5.1 |
| Freight | | 129,862 | | 2.2 |

In the manufacture of collars, cuffs, and shirts both cotton and linen are used. Table 6 shows that the quantity of cotton cloth formed 94.7 per cent of the total number of square yards of cloth used. Attention should be called to the fact that, as indicated in Table 7, the value of shirts constituted over one-third of the value of products, and in their manufacture cotton cloth is the principal material used. The average cost of cotton cloth per square yard was 7.4 cents and of linen cloth 31 cents. The average cost is obtained from the totals of the whole number of establishments

from which reports were received; in many instances the materials were bought delivered, and therefore the average can not be assumed to be the price paid by any particular establishment.

The cost of "All other materials" included the amount expended for boxes, cases, and numerous other incidentals required to prepare the product for the market.

Table 7 is a summary of the value of products, the number of dozens, and the value of collars and cuffs, shirts, and shirt waists, and the per cent of each to the total value for 1900.

TABLE 7.—QUANTITY AND VALUE OF PRODUCTS: 1900.

| | Quantity (dozens). | Value. | Per cent of total value. |
|--------------------------|--------------------|--------------|--------------------------|
| Total | | \$15,769,132 | 100.0 |
| Collars and cuffs | 10,086,045 | 9,077,700 | 57.6 |
| Shirts | 858,868 | 5,864,671 | 37.2 |
| Shirt waists | 81,918 | 650,228 | 4.1 |
| All other products | | 176,533 | 1.1 |

As shown by Table 7, the total value of products was \$15,769,132. The extent to which the manufacture of shirts is carried on in connection with the collar and cuff industry is exemplified by this table. The value of collars and cuffs was \$9,077,700, or 57.6 per cent of the total, and the value of shirts was \$5,864,671, or 37.2 per cent of the total. The number of collars and cuffs was 10,086,045 dozens, or in actual numbers, 121,032,540, and the number of shirts was 858,868 dozens, or 10,306,416. Attention should again be directed to the fact that the above figures do not represent the total quantities of collars and cuffs manufactured during the census year, but only those made by establishments which reported collars and cuffs as their principal product. No attempt was made to secure the quantities manufactured by establishments engaged primarily in the manufacture of shirts, as collars and cuffs are principally made by them to match the shirt. Further, the number of dozens of shirts represents only the quantity manufactured in connection with the collar and cuff industry, and therefore constituted only a small percentage of the total number manufactured by establishments engaged principally in the manufacture of shirts. The value of shirt waists and "all other products" formed but relatively small per cents of the total.

Table 8 shows the totals for Troy and other cities in New York, in comparison with the state as a whole, and with the United States.

TABLE 8.—COMPARATIVE SUMMARY OF STATISTICS FOR TROY AND OTHER CITIES OF NEW YORK, FOR NEW YORK STATE, AND FOR THE UNITED STATES: 1900.

| | United States. | NEW YORK STATE. | | | | | |
|---|----------------|-----------------|----------------------------------|--------------|--------------------------|----------------------------|--------------------------|
| | | Total. | Per cent of United States total. | Troy. | | Other cities, ¹ | |
| | | | | Total. | Per cent of state total. | Total. | Per cent of state total. |
| Number of establishments..... | 57 | 54 | 94.7 | 29 | 53.7 | 25 | 46.3 |
| Capital..... | \$10,216,317 | \$10,176,067 | 99.6 | \$8,768,337 | 86.2 | \$1,407,730 | 13.8 |
| Salaried officials, clerks, etc., number..... | 808 | 499 | 61.8 | 412 | 82.6 | 87 | 17.4 |
| Salaries..... | \$583,087 | \$574,870 | 99.6 | \$189,039 | 33.1 | \$84,911 | 14.8 |
| Wage-earners, average number..... | 17,115 | 17,012 | 99.4 | 14,822 | 87.1 | 2,190 | 12.9 |
| Total wages..... | \$5,658,969 | \$5,639,095 | 99.5 | \$4,956,427 | 88.0 | \$676,668 | 12.0 |
| Men, 16 years and over, average number..... | 2,391 | 2,374 | 99.3 | 2,013 | 84.3 | 361 | 15.2 |
| Wages..... | \$1,116,685 | \$1,106,907 | 99.2 | \$941,500 | 85.1 | \$165,407 | 14.9 |
| Women, 16 years and over, average number..... | 14,543 | 14,459 | 99.4 | 12,666 | 87.6 | 1,793 | 12.4 |
| Wages..... | \$4,515,856 | \$4,499,133 | 99.6 | \$3,993,309 | 88.3 | \$505,824 | 11.2 |
| Children, under 16 years, average number..... | 181 | 179 | 99.9 | 143 | 79.9 | 36 | 20.1 |
| Wages..... | \$27,428 | \$27,055 | 98.6 | \$21,618 | 79.9 | \$5,437 | 20.1 |
| Miscellaneous expenses..... | \$1,128,887 | \$1,118,908 | 99.1 | \$954,507 | 85.0 | \$134,396 | 12.0 |
| Cost of materials used..... | \$9,011,556 | \$8,992,425 | 99.7 | \$8,064,589 | 84.5 | \$927,836 | 15.5 |
| Value of products..... | \$15,769,182 | \$15,738,541 | 99.6 | \$13,460,196 | 85.7 | \$2,248,345 | 14.3 |
| Collars and cuffs: | | | | | | | |
| Value..... | \$9,077,700 | \$9,020,562 | 99.4 | \$8,078,271 | 89.5 | \$947,291 | 10.5 |
| Dozen..... | 10,089,945 | 10,011,650 | 99.3 | 8,851,400 | 88.7 | 1,130,250 | 11.3 |
| All other products..... | \$6,691,482 | \$6,682,979 | 99.9 | \$5,386,925 | 80.6 | \$1,296,054 | 19.4 |

¹ Includes establishments distributed as follows: Albany, 9; Glens Falls, 6; New York, 7; Cohoes, 1; Malone, 1; Schenectady, 1. (See Table 9.)

Table 8 indicates the extent to which the industry is local and peculiar to the state of New York, and especially to Troy. The industry is practically confined to the state of New York and is localized in and about Troy. Of the total number of establishments returned for the state, 29, or 53.7 per cent, were located in that city. The capital reported for Troy was \$8,768,337, or 86.2 per cent, and the wage-earners formed 87.1 per cent of the state total. Of the remaining items not one formed less than 80 per cent of the state total. The large per cent of the total capital and number of wage-earners in comparison with the smaller per cent of the number of establishments shows the size of the Troy establishments in comparison with those of the rest of the state.

The average capital and average number of wage-earners of the establishments located in Troy and in the other cities shed further light upon this subject. The average capital per establishment for Troy was \$302,356 and the average number of wage-earners 511, as compared with an average capital of \$17,159 and an average number of wage-earners of 88 for the other cities of the state. The value of products formed 85.7 per cent, and the number and value of collars and cuffs was 89.5 per cent, of the total for the state.

This industry resembles the manufacture of leather gloves and mittens in its tendency to centralize in one community; and the causes of the localization are analogous, as both were due to the circumstances connected with the inception of the industries in this country. The historical sketch which follows indicates that the first collars and cuffs were made in Troy, and as the industry became a factor in the commercial world, the number of families which became dependent upon it steadily increased, until nearly every one within a radius of 25 or 30 miles was vitally interested in the manufacture of collars and cuffs. Nearly every factory is either owned or controlled by residents of Troy, most of whom were at one time employed in the factories, and who, by their enterprise and energy, have become managers or owners of establishments. The young women, even after leaving the factory to assume the responsibilities of the household, continue to "turn," "paste," or "buttonhole" collars and cuffs during their leisure hours. Thus circumstances have continued to make this industry local.

Collars and cuffs are manufactured in other cities in New York to some extent, but principally within a short distance of Troy. The statistics for these cities are shown in Table 9.

TABLE 9.—STATISTICS OF CITIES OF NEW YORK STATE, EXCLUSIVE OF TROY: 1900.

| | Rank, by value of products. | Number of establishments. | Capital. | SALARIED OFFICIALS, CLERKS, ETC. | | WAGE-EARNERS. | |
|---------------------------------|-----------------------------|---------------------------|-------------|----------------------------------|-----------|-----------------|-----------|
| | | | | Number. | Salaries. | Average number. | Wages. |
| Total..... | | 25 | \$1,407,730 | 87 | \$84,911 | 2,190 | \$676,668 |
| Glens Falls..... | 1 | 6 | 518,462 | 46 | 37,597 | 878 | 200,031 |
| Albany..... | 2 | 9 | 373,540 | 15 | 16,804 | 691 | 193,268 |
| New York..... | 3 | 7 | 140,148 | 22 | 18,180 | 189 | 77,922 |
| Other cities ¹ | | 3 | 375,571 | 4 | 12,350 | 532 | 205,411 |

TABLE 9.—STATISTICS OF CITIES OF NEW YORK STATE, EXCLUSIVE OF TROY: 1900—Continued.

| | Miscellaneous expenses. | Cost of materials used. | PRODUCTS. | | | | | |
|---------------------------------|-------------------------|-------------------------|--------------|--------------------|-----------|---------|-------------|---------------------|
| | | | Total value. | Collars and cuffs. | | Shirts. | | All other products. |
| | | | | Dozens. | Value. | Dozens. | Value. |  | Value. |
| Total | \$134,396 | \$927,886 | \$2,243,345 | 1,130,250 | \$947,291 | 153,022 | \$1,094,849 | \$201,205 |
| Glens Falls | 46,196 | 234,591 | 720,982 | 463,669 | 397,012 | 35,762 | 232,370 | 80,700 |
| Albany | 25,726 | 250,107 | 602,805 | 281,744 | 210,679 | 61,440 | 244,101 | 143,025 |
| New York | 19,843 | 150,365 | 297,415 | 194,437 | 147,250 | 35,720 | 123,925 | 21,540 |
| Other cities ¹ | 43,132 | 232,823 | 622,140 | 201,000 | 191,450 | 50,700 | 123,750 | 940 |

¹Includes establishments distributed as follows: Cohoes, 1; Malone, 1; Schenectady, 1.

Table 9 shows that Glens Falls led the remaining cities in the value of products, although Albany ranked first in the number of establishments. New York followed Albany in the number of establishments and also in the value of products. The total output of collars and cuffs for these cities is insignificant in comparison with the number reported for Troy.

Table 10 shows the imports of collars and cuffs, composed in whole or in part of linen, for each year from 1890 to 1900, inclusive, according to the reports of the Bureau of Statistics, Treasury Department.

TABLE 10.—COLLARS AND CUFFS, COMPOSED IN WHOLE OR IN PART OF LINEN, IMPORTS FOR CONSUMPTION: 1890 TO 1900, INCLUSIVE.

| YEARS. | Dozens. | Value. | YEARS. | Dozens. | Value. |
|-----------|---------|----------|-----------|---------|-----------|
| 1900..... | 48,280 | \$56,338 | 1897..... | 97,575 | \$103,603 |
| 1899..... | 55,443 | 60,479 | 1896..... | 107,849 | 120,017 |
| 1898..... | 66,833 | 70,033 | 1895..... | 111,136 | 133,457 |

TABLE 10.—COLLARS AND CUFFS, COMPOSED IN WHOLE OR IN PART OF LINEN, IMPORTS FOR CONSUMPTION: 1890 TO 1900, INCLUSIVE—Continued.

| YEARS. | Dozens. | Value. | YEARS. | Dozens. | Value. |
|-----------|---------|----------|-----------|------------------|------------------|
| 1894..... | 83,679 | \$87,854 | 1891..... | 40,083 | \$45,022 |
| 1893..... | 89,138 | 93,705 | 1890..... | (¹) | (¹) |
| 1892..... | 78,328 | 87,285 | | | |

¹Not separately reported prior to 1891.

The fluctuations in the imports of collars and cuffs are shown in the above table. It appears that from 1891 to 1895, inclusive, with the exception of 1894, the imports steadily increased. Since 1895 the decrease has been more rapid than was the increase prior to that date, until in 1900 the figures were only slightly in excess of those reported for 1891. They are so insignificant compared with the American manufacture that it may be said that nearly all of the collars and cuffs used in this country are of home manufacture.

HISTORICAL AND DESCRIPTIVE.

The history of collar manufacture in this country dates from its inception in Troy, N. Y., about seventy-five years ago. At that date shirts were made with collars attached; and it is stated that the wife of a Troy blacksmith made for sale the first separate collar, which was cut with scissors on a paper pattern. The making of detachable collars was naturally regarded as a great reform in men's wear, and it attracted the attention of Mr. Ebenezer Brown, a retired Methodist minister, who at that time was the proprietor of a small dry goods store. He it was who first conceived the idea of making collars in commercial quantities, and their manufacture formed an important branch of his business.

At first the collars were made by the female members of his household, the linen being cut to shape with scissors, hand stitched, and starched and ironed upon the kitchen table. Soon the increasing demand for his "store collars" encouraged him to engage the services of the wives and daughters of his neighbors. The material was cut at his store on a wooden pattern, which presaged the modern cutting table, and was the first notable advance in the process of manufacture. The material being ready, the workers took it to their homes and agreed to "make, wash, starch, and iron

the collars," and to receive merchandise as their compensation. It is stated that a card containing the following statement of the former preacher accompanied each installment of work: "In pay you buy my goods at my prices."

The collars were tied around the neck of the wearer with tape string, and were commonly referred to as "string collars." They were two-ply, of heavy linen, made somewhat stiff with starch, and were supported by haircloth stocks buckled at the back of the neck.¹ Their immediate success and popularity caused others to engage in the manufacture. For a time they followed Mr. Brown's methods, and conducted a collar business in connection with other lines of industry; and it was not until 1843 that the manufacture of linen collars and shirt bosoms was engaged in as a separate business.

The following year another independent stock and collar maker appeared, and a few years later he added a laundry to his factory and laundered the goods of other collar makers in addition to those of his own manufacture. The operation of a laundry in connection with collar manufacture had a stimulating effect

¹City of Troy and Its Manufacturing, by Arthur James Weise, 1886, page 74.

upon the industry, and caused the establishment of additional collar factories.

The manufacture of collars was an organized industry some years previous to that of cuffs and shirts. It was not until the year 1845 that the latter industry was begun in Troy, and it was a natural outgrowth of the collar industry. That the collar industry was at that time in a prosperous condition may be judged from the fact that previous to the introduction of the sewing machine, manufacturers were unable to fill their orders for lack of a sufficient number of skilled operators.

It appears that the introduction of the sewing machine for the manufacture of collars and cuffs is credited to both Mr. O. W. Edson and Mr. Jefferson Gardner. At first there was much opposition to the use of the machine, both on the part of the employer and employee, the former having little faith in its efficiency and the latter fearing that the machine would displace his labor. Mr. Edson, however, purchased a number of sewing machines, and at his home instructed the girls in his employ how to operate them; and as soon as the operator became proficient the machine was transferred to his factory. Mr. Gardner also installed machines in his establishment at about the same time. The advantages of machine over hand work were soon seen and appreciated, and other manufacturers began to adopt them. The application of steam power was another great advance in the industry and not only caused the erection of new establishments, but greatly reduced the cost of production, and also caused a proportionate decrease in the price to the consumer.

In general there are two classes of collars, the standing and the turn down, and, of course, there are endless varieties of each class, each manufacturer originating a number of styles for which his firm is usually widely known. After an examination of the strength, weight, and color of the linen and muslin, the goods are sent to the cutter, who stretches the webs back and forth upon the table until the desired number of thicknesses is obtained, when iron weights are placed at intervals to keep the cloth in position. The cutter, after arranging block patterns of the desired size and style, begins at the edge of the cloth nearest to him and so cuts away from him across the goods. The back and front of a collar are cut together, and a second operation is required for cutting the interlinings. In a straight standing collar the facing is usually of cambric muslin, except in the case of an all-linen collar, and it must conform to the shape of the front of the collar. The interlining in a four-ply collar is cut in one piece and doubled over.

As soon as the separate parts of a collar are ready to be put together the facings are sent to the "stampers," or girls who stamp the name, brand, and size on the facings. After this operation the constituent parts of the collar are arranged by the "pasters," who properly arrange the parts with paste in preparation for the

"turners." At this stage the interlining is without, and the front and back are on the inside. The pieces are stitched at the top and sides by the "runners," after which they are ready for the "turners." The reversing or turning of the collar requires a certain degree of skill and experience and is mostly done by "home workers" and not as a factory employment, although machinery is now doing this work to some extent. The collar is then ready to be sent to the stitching room proper, where the final sewing is done, after which the buttonholes are made.

The making of a turn-down collar is somewhat more complicated than that of a standing collar, as it is composed of two parts, the top and the band, whereas the standing collar in most instances is all one piece. The band itself is made up of three pieces, front, back, and interlining, and in a number of factories they are cut by stamping dies. On this style of collar the name, size, and brand are stamped on the front of the band. The parts comprising the top and front, back, and interlining are fitted together, overseamed, and run. The stitchers prepare the top for joining to the band. Inasmuch as the top and band have to be carefully fitted to each other, the curved line of one exactly coinciding with the curve of the other, "banding" requires considerable skill. The interlining and the back of the band are stitched to one side of the "top" and the "front" is stitched to the other side, and the band is then turned to its proper shape. The buttonholes are next made, and the collar is complete. The processes employed in cuff manufacture are similar to those used in the manufacture of collars.

After the collars and cuffs are finished they are sorted and counted, prior to being sent to the laundry. Many of the larger manufacturers operate laundries in connection with their factories, while others send their goods to outside laundry establishments. Wonderful improvements have been made in laundry machinery and apparatus, and both starching and ironing are now extensively done by machinery, although hand starching is still in vogue. From the establishment of the United States Patent Office to January 1, 1902, there have been issued, in connection with the laundry industry, 8,762 patents, classified as follows:

| Patents. | Number. | Patents. | Number. |
|-------------------------------|---------|---|---------|
| Total..... | 8,762 | Wash boilers..... | 453 |
| Bosom boards..... | 163 | Washing-machine agitator..... | 258 |
| Clamps..... | 14 | Washing machine and bed..... | 528 |
| Clothes driers..... | 821 | Washing-machine boiler..... | 200 |
| Clothesline fasteners..... | 110 | Washing machine, combined washing and wringing..... | 50 |
| Clothesline reels..... | 82 | Washing-machine cylinder..... | 269 |
| Clotheslines..... | 209 | Washing machines, miscellaneous..... | 72 |
| Clothes pounders..... | 230 | Washing-machine pounder..... | 797 |
| Clothes sticks and tongs..... | 41 | Washing-machine reciprocating rubber..... | 931 |
| Fluting irons..... | 160 | Washing machine, rocking..... | 191 |
| Hand rubbers..... | 43 | Wringing..... | 122 |
| Ironing machines..... | 400 | Washing-machine roller..... | 167 |
| Ironing tables..... | 559 | Washing-machine rotary rubber..... | 51 |
| Laundries..... | 22 | Wash tubs..... | 98 |
| Mangles..... | 96 | Wringer rolls..... | 524 |
| Sadiron holder..... | 58 | Wringers..... | |
| Sadiron..... | 493 | | |
| Starching machines..... | 91 | | |
| Wash benches..... | 111 | | |
| Washboards..... | 318 | | |

After being received in the laundry the goods are first washed in large revolving wash wheels, which are located in the basement. They are then sent upstairs to be smoothed out preparatory to starching, which is the next process. After this operation they are smoothed out by hand, before being sent to the dry room to be made ready for the ironing machine. After coming from the laundry they are examined for any damages or manufacturing imperfections hitherto overlooked. They are then boxed and prepared for shipment.

Table 11, which follows, shows in detail the statistics relating to the manufacture of collars and cuffs, as returned by the 57 establishments engaged in the industry in 1900.

TABLE 11.—COLLARS AND CUFFS, BY STATES: 1900.

| | United States. | New York. | All other states. ¹ |
|---|----------------|--------------|--------------------------------|
| Number of establishments | 57 | 51 | 3 |
| Character of organization: | | | |
| Individual | 20 | 18 | 2 |
| Firm and limited partnership | 29 | 29 | — |
| Incorporated company | 8 | 7 | 1 |
| Capital: | | | |
| Total | \$10,216,317 | \$10,176,067 | \$40,250 |
| Land | \$303,847 | \$302,897 | \$450 |
| Buildings | \$1,113,140 | \$1,105,940 | \$7,200 |
| Machinery, tools, and implements | \$964,363 | \$957,063 | \$7,300 |
| Cash and sundries | \$7,835,467 | \$7,810,167 | \$25,300 |
| Proprietors and firm members | 104 | 102 | 2 |
| Salaried officials, clerks, etc.: | | | |
| Total number | 508 | 499 | 9 |
| Total salaries | \$583,087 | \$574,850 | \$8,237 |
| Officers of corporations— | | | |
| Number | 19 | 19 | — |
| Salaries | \$73,730 | \$73,730 | — |
| General superintendents, managers, clerks, etc.— | | | |
| Total number | 489 | 480 | 9 |
| Total salaries | \$509,357 | \$501,120 | \$8,237 |
| Men— | | | |
| Number | 429 | 422 | 7 |
| Salaries | \$481,591 | \$474,412 | \$7,179 |
| Women— | | | |
| Number | 60 | 58 | 2 |
| Salaries | \$27,706 | \$26,708 | \$1,058 |
| Wage-earners, including pieceworkers: | | | |
| Greatest number employed at any one time during the year | 18,419 | 18,230 | 189 |
| Least number employed at any one time during the year | 14,854 | 14,795 | 59 |
| Average number | 17,135 | 17,032 | 103 |
| Total wages | \$5,058,969 | \$5,633,095 | \$25,874 |
| Men, 16 years and over— | | | |
| Average number | 2,391 | 2,374 | 17 |
| Wages | \$1,115,685 | \$1,106,907 | \$8,778 |
| Women, 16 years and over— | | | |
| Average number | 14,563 | 14,479 | 84 |
| Wages | \$4,515,856 | \$4,499,133 | \$16,723 |
| Children, under 16 years— | | | |
| Average number | 181 | 179 | 2 |
| Wages | \$27,428 | \$27,055 | \$373 |
| Average number of wage-earners, including pieceworkers, employed during each month: | | | |
| Men, 16 years and over— | | | |
| January | 2,507 | 2,495 | 12 |
| February | 2,545 | 2,531 | 14 |
| March | 2,615 | 2,601 | 14 |
| April | 2,587 | 2,572 | 15 |
| May | 2,377 | 2,358 | 19 |
| June | 2,540 | 2,322 | 18 |
| July | 2,274 | 2,256 | 18 |
| August | 2,066 | 2,045 | 21 |
| September | 2,241 | 2,221 | 20 |
| October | 2,297 | 2,278 | 19 |
| November | 2,442 | 2,423 | 19 |
| December | 2,405 | 2,386 | 19 |
| Women, 16 years and over— | | | |
| January | 14,937 | 14,900 | 37 |
| February | 15,518 | 15,479 | 39 |
| March | 15,856 | 15,808 | 48 |
| April | 15,617 | 15,561 | 56 |
| May | 14,787 | 14,723 | 64 |

¹Includes establishments distributed as follows: Pennsylvania, 2; Vermont, 1.

TABLE 11.—COLLARS AND CUFFS, BY STATES: 1900—Continued.

| | United States. | New York. | All other states. ¹ |
|--|----------------|--------------|--------------------------------|
| Average number of wage-earners, including pieceworkers, employed during each month—Continued. | | | |
| Women, 16 years and over—Continued, | | | |
| June | 14,487 | 14,422 | 65 |
| July | 13,709 | 13,615 | 94 |
| August | 13,217 | 13,087 | 130 |
| September | 13,602 | 13,468 | 144 |
| October | 13,925 | 13,807 | 118 |
| November | 14,439 | 14,341 | 98 |
| December | 14,056 | 14,542 | 114 |
| Children, under 16 years— | | | |
| January | 172 | 170 | 2 |
| February | 178 | 176 | 2 |
| March | 182 | 180 | 2 |
| April | 182 | 180 | 2 |
| May | 193 | 194 | 4 |
| June | 211 | 209 | 2 |
| July | 193 | 192 | 1 |
| August | 173 | 171 | 2 |
| September | 178 | 176 | 2 |
| October | 175 | 173 | 2 |
| November | 178 | 175 | 3 |
| December | 154 | 153 | 1 |
| Miscellaneous expenses: | | | |
| Total | \$1,128,887 | \$1,118,904 | \$9,984 |
| Rent of works | \$78,588 | \$78,393 | \$195 |
| Taxes, not including internal revenue | \$14,188 | \$14,174 | \$14 |
| Rent of offices, insurance, interest, etc. | \$672,829 | \$670,452 | \$2,377 |
| Contract work | \$303,282 | \$355,884 | \$7,398 |
| Materials used: | | | |
| Total cost | \$6,011,556 | \$5,992,425 | \$19,131 |
| Cloth— | | | |
| Total square yards | 60,817,101 | 60,020,403 | 190,698 |
| Total cost | \$5,251,237 | \$5,235,255 | \$15,982 |
| Cotton, square yards | 57,602,200 | 57,421,002 | 181,198 |
| Cost | \$4,255,930 | \$4,242,898 | \$13,032 |
| Linen, square yards | 3,214,901 | 3,205,401 | 9,500 |
| Cost | \$995,307 | \$992,357 | \$2,950 |
| Buttons, thread, ribbon, tape, etc., cost | \$199,240 | \$198,395 | \$845 |
| Fuel | \$64,802 | \$64,486 | \$316 |
| Rent of power and heat | \$8,911 | \$8,914 | \$27 |
| Mill supplies | \$50,469 | \$50,376 | \$93 |
| All other materials | \$306,955 | \$305,393 | \$1,562 |
| Freight | \$129,862 | \$129,606 | \$256 |
| Products: | | | |
| Aggregate value | \$15,769,132 | \$15,708,541 | \$65,591 |
| Collars, cuffs, shirts, and shirt waists: | | | |
| Total value | \$15,592,599 | \$15,535,461 | \$57,138 |
| Total cost | \$10,086,045 | \$10,011,650 | \$74,395 |
| Collars and cuffs, dozens | \$9,077,700 | \$9,020,562 | \$57,138 |
| Value | \$58,868 | \$58,868 | — |
| Shirts, dozens | \$5,864,671 | \$5,864,671 | — |
| Value | \$1,948 | \$1,948 | — |
| Shirt waists, dozens | \$650,228 | \$650,228 | — |
| Value | \$176,533 | \$168,080 | \$8,453 |
| All other products, value | — | — | — |
| Comparison of products: | | | |
| Number of establishments reporting for both years | 44 | 42 | 2 |
| Value for census year | \$13,185,380 | \$13,120,439 | \$64,941 |
| Value for preceding business year | \$11,994,237 | \$11,965,637 | \$28,600 |
| Power: | | | |
| Number of establishments reporting | 46 | 43 | 3 |
| Total horsepower | 2,304 | 2,269 | 35 |
| Owned— | | | |
| Engines— | | | |
| Steam, number | 29 | 27 | 2 |
| Horsepower | 1,782 | 1,749 | 33 |
| Water wheels, number | 3 | 3 | — |
| Horsepower | 140 | 140 | — |
| Electric motors, number | 1 | 1 | — |
| Horsepower | 2 | 2 | — |
| Rented— | | | |
| Electric, horsepower | 141 | 141 | — |
| All other, horsepower | 239 | 237 | 2 |
| Furnished to other establishments, horsepower | 45 | 45 | — |
| Establishments classified by number of persons employed, not including proprietors and firm members: | | | |
| Total number of establishments | 57 | 54 | 3 |
| Under 5 | 8 | 6 | 2 |
| 5 to 20 | 11 | 11 | — |
| 21 to 50 | 7 | 7 | — |
| 51 to 100 | 8 | 7 | 1 |
| 101 to 250 | 7 | 7 | — |
| 251 to 500 | 6 | 6 | — |
| 501 to 1,000 | 5 | 5 | — |
| Over 1,000 | — | — | — |

¹Includes establishments distributed as follows: Pennsylvania, 2; Vermont, 1.

Twelfth Census of the United States.

CENSUS BULLETIN.

No. 189.

WASHINGTON, D. C.

JUNE 14, 1902.

MANUFACTURES.

CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT.

HON. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of cheese, butter, and condensed milk, factory product, during the census year ending May 31, 1900, prepared under my direction by Mr. Henry E. Alvord, chief of the dairy division of the United States Department of Agriculture, acting in the capacity of an expert special agent of the division of manufactures of the Census Office.

The industry was introduced into the United States prior to 1880, and at the census of that date, and in 1890, its general statistics were collected, and may be found in Table 1 of the accompanying report.

The statistics are presented in 12 tables: Table 1 showing comparative figures for the industry, including urban dairy and factory products at the censuses of 1880, 1890, and 1900; Table 2 showing the comparative figures of the factory products for the last three decades; Table 3 showing comparative statistics of the urban dairy products for 1890 and 1900; Table 4 showing, by states, the number of establishments classified according to products; Table 5 presenting a comparative summary of the number of establishments in selected states, as reported for 1890 and 1900; Table 6 showing capital invested in cheese, butter, and condensed-milk factories,

by geographical groups, 1890 and 1900; Table 7 showing the quantity and cost of materials for 1890 and 1900; Table 8 showing the kind, quantity, and value of products for 1890 and 1900; Table 9 showing the kind, quantity, and value of products in the 5 states of greatest production for 1900 and comparison of total values for 1890 and 1900; Table 10 showing a comparative summary of the factory portion of the industry, by states, arranged geographically, 1890 and 1900; Table 11 showing the details of the factory part of the industry, by states and territories, for 1900; and Table 12 showing the details of the urban dairy branch of the industry, by states and territories, 1900.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class, overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried

employees included in that group for the census of 1890.

In some instances the number of proprietors and firm members, shown in the accompanying tables, falls short of the number of establishments reported. This is accounted for by the fact that no proprietors or firm members are reported for corporations or cooperative establishments. The number of salaried officials, clerks, etc., is the greatest number reported employed at any one time during the year.

The reports show a capital of \$36,508,015 invested in the manufacture of cheese, butter, and condensed milk, factory product, in the 9,355 establishments reporting for the country. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations. The value of the products is returned at \$131,199,277, to produce which involved an outlay of \$915,442 for salaries of officials, clerks, etc.; \$6,170,670 for wages; \$1,590,766 for miscellaneous expenses, including rent, taxes, etc.; and \$109,151,205 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products, is in any sense, indicative of the profits in the manufacture of the products during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the shop or factory. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,



Chief Statistician for Manufactures.

CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT.

By HENRY E. ALVORD, *Expert Special Agent.*

One of the most striking features in the history of dairy farming in the United States is the transfer of this productive industry, in large part, from the farm to the factory. The cows and milk continue to be farm property and products, but a constantly increasing share of the labor of converting milk into marketable form is done at creameries, cheese factories, and condenseries. The products of these establishments come into the realm of manufactures.

This change has taken place during the last half century, which covers the period of development of associated and cooperative dairying in America. When the milk produced on two or more farms, or the cream from such milk, is brought together at one place to be condensed, or made into butter or cheese, domestic industry ceases, the place becomes a factory, and its output a manufactured product. The United States census of 1850 noted the existence of 8 cheese factories. The number increased very little until after 1860, but in 1870 there were 1,313 reported, including both cheese factories and butter factories, generally called creameries. The census for 1880 reported 3,932, and that for 1890 gave the number as 4,712. The latter number of establishments represented those only from which reports were received. It is known, however, that a considerable number of such factories, probably 2,500, were then actually in operation from which no returns were obtained for the Eleventh Census. This fact should be borne in mind when comparisons are made between the statistics of 1890 and those of 1900. The returns for 1900 include the statistics of 9,242 butter, cheese, and condensed-milk factories. These central plants have under their control 2,050 skimming or separating stations and 747 other branches.

The statistics presented in the following tables embrace the operations of establishments engaged in the manufacture of cheese, butter, and condensed milk. Table 1 presents a general view of the growth of this form of dairying in the United States as returned at the censuses of 1880 to 1900, inclusive, with the percentages of increase for each decade.

TABLE 1.—COMPARATIVE SUMMARY, CHEESE, BUTTER, AND CONDENSED MILK, INCLUDING URBAN DAIRY AND FACTORY PRODUCTS, 1880 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

| | DATE OF CENSUS. | | | PER CENT OF INCREASE. | |
|------------------------------------|-----------------|--------------|------------------|-----------------------|--------------|
| | 1900 | 1890 | 1880 | 1890 to 1900 | 1880 to 1890 |
| Number of establishments | 9,355 | 4,712 | 3,932 | 98.5 | 19.8 |
| Capital | \$36,508,015 | \$16,624,163 | \$9,604,803 | 119.6 | 78.1 |
| Salaries, etc., number | 2,828 | 12,320 | (²) | 21.9 | ..... |
| Salaries | \$915,442 | \$968,604 | (²) | \$5.5 | ..... |
| Wage-earners, average number | 12,865 | 12,601 | 7,903 | 2.1 | 59.4 |
| Total wages | \$6,170,670 | \$4,422,101 | \$1,546,495 | 39.5 | 185.9 |
| Men, 16 years and over | 11,694 | 11,775 | 6,419 | 30.7 | 33.4 |
| Wages | \$5,862,256 | \$4,267,169 | (²) | 37.4 | ..... |
| Women, 16 years and over | 1,049 | 725 | 1,330 | 44.7 | 345.5 |
| Wages | \$290,882 | \$143,758 | (²) | 102.3 | ..... |
| Children, under 16 years | 122 | 101 | 154 | 20.8 | 334.4 |
| Wages | \$17,532 | \$11,174 | (²) | 56.9 | ..... |
| Miscellaneous expenses | \$1,590,766 | \$875,182 | (⁴) | 81.8 | ..... |
| Cost of materials used | \$109,151,205 | \$51,364,574 | \$18,363,579 | 112.5 | 179.7 |
| Value of products | \$131,199,277 | \$62,686,043 | \$25,742,510 | 109.3 | 143.5 |

¹ Includes proprietors and firm members, with their salaries; number only reported in 1900, but not included in this summary.

² Not reported separately.

³ Decrease.

⁴ Not reported.

Table 1 shows that the production of butter, cheese, and condensed milk greatly increased during the last twenty years, the capital having increased from \$9,604,803 in 1880 to \$36,508,015 in 1900, a gain of \$26,903,212, or 280.1 per cent. The products in the same period increased from \$25,742,510 to \$131,199,277, a gain of \$105,456,767, or 409.7 per cent, and the number of establishments increased from 3,932 to 9,355, or 137.9 per cent. (The total of 9,355 is made up of 9,242 regular butter, cheese, and condensed milk factories, and 113 urban establishments reporting the manufacture of butter or cheese or both.)

Tables 2 and 3 show separately the operations of the factories, and of the urban dairy establishments engaged in the manufacture of butter, cheese, and condensed milk.

TABLE 2.—COMPARATIVE SUMMARY, CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, 1880 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

| | DATE OF CENSUS. | | | PER CENT OF INCREASE. | |
|--|-----------------|--------------|------------------|-----------------------|--------------|
| | 1900 | 1890 | 1880 | 1890 to 1900 | 1880 to 1890 |
| Number of establishments | 9,242 | 4,552 | 3,992 | 108.0 | 15.8 |
| Capital | \$36,309,164 | \$16,016,573 | \$9,604,803 | 126.7 | 66.8 |
| Salaried officials, clerks, etc., number | 2,818 | 12,150 | (²) | 31.1 | ..... |
| Salaries | \$911,712 | \$367,151 | (²) | 5.1 | ..... |
| Wage-earners, average number | 12,799 | 12,219 | 7,908 | 4.7 | 54.6 |
| Total wages | \$6,145,561 | \$4,248,854 | \$1,645,495 | 44.6 | 174.7 |
| Men, 16 years and over | 11,637 | 11,429 | 6,419 | 1.8 | 78.0 |
| Wages | \$5,838,989 | \$4,102,462 | (²) | 42.3 | ..... |
| Women, 16 years and over | 1,041 | 690 | 1,330 | 50.9 | \$48.1 |
| Wages | \$289,190 | \$135,426 | (²) | 113.5 | ..... |
| Children, under 16 years | 121 | 100 | 154 | 21.0 | \$35.1 |
| Wages | \$17,382 | \$10,966 | (²) | 58.5 | ..... |
| Miscellaneous expenses | \$1,574,790 | \$813,954 | (⁴) | 93.5 | ..... |
| Cost of materials used | \$108,841,200 | \$49,819,301 | \$18,363,579 | 118.5 | 171.3 |
| Value of products | \$180,783,349 | \$60,635,705 | \$25,742,516 | 115.7 | 135.5 |

¹ Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 11.)

² Not reported separately.

³ Decrease.

⁴ Not reported.

TABLE 3.—COMPARATIVE SUMMARY, CHEESE AND BUTTER, URBAN DAIRY PRODUCTS, 1890 and 1900, WITH PER CENT OF DECREASE.

| | DATE OF CENSUS. | | PER CENT OF DECREASE. |
|--|-----------------|-------------|-----------------------|
| | 1900 | 1890 | 1890 to 1900 |
| Number of establishments | 113 | 160 | 29.4 |
| Capital | \$204,851 | \$607,590 | 66.3 |
| Salaried officials, clerks, etc., number | 10 | 170 | 94.1 |
| Salaries | \$3,780 | \$101,458 | 96.3 |
| Wage-earners, average number | 66 | 382 | 82.7 |
| Total wages | \$25,109 | \$173,247 | 85.5 |
| Men, 16 years and over | 57 | 346 | 83.5 |
| Wages | \$23,267 | \$164,707 | 85.9 |
| Women, 16 years and over | 6 | 35 | 77.1 |
| Wages | \$1,692 | \$8,392 | 79.7 |
| Children, under 16 years | 1 | 1 | ..... |
| Wages | \$150 | \$208 | 27.9 |
| Miscellaneous expenses | \$15,976 | \$61,228 | 73.9 |
| Cost of materials used | \$310,005 | \$1,545,278 | 79.9 |
| Value of products | \$415,928 | \$2,050,338 | 79.7 |

¹ Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 12.)

Table 2 shows that from 1890 to 1900 the number of establishments making factory products increased from 4,552 to 9,242, or 103 per cent, with a corresponding increase in capital, wages, and products; but for reasons already stated it would be misleading to accept as correct the actual increase in the industry based upon the returns for 1890.

Table 3 shows that in 1900 there were 113 urban establishments. These were located in 15 different states, as follows: Missouri, 36; New York, 20; Kentucky, 18; California, 8; Illinois, 7; Ohio and Pennsylvania, 5 each; Maryland and Michigan, 4 each; and Connecticut,

Indiana, Massachusetts, Tennessee, West Virginia, and Wisconsin, 1 each. In most cases these are milk-supply companies, the manufacture of butter and cheese being a secondary consideration in order to make use of the variable surplus of unsold milk and cream. In some instances, however, the establishments are evidently creameries or cheese factories which escaped the regular enumerators, and the returns from these are so incomplete as to exclude them from the factory tables. The total products reported by these urban establishments for 1900 were 827,470 pounds of butter and 662,164 pounds of cheese. While these quantities do not appear in Tables 6 and 7, showing the materials and products of factories, they are necessarily included later in giving the total production of different states.

Table 4 shows the distribution of cheese, butter, and condensed-milk factories, classified according to products, by states and territories.

During the earlier years of their operation it was not uncommon for both butter and cheese to be made in these factories at different seasons, or butter and skim cheese at the same time. A more distinct separation has resulted from a healthy sentiment (aided by state laws) to make full-cream cheese, and from a preference on the part of creameries to have no cheese making about the premises. The totals from Table 4, according to their products, are as follows:

| | |
|---|-------|
| Number making butter only | 5,275 |
| Number making cheese only | 3,299 |
| Number making condensed milk only | 38 |
| Number selling cream only | 47 |
| Number reporting two or more products | 583 |

Of the last group there are 571 which make both butter and cheese, 11 which make butter and condensed milk, and 1 which makes cheese and condensed milk. Recognizing the dual character of some establishments, it is found that there are altogether 5,857 where butter is made and 3,871 where cheese is made.

Under this classification Iowa has the greatest number of creameries, 824, and Wisconsin the next, 788; then New York, 740; Pennsylvania, 619; Minnesota, 546; and Illinois, 465. No other state has as many as 200. As to cheese factories, the states having the greatest number are these: New York, 1,314; Wisconsin, 1,286; Ohio, 320; Pennsylvania, 140; and Michigan, 136. No other state has more than 90.

As reported at the census of 1890, the 3 states having the greatest number of creameries and cheese factories together were New York (1,337), Wisconsin (966), and Iowa (500). The same states were in the lead in 1900, but Wisconsin and New York changed places; these 2 states divide their establishments similarly, there being in each somewhat more than half as many creameries as cheese factories. Iowa, holding third place, is preeminent in butter-making, with more creameries than any other, and only 85 cheese factories.

TABLE 4.—CHEESE, BUTTER, AND CONDENSED-MILK FACTORIES: NUMBER OF ESTABLISHMENTS IN EACH CLASS, CLASSIFIED ACCORDING TO PRODUCTS, BY STATES AND TERRITORIES, 1900.

| STATES AND TERRITORIES. | Total number of establishments. | Butter only produced. | Cheese only produced. | Condensed milk only produced. | Cream for sale for the only product. | Two or more products reported. | STATES AND TERRITORIES. | Total number of establishments. | Butter only produced. | Cheese only produced. | Condensed milk only produced. | Cream for sale for the only product. | Two or more products reported. |
|-------------------------|---------------------------------|-----------------------|-----------------------|-------------------------------|--------------------------------------|--------------------------------|-------------------------|---------------------------------|-----------------------|-----------------------|-------------------------------|--------------------------------------|--------------------------------|
| United States .. | 9,242 | 5,275 | 3,299 | 38 | 47 | 588 | Montana | 3 | 3 | | | | |
| Alabama | 4 | 3 | 1 | | | | Nebraska | 93 | 82 | 5 | | 1 | 5 |
| Arizona | 7 | 1 | 1 | | | 5 | Nevada | 4 | 2 | | | | 2 |
| Arkansas | 8 | 7 | | | | | New Hampshire | 53 | 47 | 4 | 1 | 1 | |
| California | 178 | 143 | 17 | 2 | 1 | 15 | New Jersey | 53 | 47 | 1 | 1 | 4 | |
| Colorado | 38 | 20 | 9 | | 1 | 8 | New York | 1,908 | 575 | 1,151 | 12 | 4 | 166 |
| Connecticut | 71 | 52 | 2 | | | 7 | North Dakota | 21 | 18 | 8 | | | |
| Delaware | 22 | 21 | 1 | | | | Ohio | 479 | 147 | 221 | 1 | 11 | 99 |
| Georgia | 4 | 4 | | | | | Oklahoma | 5 | 2 | 3 | | | |
| Idaho | 19 | 11 | 4 | | | 4 | Oregon | 68 | 39 | 16 | | 1 | 12 |
| Illinois | 527 | 393 | 51 | 6 | 5 | 72 | Pennsylvania | 749 | 608 | 124 | 3 | 3 | 16 |
| Indiana | 112 | 75 | 26 | | | 11 | Rhode Island | 3 | 3 | | | | 2 |
| Iowa | 907 | 816 | 81 | | 2 | 8 | South Dakota | 188 | 122 | 14 | | | 2 |
| Kansas | 171 | 133 | 30 | 1 | | 7 | Tennessee | 12 | 11 | 1 | | | 1 |
| Kentucky | 9 | 7 | | | | 1 | Texas | 12 | 9 | 2 | | | |
| Maine | 61 | 41 | 16 | 1 | | | Utah | 57 | 21 | 7 | | | 20 |
| Maryland | 84 | 78 | 1 | | 6 | | Vermont | 255 | 180 | 61 | 2 | 2 | 10 |
| Massachusetts | 50 | 46 | | | | 2 | Virginia | 10 | 8 | 2 | | | |
| Michigan | 286 | 146 | 130 | 3 | | 6 | Washington | 60 | 33 | 8 | 1 | | 18 |
| Minnesota | 596 | 538 | 47 | | 3 | 8 | West Virginia | 1 | 1 | 2 | | | 1 |
| Mississippi | 2 | 2 | | | | | Wisconsin | 2,018 | 728 | 1,227 | 3 | | 60 |
| Missouri | 79 | 48 | 24 | 1 | | 6 | Wyoming | 2 | 1 | | | | 1 |

During the last twenty years creameries have increased in number much faster than cheese factories, and the system has extended into new territory, especially in the Central and Western states. Table 5 shows the growth of the factory industry, as a whole, in states and territories where the number of establishments has doubled during the last decade, thus indicating also something of its geographical extension.

TABLE 5.—NUMBER OF CHEESE, BUTTER, AND CONDENSED-MILK FACTORIES IN STATES AND TERRITORIES, 1890 AND 1900, IN WHICH THE NUMBER DOUBLED DURING THE DECADE.

| STATES AND TERRITORIES. | 1900 | 1890 | STATES AND TERRITORIES. | 1900 | 1890 |
|-------------------------|------|------|-------------------------|-------|------|
| Alabama | 4 | | Nevada | 4 | |
| Arizona | 7 | | New Hampshire | 53 | 23 |
| Arkansas | 8 | | New Jersey | 58 | 16 |
| California | 178 | 19 | North Dakota | 21 | 10 |
| Colorado | 88 | 6 | Oklahoma | 5 | |
| Delaware | 22 | 5 | Oregon | 68 | 12 |
| Georgia | 4 | | Pennsylvania | 749 | 300 |
| Idaho | 19 | 4 | South Dakota | 188 | 16 |
| Illinois | 527 | 262 | Tennessee | 12 | 4 |
| Indiana | 112 | 52 | Texas | 12 | 3 |
| Kentucky | 9 | 1 | Utah | 57 | 3 |
| Maryland | 84 | 24 | Vermont | 255 | 123 |
| Michigan | 286 | 100 | Washington | 60 | 3 |
| Minnesota | 596 | 106 | Wisconsin | 2,018 | 966 |
| Montana | 3 | 1 | Wyoming | 2 | 1 |

Of the 28 states and 2 territories named in this table, every one appears to have at least doubled the number of its dairy manufacturing establishments during the decade, and the 4 states and 2 territories in which ten years ago none were reported now have a total of 32. The 3 Pacific states have increased from 34 to 306. The most remarkable growth is in the group of 8 Central and 4 Western states (not all named in the table), which collectively increased from 2,559 to 5,427, a majority of

the total number in the country. And a very notable advance is that from 7 to 49 in 6 Southern states.

Kansas and Nebraska do not appear in Table 5, because the number of their dairy establishments had not doubled in the stated time. This would be misleading but for special explanation, as few states have actually advanced faster in general dairy development during the decade. Kansas increased the value of its creamery products fourfold, and among the large-producing states, this growth was exceeded only by California. Kansas and Nebraska had 101 and 58 establishments, respectively, in 1890, and 171 and 93, respectively, in 1900; but the detailed returns show, in addition, 307 and 284 branch factories and skimming stations in the two states. Also that 474 centrifugal cream separators were in operation in Kansas and 325 in Nebraska. Ten years before these numbers could not have exceeded 110 and 60, respectively. These facts are accounted for by the organization in each of these states, within recent years, of very large creamery companies, which have consolidated or absorbed many creameries which previously had an independent existence. Hence the large number of branches or skimming stations, which in few other states appear so numerous. Vermont is another example of an increase in production apparently out of proportion to new establishments. The latter, as reported, only doubled in the last decade, while their products nearly quadrupled. Consolidation and large companies with branch factories explain this fact also. Vermont reported 184 skimming stations and 382 separators in use in the creameries of that state and their branches.

Table 6 is a comparative summary of capital by geographical groups, 1890 and 1900.

TABLE 6.—COMPARATIVE SUMMARY OF CAPITAL, BY GEOGRAPHICAL GROUPS, 1890 AND 1900.

| STATES. | Year. | Total. | Land. | Buildings. | Machinery, tools, and implements. | Cash and sundries |
|-----------------------|---------------------------|--------------|-------------|--------------|-----------------------------------|-------------------|
| United States... | 1900 | \$36,303,164 | \$1,818,519 | \$11,514,198 | \$13,827,667 | \$9,142,780 |
| | 1890 | 16,016,573 | 968,833 | 5,588,257 | 5,088,192 | 4,376,881 |
| | Per cent of total..... | 100.0 | 5.0 | 31.7 | 38.1 | 25.2 |
| | Per cent of increase..... | 126.7 | 87.8 | 106.0 | 172.0 | 108.9 |
| New England states | 1900 | 2,570,625 | 125,021 | 730,683 | 819,768 | 886,158 |
| | 1890 | 882,094 | 38,882 | 296,641 | 302,808 | 243,769 |
| Middle states..... | 1900 | 10,678,755 | 528,809 | 8,007,158 | 3,864,052 | 2,678,786 |
| | 1890 | 5,508,329 | 286,139 | 2,030,805 | 1,691,972 | 1,499,713 |
| Southern states..... | 1900 | 183,897 | 12,105 | 46,229 | 88,716 | 86,847 |
| | 1890 | 93,057 | 9,400 | 31,495 | 41,525 | 10,637 |
| Central states..... | 1900 | 17,886,811 | 797,878 | 5,708,122 | 7,051,891 | 4,328,989 |
| | 1890 | 8,377,962 | 465,430 | 2,843,565 | 2,722,138 | 2,346,829 |
| Western states..... | 1900 | 3,282,183 | 116,996 | 1,062,562 | 1,932,227 | 770,898 |
| | 1890 | 922,980 | 62,912 | 341,751 | 284,859 | 233,458 |
| Pacific states..... | 1900 | 1,684,677 | 236,850 | 343,844 | 663,473 | 440,510 |
| | 1890 | 221,790 | 101,365 | 40,000 | 38,700 | 41,725 |
| All other states..... | 1900 | 16,216 | 860 | 6,600 | 7,600 | 1,156 |
| | 1890 | 10,361 | 4,205 | 4,000 | 1,400 | 756 |

¹ Includes establishments distributed as follows: 1900—Mississippi, 2; Wyoming, 2. 1890—Kentucky, 1; Montana, 1; Wyoming, 1.

Table 6 shows that the capital invested in cheese, butter, and condensed-milk factories increased from \$16,016,573 in 1890 to \$36,303,164 in 1900, a gain of \$20,286,591, or 126.7 per cent. Of the several items representing the capital invested in plants, land increased 87.8 per cent; buildings, 106 per cent; while the value of machinery, tools, and implements, the item which perhaps of all others best illustrates the real development of an industry, increased 172 per cent. Capital in the geographical divisions increased during the decade as follows: New England states from \$882,094 to \$2,570,625, an increase of \$1,688,531, or 191.4 per cent; Middle states from \$5,508,329 to \$10,678,755, an increase of \$5,170,426, or 93.9 per cent; Southern states from \$93,057 to \$183,897, an increase of \$90,840, or 97.6 per cent; Central states from \$8,377,962 to \$17,886,811, an increase of \$9,508,849, or 113.5 per cent; Western states from \$922,980 to \$3,282,183, an increase of \$2,359,203, or 255.6 per cent; and the Pacific states from \$221,790 to \$1,684,677, an increase of \$1,462,887, or 659.6 per cent.

Table 7 is a comparative summary of the kinds, quantity, and cost of materials used for 1890 and 1900, with per cent of increase for the decade, and Table 8 presents the quantity and value of the products for 1890 and 1900, with per cent of increase.

TABLE 7.—QUANTITY AND COST OF MATERIALS USED, 1890 AND 1900, WITH PER CENT OF INCREASE.

| | 1900 | 1890 | Per cent of increase. |
|-----------------------------|---------------|---------------|-----------------------|
| Aggregate cost..... | \$108,841,200 | \$49,819,301 | 118.5 |
| Butter: | | | |
| Total cost..... | \$78,489,355 | \$28,396,954 | 158.8 |
| Milk— | | | |
| Pounds..... | 8,514,806,674 | 1,893,319,242 | 349.7 |
| Cost..... | \$65,335,287 | \$13,355,848 | 389.2 |
| Cream— | | | |
| Pounds..... | 203,673,968 | 483,630,741 | 157.9 |
| Cost..... | \$8,154,068 | \$15,041,611 | 145.8 |
| Cheese: | | | |
| Milk— | | | |
| Pounds..... | 2,741,898,114 | 2,684,550,517 | 2.1 |
| Cost..... | \$21,258,712 | \$16,320,590 | 30.3 |
| Condensed milk: | | | |
| Total cost..... | \$7,252,124 | \$2,159,856 | 235.8 |
| Milk— | | | |
| Pounds..... | 421,375,073 | 83,617,655 | 403.9 |
| Cost..... | \$4,662,437 | \$1,264,103 | 263.8 |
| Sugar— | | | |
| Pounds..... | 59,873,859 | 13,372,365 | 280.4 |
| Cost..... | \$2,589,687 | \$895,753 | 189.1 |
| Fuel..... | \$1,708,634 | \$526,844 | 224.3 |
| Rent of power and heat..... | \$17,285 | \$7,552 | 123.9 |
| All other materials..... | \$5,115,090 | \$2,407,505 | 112.5 |

¹ Decrease.

TABLE 8.—QUANTITY AND VALUE OF PRODUCTS, 1890 AND 1900, WITH PER CENT OF INCREASE.

| | 1900 | 1890 | Per cent of increase. |
|---------------------|---------------|--------------|-----------------------|
| Total value..... | \$130,783,349 | \$60,635,705 | 115.7 |
| Butter: | | | |
| Pounds..... | 420,126,546 | 181,284,916 | 131.7 |
| Value..... | \$84,079,754 | \$36,675,411 | 129.3 |
| Cheese: | | | |
| Pounds..... | 231,972,324 | 238,035,065 | 13.5 |
| Value..... | \$23,519,829 | \$19,802,951 | 33.9 |
| Condensed milk: | | | |
| Pounds..... | 186,921,787 | 37,926,821 | 392.8 |
| Value..... | \$11,888,792 | \$3,580,927 | 231.4 |
| All other products: | | | |
| Value..... | \$8,204,974 | \$570,416 | 1,364.2 |

AVERAGE PRODUCT OF FACTORIES.

There is much difference in the size of the creameries in the several states. In New York and Pennsylvania they are small, the average annual product being, respectively, 54,991 and 59,995 pounds of butter. In Illinois and Minnesota the average is 73,237 and 75,411 pounds, and in Wisconsin 78,444 pounds. In Iowa the creameries are larger, with an average annual output of 93,730 pounds. Vermont and Kansas show the influence of a few large establishments in raising the average to 118,176 and 129,975 pounds, respectively. For the entire country the average product of a creamery for a year is 71,731 pounds of butter. Similar differences exist among the cheese factories. The largest are in New York, where the average product is 96,945

pounds a year. In Wisconsin, where there are many small establishments, the average is brought down to 60,458 pounds. In Michigan and Pennsylvania the average is 76,637 and 73,339 pounds, respectively. The annual product of the average cheese factory for the whole country is a little larger than for the average creamery, namely, 72,842 pounds. It must be remembered, however, that this represents only 730,000 pounds of milk used by the average cheese factory in a year, while the average creamery requires over 1,500,000 pounds of milk for its annual product of butter. This does not indicate that twice as many cows are necessary to support a creamery as for a cheese factory, because as a rule the latter is in operation only during the pasturage season, or about half the year, while in most cases the creamery makes butter the entire year. In fact, the average creamery represents, while in operation, the milk from 450 cows, and the average cheese factory 290 cows. In the aggregate, the creameries of the United States appear to use all the milk from about two and a half million cows throughout the year, or an average of 160 pounds of butter per cow; and the cheese factories use the milk from 1,130,000 cows for half the year, representing an average product of 250 pounds of cheese per cow in six months.

ENTIRE DAIRY INDUSTRY OF THE UNITED STATES.

In order to present the dairy industry of the United States as a whole, there are here brought together certain statistics of agriculture and of manufactures. The totals for the census year 1900, thus combined, are as follows:

| | |
|--|------------------|
| Cows kept for milk, on farms, number | 17, 139, 674 |
| Cows kept for milk, not on farms, number | 973, 033 |
| Total number of cows kept for milk | 18, 112, 707 |
| Milk produced, on farms, gallons | 7, 266, 392, 674 |
| Milk produced, not on farms, gallons ¹ | 462, 190, 676 |
| Total gallons of milk produced | 7, 728, 583, 350 |
| Butter, made on farms, pounds | 1, 071, 745, 127 |
| Butter, made in factory creameries, pounds | 420, 126, 546 |
| Butter, made in urban dairy establishments, pounds | 827, 470 |
| Total pounds of butter made | 1, 492, 699, 143 |
| Cheese, made on farms, pounds | 16, 372, 330 |
| Cheese, made in factories, pounds | 231, 972, 324 |
| Cheese, made in urban dairy establishments, pounds | 662, 164 |
| Total pounds of cheese made | 299, 006, 818 |
| Condensed milk produced, pounds | 186, 921, 787 |
| Value of total butter made, at 18 cents | \$268, 685, 845 |
| Value of total cheese, at 9 cents | 26, 910, 614 |
| Value of total condensed milk | 11, 888, 792 |
| Value of total cream sold | 4, 435, 444 |
| Value of total sundry factory products | 1, 261, 359 |
| Value of total milk consumed ¹ | 277, 645, 100 |
| Aggregate value dairy products of United States | \$590, 827, 154 |

¹ Estimated.

TOTAL BUTTER AND CHEESE PRODUCTION.

It is interesting to note that while the extension of the creamery system has been such as to raise the product of these establishments during the decade from 15.2 to 28.2 per cent of the total butter product of the United States, with a net increase, as reported, of 131.7 per cent, the quantity of butter made on farms has, nevertheless, increased nearly 50,000,000 pounds, in spite of the fact that it decreased relatively from 81.8 per cent of the total product to 71.9 per cent.

As a rule, the states producing the greatest quantities of butter in factories are also those in which the quantities made on farms are greatest. Ohio is a notable exception. It produced 79,551,299 pounds of butter on farms, which is more than any other state, while its creamery product was comparatively small, being only 8,117,321 pounds. By combining the products of farm and factory, it is found that the 5 states named in Table 8 lead all the others in total butter produced, although in a different order. Iowa stands first, with 139,022,552 pounds; and then follow New York, 115,408,222 pounds; Pennsylvania, 111,358,246 pounds; Wisconsin, 106,552,649 pounds, and Illinois, 86,548,762 pounds. In Iowa and Wisconsin creameries produced more than the farms, but in Pennsylvania, New York, and Illinois the reverse was true. According to the Eleventh Census the 5 states showing the greatest production of butter were Iowa, New York, Pennsylvania, Illinois, and Ohio. Wisconsin held the sixth place. The aggregate production of butter for the whole country reported in the census for 1890 was 1,205,508,384 pounds. For 1900 it was 1,492,699,143 pounds.

Compared with the reports of the census of 1890, the returns for 1900 for cheese show a continued transfer of production from the farm to the factory. The total made on the farm has decreased and the total factory product has increased. The production seems to be concentrating also. The 10 states reported in 1890 as leading in total cheese production were New York, Wisconsin, Ohio, Illinois, Vermont, Iowa, Pennsylvania, Michigan, California, and Minnesota. Of these the first 3 named still stand at the head and in the same order; all show a somewhat increased product during the decade. Pennsylvania and Michigan now come next, both with product more than doubled. These 5 are the only states credited with more than 10,000,000 pounds of cheese each in 1900. California comes next, with a product of 6,926,131 pounds, being an increase; while the remaining 4, although following in the order above named, all show decreases. The cheese factories in these same states in 1900 (including establishments making butter in connection with the manufacture of cheese) numbered as follows: New York, 1,314; Wisconsin, 1,286; Ohio, 320; Pennsylvania, 140; Michigan, 136; California, 32; Illinois, 123; Vermont, 71; Iowa, 89; and Minnesota, 55. No other state had as many as 40. It is further interesting to

note that Wisconsin, Pennsylvania, and California each reports increased quantities of cheese made on the farm, while in all the other states named there has been a falling off in this item. California produced 4,249,588 pounds of farm-made cheese in 1900, and 2,676,543 pounds made in factories; this is the only instance of the kind and the only state reporting as much as 3,000,000 pounds made on farms.

Maine furnishes a good example of the changes in cheese making which have taken place in some sections during the last quarter century. Twenty-five years ago Maine had 60 cheese factories and now has 16. The condition of the latter is a fair average of those of the older cheese-making states. The factories average 243 cows, or not quite 5 cows to each patron; the average of cheese made per cow is 144.8 pounds, the range being from 89 pounds to 180 pounds. Six factories, with 1,600 cows, report an average of 167

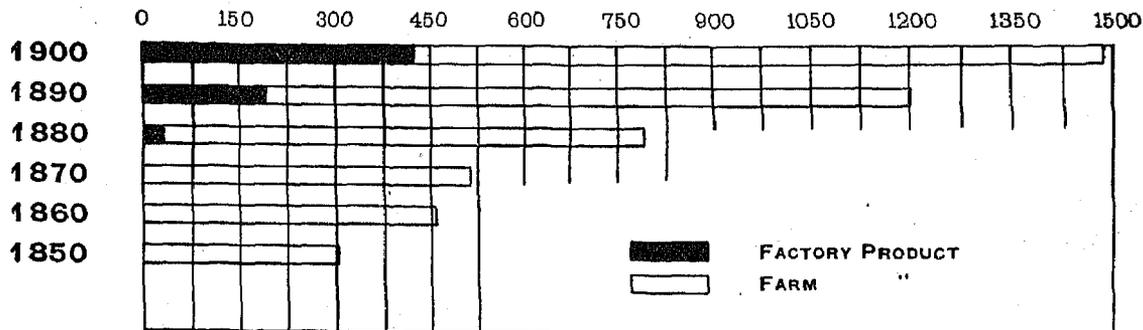
pounds per cow. Of course this difference in product depends largely upon the length of the season during which the factories are in operation.

New York and Wisconsin continue to be the great cheese-producing states of the Union. They are credited for 1900 with totals of 127,795,195 pounds and 77,748,680 pounds, respectively, and together they produced 205,543,875 pounds, or more than two-thirds of all the cheese made in the United States. The aggregate production of cheese in the United States, reported at the census of 1890, was 256,761,883 pounds; of this 18,726,818 pounds, or 7.3 per cent, was made on farms. For 1900 the aggregate was 299,006,818 pounds, of which 16,372,330 pounds, or 5.5 per cent, was made on farms.

A clear idea of the growth of the production of butter and cheese in the United States, decade by decade, together with the relative products of farm and factory, may be obtained from the diagram which follows.

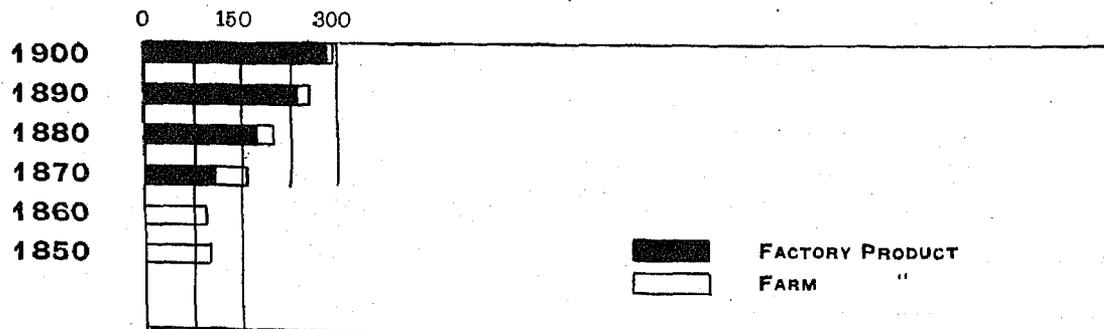
PRODUCTION OF BUTTER

in hundreds of millions of pounds.



PRODUCTION OF CHEESE

in hundreds of millions of pounds.



THE FACTORY OR ASSOCIATED SYSTEM OF DAIRYING.

The statement has been frequently made that the associated system of dairying originated in the United States, and it has been called the "American system." Those who first associated themselves and brought milk together from different farms for making butter and cheese probably never heard of such methods elsewhere, and were originators for their own time and neighborhoods. But in the Jura mountain region of France and Switzerland, cooperative cheese making has been systematically practiced for at least four centuries, and

probably much longer. In the United States, cooperation among dairymen was first applied in making cheese. This plan attracted attention and was recognized as successful in Oneida county, N. Y., about 1852. Very slowly the cheese factory became an established institution; but once fairly started in the heart of the cheese-making district of New York, the system spread rapidly. The "war period," during which the price of cheese more than doubled, lent additional impetus to the movement. A like effect was produced by the increase in cheese exports which occurred about the same time. These exports rose from 13,020,817 pounds in 1850 to

15,515,799 in 1860, and to 53,089,468 in 1865. Ten years later 101,010,853 pounds of cheese were exported. The early growth of the factory system is shown in the following tabular statement:

NUMBER OF CHEESE FACTORIES ESTABLISHED IN THE STATE OF NEW YORK ANNUALLY: 1854-1866.

| YEAR. | Facto- ries. | YEAR. | Facto- ries. | YEAR. | Facto- ries. |
|------------|-----------------|------------|-----------------|------------|-----------------|
| 1854 | 4 | 1859 | 4 | 1864 | 210 |
| 1855 | 2 | 1860 | 17 | 1865 | 52 |
| 1856 | 3 | 1861 | 18 | 1866 | 46 |
| 1857 | 3 | 1862 | 25 | | |
| 1858 | 4 | 1863 | 111 | | |

Cheese factories were started in Pennsylvania and Ohio soon after they became popular in New York, and later they appeared in other states, East and West.

The system of making butter in quantity from milk or cream collected from numerous farms soon followed the introduction of cheese factories. Such establishments are properly butter factories, but the name of "creamery" has been generally adopted and is not likely to be changed. So far as known, the creamery system of butter making originated in the United States. The first creamery was built in Orange county, N. Y., in the year 1864, and received daily the milk from 375 cows. In Illinois the first cheese factory was started in 1863, and the first creamery in 1867. In Iowa these events took place in 1866 and 1871, respectively.

The early cheese factories and creameries were purely cooperative concerns, and it is in this form that the system has usually extended into new territory, whether for the production of butter or cheese. The cow owners and producers of milk join upon any agreed basis in organizing, building (or renting and refitting), equipping, and managing the factory, and disposing of its products. The farmers interested as joint owners, and all who furnish milk or cream, are called "patrons." The operations are managed by a committee or board of directors chosen by and from the patrons. If the business is large enough to warrant the expense, the immediate supervision is intrusted to a single manager, employed by the board. In a factory of this kind all expenses are deducted from the gross receipts and the remainder divided pro rata among the patrons upon the basis of the raw material contributed. Another plan is for the plant to be owned by a joint-stock company composed largely, if not wholly, of farmers, material being received from any satisfactory producer. In this case interest on the property or capital is usually included in the current expenses; the management is otherwise the same. The proprietary plan is also common, being conducted much like any other factory. The proprietor, firm, or incorporated company buys the milk or cream of producers at prices mutually agreed upon from time to time, and assumes all the expenses, risks, and profits of the business. Another way is for the

factory, however owned, to bear all expenses and charge a fixed price per pound for making and selling the product. The proceeds of sales, less this fixed price, are then divided as on the purely cooperative plan. All of these methods are varied and modified in practice. Settlements are made monthly in almost all cases, and these cash payments to the patrons have a marked effect upon the tone of business in any community where successful factories are operated.

It was impossible to separate these establishments in classes according to all the modifications of ownership and management, but 4 groups were made: Individual, 4,509; firm, 1,340; corporation, 1,628; cooperative, 1,813; total, 9,242. It thus appears that the proprietary plan or private ownership is now greatly in excess of the cooperative system. The tendency has been in this direction for a number of years. In New England, less than twenty years ago, all the creameries were cooperative; now a bare majority remain so in Massachusetts only. In Iowa, where the cooperative plan formerly prevailed, less than one-third still remain of that form. Minnesota creameries were for years nearly all cooperative; about 60 per cent continue to be so. As examples of the other extreme, only 7 factories are cooperative out of 178 in California, only 12 out of 171 in Kansas, and but 377 out of 2,018 in Wisconsin.

Although establishments of this kind are usually successful, there is mismanagement and failure, as in other lines of industry. Many have been started by "promoters," injudiciously located or overcapitalized, and closed after brief careers. Fires, consolidations, and other changes of ownership add to the causes for frequent changes. Of the 9,242 establishments enumerated in 1900, over one-half, or 5,389 were reported as established within the preceding decade, and 828 as started during the census year.

CREAMERIES AND THEIR PRODUCTS.—The creamery system was introduced east of the Hudson River about twenty years ago, upon what was known as the "cream-gathering" plan. This was a popular form of creamery management in some Western states and in parts of the Middle states, from 1876 or 1878 until after 1890. Under this plan the milk was separated by gravity (or "setting") on the producing farms, skimmed there and the cream only went to the creamery, being usually collected daily by agents or gatherers from the factory, hence the name "cream gathering." The dairy centrifuge, or cream separator, made its appearance in America in the year 1879 and has revolutionized dairy and creamery management. The popularity of this machine for mechanical skimming or separation of cream dates from about 1885, and since that time "the separator plan" has been adopted by practically all new factories, and has rapidly replaced the cream-gathering plan in established creameries. The separator, operated by power, has been placed at the creamery, and at its branches or separating stations; and the milk for but-

ter has been hauled daily to these places to be there creamed or separated. This radical change of management accounts for the decrease in cream as a "material" received by the creameries, and partly for the increased quantity of milk so received.

That cream-gathering creameries have not ceased to exist, however, is evident from the quantity of cream still included in the creamery receipts of "materials." There were 203,673,958 pounds reported for 1900; of this 63,308,657 pounds (7,720,568 gallons) were sold by the creameries, leaving 140,365,301 pounds, or enough to make 40,000,000 pounds of butter, being almost 10 per cent of the entire creamery output. Iowa is a good example, although not a strong cream-gathering state. It is known that 10 per cent of all creameries in Iowa are conducted on the cream gathering plan, and 7 per cent in addition combine this plan with that of receiving whole milk to be separated at the creamery.

CREAMERY MATERIALS AND EQUIPMENT.—The large quantity of cream still appearing as raw material at the creameries is indicative of the change in the system. The centrifugal cream separator was introduced and generally adopted in large sizes requiring steam power, and of such capacity that one machine, operated a few hours every morning, could cream the milk from several hundred cows. One powerful separator is therefore the usual equipment of a creamery, and does the work for a whole neighborhood. It has been found, however, that the labor and expense of daily hauling the entire milk product of patrons' farms to the creamery, often several miles distant, is too great a tax upon the industry. A movement toward relief to the patrons and economy in creamery management has been the establishment of neighborhood "skimming stations," equipped only with a separator and power to operate it, as branches of the central plant. From these stations the cream is transported to the parent butter-making factory. Centrifugal separators in use by creameries were first enumerated for the census of 1900, also, for the first time, the branch factories or separating or skimming stations. Separators to the number of 9,701 were returned and 2,719 branch stations of all kinds. While cheese factories sometimes have branches of the parent establishment, they do not have separating or skimming stations; all the latter class of subsidiary establishments, and also a part of the other branch factories, may therefore be taken as belonging to creameries. Hence, if to the 5,567 creameries there be added 2,050 skimming stations and 669 other branches, 8,286 establishments are found having use for separators. About 1,600 creameries, therefore, use two or more separators. The exact number which are still operated without the centrifuge, or upon the old cream-gathering plan, remains undetermined.

The new elements influencing modification in the creamery system are the invention of what is known as

the Babcock fat test for milk and the adoption of the farm separator in sizes for either hand or power. The Babcock test is a chemico-mechanical contrivance, not difficult to operate, by which the percentage of butter fat in either milk or cream may be measured with mathematical accuracy, and the value of the butter-making elements thus fixed, so far as quantity is concerned. Accordingly, the milk may be separated on the producing farm by the most convenient process, and only the cream sent to the creamery, where actual butter value is determined by test and the cream paid for accordingly. Milk delivered at creameries and cheese factories is now generally tested in this way, and paid for on the basis of its fat contents or butter-making value. The butter fat, as measured by this test, is paid for at a fixed price per pound, irrespective of the weight or bulk of serum with which it is mixed in the form of milk or cream. Farm and creamery methods are so much simplified by these improvements that many dairy farmers are procuring private separators. The state dairy commissioner of Iowa reports 904 farm separators owned by patrons of creameries in 1898, 1,762 in 1899, 3,332 in 1900, and 5,231 in 1901. This new form of the "cream-gathering plan" is rapidly extending. Cream again forms a large share of the raw material received at the factories for butter making, and the next census will probably show, instead of a decrease, a very considerable increase in this item.

CREAMERY PRODUCTS.—The quantity of butter made at creameries has been reported under two heads—"packed solid" and "prints or rolls." It appears that of all creamery butter, 328,956,590 pounds, or 78.3 per cent, is packed in solid form, and 91,169,956 pounds, or 21.7 per cent, in prints or rolls. The totals of these two forms in the several states indicate differences in the market requirements and the local customs as to preparing butter for shipment and sale. In the New England states, the numerous cities and large towns easy of access furnish markets where butter can be sold directly to retail dealers or consumers. For this purpose it is prepared in bricks, prints, or balls weighing a half pound or a pound. Vermont excepted, the creameries of these states make twice as much butter into prints as they pack in solid form. In Rhode Island and Connecticut, with consuming markets at their doors, 8 pounds of creamery butter is put into prints to every pound packed. In Vermont, on the contrary, with little local demand and the consequent necessity of shipping away to market, only about one-fourth of the creamery butter is made into prints. In New York the practice has always been to pack butter solidly in firkins, tubs, or boxes; and print butter is rather exceptional in the great market of New York city. In that state, therefore, 4½ pounds of butter are packed to 1 pound put in prints. The Philadelphia market, on the contrary, and Pennsylvania markets in general,

have always been noted for print butter; consequently, it is not surprising to find that the creameries of that state report almost as much made into prints as the quantity solid packed. From Iowa, Wisconsin, and Minnesota butter must be sent long distances to market, and naturally goes mainly in bulk; less than one-eighteenth of the creamery product of those states is made into prints. South Dakota, even more remote from market, packs 99 per cent of its creamery butter in solid form. But upon the Pacific coast local customs favor butter in rolls of 2 pounds weight; accordingly, in the states of California, Oregon, and Washington, three-fourths of all the butter made at creameries is reported as in prints or rolls.

BUTTER PRICES.—Creameries which are able to market butter in the form of prints or rolls generally derive a benefit therefrom. Although extra labor is required to prepare butter in this way, and packages and transportation for it cost rather more, it is a retail form, attractive, brings a higher price, and can be sold more directly to the consumer, saving the commissions of the middlemen. The average price obtained for all butter, as reported by the creameries for the census year 1900, was very nearly 20.1 cents per pound. The average for that packed solid, for the United States, was 19.4 cents, and for the prints or rolls 22.1 cents. The advantage of near-by markets is shown by these average prices for print butter: Connecticut, 24.6 cents per pound; Massachusetts, 23.5 cents; and Pennsylvania, 23.4 cents. For California creamery rolls the average was 22.3 cents. Contrasted with these is the average price for the packed or tub butter of Iowa, Minnesota, and Wisconsin creameries, 19 cents; 18 cents for Nebraska, and 17 cents for Kansas.

RICHNESS OF MILK, OR BUTTER RATIO.—Assuming the substantial accuracy of the returns from creameries of milk and cream received for making butter, and of the butter made from it, interesting computations can be made of the ratio of milk to butter in the country at large and the several states. The results illustrate the difference in the average richness of milk in different localities. The nearest quarter-pound obtained in each calculation is taken as quite accurate enough for purposes of comparison. It is thus found that creameries of the United States require, on the average, 22½ pounds of milk, or its equivalent in cream, to make 1 pound of merchantable butter. New York appears to have the richest milk of any of the leading dairy states, its creameries making a pound of butter from every 21 pounds of milk received. New Hampshire stands second, with a ratio of 21¼ to 1, and California third, 21½ to 1. Minnesota, Pennsylvania and Wisconsin are alike, showing 22 pounds as the average. Then Illinois, 22¼; Kansas and Vermont, 23¼; and Iowa 24, pounds. These 10 states suffice for illustration. The results can not be accepted as absolutely accurate; it is probable

that the average pounds of milk stated for the country at large and for most of the states named, is somewhat below the truth. For the United States the ratio stated would indicate that all milk contributed to creameries has an average of 3.8 per cent of butter fat. For New York the average would have to be 4.1 per cent fat. It is not likely that the average richness of milk is as great as this. Nor is it probable that there is so great a difference between New Hampshire and New York, and Vermont, in this respect. The comparison between Minnesota and Wisconsin, Illinois and Iowa, is believed to be correct. Wisconsin has large holdings of "special-purpose cows," animals giving rich milk, and the same is true of Minnesota to a considerable degree, while in Iowa the "general-purpose cow" is popular, giving milk less in quantity and poorer in butter quality.

If, instead of the above, 23 pounds of milk to a pound of butter is assumed as the average for the United States, this would necessitate milk with an average of 3.7 per cent of butter-fat. No state has dared to fix a legal standard as high as this, and only one has a standard above 3.5 per cent.

CREAM SALES.—The returns of creamery products give evidence that the sale of cream has become a large and profitable branch of the business in some states. The creameries of New York, Illinois, and Pennsylvania made sales of cream, respectively, as follows: 1,492,926 gallons at 53 cents, 1,190,125 gallons at 56 cents, and 686,316 gallons at 58 cents. No other state sold as much as a million gallons, but in these 3 the cream sales equalled 8 per cent of the value of butter sold. A different and notable case is that of the state of Maine; its creameries sold 755,845 gallons of cream at 71 cents a gallon, or \$534,295, and this was considerably more than half as much as the total butter sales of the state. The quantity of cream reported as sold by all the creameries of the United States was 7,720,569 gallons, valued at \$4,435,444, or 57 cents per gallon; the profit of this branch of the business is seen by the fact that, at the average creamery receipts for butter, this quantity of cream, if made into butter, would have realized only \$3,438,754. Ordinarily the gallon of cream thus sold would be the equivalent of a fraction less than 2 pounds of butter.

SKIM MILK.—Of this by-product of the creameries the great amount of 2,253,494,156 pounds is reported as "sold, fed, or returned to patrons." The total value is given at \$2,531,460, or 11.2 cents per 100 pounds. Skim milk is believed to be actually worth twice as much as this to farmers who will use it judiciously as food for young stock. But commercially it is worth less, or about 10 cents per 100 pounds; this is the usual price allowed to patrons who sell it to the creameries for conversion into casein.

DRIED CASEIN.—A comparatively new branch of the dairy industry, which has acquired importance enough

to deserve mention, is the production of commercial casein from the skim milk of creameries. Milk from which all the fat has been extracted by the separator is coagulated by acid, the whey drawn off, the acid washed from the curd, and the curd or casein then dried. The desiccated product has a commercial value of 3 to 5 cents per pound at the creameries where made, depending largely upon subsequent cost of transportation, and is used for making a glue good for paper sizing, as a "binder" for cheap paint, a "filler" for dressing wood and heavy fabrics, and for various other purposes. The statistics of creamery products show 12,298,405 pounds of this material made during the census year 1900, having a value, at the creameries, of \$383,581, or only a little more than 3 cents a pound. The state of New York produced more than half the total quantity, and Pennsylvania and Illinois are the only others in which over one million pounds were made.

CHEESE-FACTORY PRODUCTS.—The management of the cheese factory is in some respects similar to that of the creamery. Patrons deliver the whole milk at the factory daily, while still sweet and sound, and it is made into cheese without delay. Cheese is the only commercial product of the factory, and the only waste product is whey. The latter may be returned to patrons, or fed to swine at the factory, or sold to be used as the material for making sugar-of-milk. For a score of years or more after these factories became numerous they made cheese which, although different in form, size, color, and quality, was nearly all made upon the same general plan, closely resembling that of the English cheddar. Hence a certain uniformity of type was established which became known as the "standard American," or "full-cream factory" cheese, also often called cheddar. During the last ten or twenty years, however, a much greater variety has entered into the factory cheese; this is chiefly the result of imitating certain popular foreign kinds. The Twelfth Census has, for the first time, attempted to classify the factory product. It appears that the 3,871 cheese factories of the United States reported a total production of 281,972,324 pounds of cheese during the census year, as against 238,035,065 pounds in 1890, and that of the former quantity 225,776,105 pounds was of the American standard factory kind, and 56,196,219 pounds, or 20 per cent, of the several other varieties.

In New York 89.2 per cent of the cheese product was of the standard full-cream, cheddar-made variety, and this preponderates in Ohio, Michigan, and Pennsylvania. These are the oldest cheese-making states. In Wisconsin the 77,748,680 pounds was divided as follows: American standard 62.1 per cent and the other kinds 37.9 per cent. In Illinois, however, the standard

is exceeded in quantity by the other varieties—4,324,461 pounds of the former to 4,730,658 pounds of the latter. These "other kinds" comprise various well-known foreign varieties, those made in large quantity being mainly the Swiss gruyère or emmenthaler and the limburger; there are also some resembling the latter, especially the "brick" cheese. The Neufchâtel and cream cheese, the brie and camembert, are also made in considerable quantities. The value of cheese at the factory is reported as averaging nearly 9.5 cents per pound, being a little more for the standard variety than the average for all other kinds.

WHEY.—The quantity of whey reported as the waste product of cheese factories is 209,067,667 pounds, but this had a value of only \$204,277. It appears that of this only 21.3 per cent was sold and the remainder "used" or returned to the patrons. As milk-sugar is the sole commercial product for which whey is utilized in the United States, it is probable that all reported sold was for that purpose. The quantity of sugar-of-milk manufactured was not ascertained. There are only three or four places in the United States where this article is made, and yet it is produced here in greater quantity than anywhere else in the world.

THE CONDENSED-MILK INDUSTRY.—The condensed-milk industry was started about the same time as the factory system for making butter and cheese. Some method had long been sought for preserving milk, but none was successful until the invention of Gail Borden. After ten years of experimenting, he decided that a semiliquid state was the best form of preservation, and in 1856 settled upon the process which has since popularized the product in every quarter of the globe. The present extensive industry, in Europe as well as America, with its numerous different establishments and many commercial names or brands, is based upon Mr. Borden's methods. This applies to the unsweetened article as well as that preserved with sugar, for "plain condensed milk" was first introduced and put upon the market about the year 1861. It was then mainly in open vessels and intended for early use. Between 1860 and 1870 milk in both forms had become well known, and four or five factories were in operation, each producing about 5,000 1-pound cans per day.

Prior to the Twelfth Census, the statistics of this industry were few. In 1880 the total annual product was reported as 13,033,267 pounds, valued at \$1,547,588, and ten years later the same items were 37,926,821 pounds, and \$3,586,927. For 1890 the total materials reported as used cost \$2,792,086, and included 83,617,655 pounds of milk and 13,372,365 pounds of sugar. There is little doubt that these figures were considerably below the actual facts.

It now appears that in the year 1900 there were 50 establishments for condensing milk, operating in 14 different states, with a business shown by the following aggregates:

| MATERIALS. | Quantity (pounds). | Cost. |
|-------------------------------------|--------------------|---------------|
| Milk bought..... | 421, 378, 078 | \$4, 662, 487 |
| Sugar bought..... | 50, 873, 859 | 2, 589, 887 |
| Cans, labels, etc..... | | 1, 054, 897 |
| Materials used, aggregate cost..... | | 8, 907, 021 |

| PRODUCTS. | Quantity (pounds). | Value. |
|------------------------------------|--------------------|----------------|
| Condensed milk..... | 186, 921, 787 | \$11, 888, 792 |
| Other and incidental products..... | | 83, 680 |
| Products, aggregate value..... | | 11, 922, 472 |

The two states of New York and Illinois contain more than half of the condenseries reported, and produce over three-fourths of the entire output. Eleven states produced over 1,000,000 pounds of condensed milk each during the census year 1900. Arranged in the order of greatest product, they were (with number of condenseries in each from which statistics were obtained): New York, 16; Illinois, 11; Michigan, 4; California, 2; Wisconsin, 4; Pennsylvania, 3; New Hampshire, 1; Maine, 1; Vermont, 2; Washington, 1, and New Jersey, 1. The number of these establishments, with the position of the state in this list, gives a fair idea of the distribution of the industry. The total product in New York was 75,447,148 pounds, followed closely by Illinois, with 71,257,449. As the latter state has only 11 factories while the former has 16, the size of those in Illinois must be relatively large. Michigan made 18,378,869 pounds of condensed milk, but no other state in the above list made as much as 5,000,000 pounds. Missouri, Indiana, Kansas, and Ohio, with one condensery each, produced from 100,000 to 380,500 pounds.

Of the 50 establishments reported, 38 had condensed milk as their only product; 11 made butter also. The latter class is highly suggestive of a skimmed or partly skimmed article of milk being condensed. Five of these factories are in Illinois and 3 in New York. One factory in New York made both cheese and condensed milk, and 1 in Illinois both of these articles, and butter also.

There are several interesting items in the statistics of this industry. Although a considerable but unknown part of the product is the plain or unsweetened article, the sugar used for the remainder costs more than half as much as all of the milk condensed and preserved. The materials have a total value of \$8,907,021, and that of the finished product is \$11,922,472 for the whole country. But the cost of manufacture includes, besides the materials, the use and wear and tear of the factories, with their expensive machinery and general equipment,

and the wages of many skilled employees. The value of the condensed milk, at the factories, appears to average a little over 6½ cents per pound, in cans. There is a variation between 6 and 7 cents in different states, which is easily accounted for. In some the proportion of unsweetened milk is much greater and the cost and value correspondingly less. The quality of milk and of condensed product is very much better in some cases than in others, and the consequent cost and value are more. Under the general designation of "condensed milk" are included all the preparations of milk from which a large part of the water has been evaporated, including sweetened and unsweetened "condensed milk," "evaporated milk," "condensed cream," and "evaporated cream." These names are rather indiscriminately used, as cream or even enriched milk is seldom condensed or evaporated, while it is unfortunately true, on the other hand, that much poor and skimmed milk is condensed without being so marked or named.

MILK PRICES.—The census returns of the prices to patrons for milk are probably not altogether reliable, although they can not be far from the truth. It appears that for the census year 1900 the average price paid to producers delivering milk to butter factories was 77 cents per 100 pounds, while cheese factories paid an average of 78 cents and condensed-milk factories \$1.11. According to the returns, the prices for milk for making butter ranged from 64 and 65 cents per 100 pounds, in Kansas, South Dakota, Utah, and Wyoming, and 77 cents (the average) in Illinois and Iowa, to 82 cents in New York, 85 in California, 84 in Oregon, 87 in Washington, 90 in Pennsylvania, 93 in New Hampshire, 95 in Massachusetts, and \$1.08 in Connecticut. For cheese making the factories paid an average of 86 cents per 100 pounds for milk in California, 83 cents in New York, 76 in Michigan, 74 in Wisconsin, and 72 in Ohio. Condenseries are reported as paying 96 cents per 100 pounds for milk in Illinois, \$1.14 in California, \$1.15 in Pennsylvania, and \$1.35 in New York.

CONSUMPTION OF DAIRY PRODUCTS IN THE UNITED STATES.

Computation of the per capita consumption of dairy products annually in this country is a simple matter so far as butter and cheese are concerned. To the aggregates made on farms and in factories, including urban establishments, as already given, the imports must be added and the foreign and domestic exports deducted. The average of butter imported per annum for the five years reported nearest to the census year was 47,400 pounds, and the corresponding exports, 25,600,000; but for 1900 these quantities were 44,977 pounds (net) and 18,266,371 pounds. -Consequently, there was available for consumption in the census year the net quantity of

1,474,477,749 pounds of butter, which provided a small fraction over 19 pounds for each inhabitant.

Of cheese, the average imports for the same period were 12,400,000 pounds (net) and the exports 46,000,000 pounds. For the year 1900 the exact quantities reported were, respectively, 13,247,714 pounds (net) and 48,419,353 pounds. The quantity available for consumption in the year was, therefore, 263,835,179 pounds, or 3.3 pounds of cheese per capita of the population.

Condensed milk is both exported and imported, but

the records are reported by the Treasury Department in values only, not in quantities. The best course possible is to value all alike at 8 cents per pound. Upon this estimate, for the census year 1900, the imports of this commodity were equivalent to 533,196 pounds (net) and the exports 14,242,525 pounds, making the quantity available for consumption in the United States 173,212,458 pounds, or at the rate of 2.3 pounds per capita per annum. This result is rather surprising, but may be regarded as approximately correct.

TABLE 9.—QUANTITY AND VALUE OF CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, IN THE FIVE STATES OF GREATEST PRODUCTION: 1900.

| | NEW YORK. | | WISCONSIN. | | IOWA. | | ILLINOIS. | | PENNSYLVANIA. | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|---------------|--------------|
| | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. |
| Aggregate: | | | | | | | | | | |
| 1900 | | \$26,557,888 | | \$20,120,147 | | \$15,846,077 | | \$12,879,299 | | \$10,230,000 |
| 1890 | | 14,385,966 | | 6,960,711 | | 10,545,182 | | 8,004,991 | | 5,319,431 |
| Total for butter factories or creameries | | | | | | | | | | |
| Butter, total | 40,693,846 | 8,087,210 | 61,813,502 | 12,535,528 | 77,288,264 | 15,417,779 | 14,911,589 | 7,921,321 | 37,137,141 | 9,138,883 |
| Solid packed | 33,068,820 | 6,471,515 | 55,826,290 | 11,921,914 | 74,795,240 | 14,911,589 | 34,055,312 | 6,891,038 | 37,137,141 | 8,303,912 |
| Prints and rolls | 7,625,026 | 1,615,695 | 5,987,212 | 1,207,799 | 2,438,024 | 477,323 | 30,288,587 | 6,108,308 | 13,458,287 | 2,767,190 |
| Cream sold | 11,492,926 | 784,023 | 1,251,321 | 123,578 | 1,911,875 | 44,776 | 3,816,725 | 782,725 | 23,678,874 | 5,536,722 |
| Skimmed milk disposed of | 294,465,866 | 326,726 | 391,665,003 | 458,187 | 477,164,867 | 449,355 | 1,190,125 | 669,185 | 686,316 | 296,108 |
| Casein, dried | 6,223,085 | 154,272 | 101,300 | 2,390 | 3,800 | 76 | 215,740,194 | 277,098 | 200,182,662 | 244,100 |
| Other butter-factory products | | 70,034 | | 29,459 | | 12,033 | 1,784,559 | 60,132 | 3,103,281 | 116,760 |
| Total for cheese factories | 127,386,032 | 12,333,800 | 77,748,680 | 7,353,394 | 4,242,637 | 428,208 | 9,055,119 | 643,681 | 10,267,443 | 895,288 |
| Cheese, total | 113,629,093 | 12,226,783 | 48,278,378 | 7,281,181 | 3,767,490 | 424,678 | 4,324,461 | 338,723 | 9,333,008 | 888,733 |
| Standard factory | 18,756,939 | 1,313,285 | 29,470,302 | 2,746,273 | 475,147 | 55,056 | 4,730,658 | 288,261 | 984,435 | 831,724 |
| Other kinds | 10,176,310 | 8,707 | 6,410,260 | 4,706 | 674,318 | 198 | 7,828,516 | 4,890 | 94,950 | 54,000 |
| Whey, sold | 25,246,487 | 87,314 | 79,495,694 | 51,438 | 4,364,428 | 3,422 | 1,754,500 | 1,236 | 6,364,328 | 4,762 |
| Otherwise disposed of | | 10,996 | | 16,069 | | | | 10,571 | | 475 |
| Other cheese-factory products | | | | | | | | | | 1,315 |
| Total for condensed-milk factories | 75,447,148 | 4,801,228 | 3,466,516 | 231,225 | | | 71,257,449 | 4,314,297 | 2,862,000 | 255,835 |
| Condensed milk | | 4,801,228 | | 231,225 | | | | 4,303,597 | | 255,835 |
| Other condensery products | | | | | | | | 10,700 | | |

¹ Gallons.

Table 9 shows the location of the greatest activity in the industry, by giving statistics of production in selected states. The 5 leading states, and the only ones which reported for this industry factory products having an aggregate value of over \$10,000,000 during the last census year, are New York, Wisconsin, Iowa, Illinois, and Pennsylvania.

Of the 5 states, Wisconsin shows the greatest development, the value of total production having increased from 1890 to 1900, 189.1 per cent; while Pennsylvania increased 93.4 per cent; New York, 84.6 per cent, Illinois, 60.9 per cent; and Iowa, 50.3 per cent. In each of 13 other states the total value of products for the census year was over \$1,000,000, and in some of these the apparent increase was remarkable. The gain was

well distributed from east to west. In the old dairy regions of New England, Maine gained 330.2 per cent; Vermont, 252.9 per cent, New Hampshire, 196.8 per cent; and Massachusetts, 107.7 per cent; Connecticut increased only 24.1 per cent. In the new dairy territory of the Pacific coast, the increase in California was from \$172,579 to \$3,582,942, and in Washington from \$33,100 to \$1,190,239. In the great central basin the notable examples include new dairy states as well as old ones. Among the newer, Michigan gained 232.4 per cent in value of these products; Minnesota, 186.6 per cent; Kansas, 297.1 per cent; Nebraska, 90.5 per cent; and South Dakota, 1,089 per cent. Ohio, for years a large producer, increased from \$3,001,606 to \$3,808,996, or 26.9 per cent.

TABLE 10.—COMPARATIVE SUMMARY, CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES, ARRANGED GEOGRAPHICALLY: 1890 AND 1900.

| STATES. | Year. | Number of establishments. | Capital. | SALARIED OFFICIALS, CLERKS, ETC. | | WAGE-EARNERS. | | Miscellaneous expenses. | Cost of materials used. | Value of products. |
|-------------------------|--------------|---------------------------|----------------------------|----------------------------------|------------------------|------------------|--------------------------|-------------------------|-----------------------------|-----------------------------|
| | | | | Number. | Salaries. | Average number. | Total wages. | | | |
| United States..... | 1900 1890 | 9,242 4,552 | \$86,803,164 16,016,573 | 2,818 12,160 | \$911,712 1,867,151 | 12,799 12,219 | \$6,145,561 4,248,854 | \$1,574,790 813,954 | \$108,841,200 49,819,801 | \$190,788,849 60,685,705 |
| New England states..... | 1900 1890 | 493 268 | 2,570,025 882,094 | 285 108 | 108,690 52,417 | 1,077 640 | 514,909 263,556 | 148,420 58,610 | 9,453,854 8,890,845 | 11,182,883 4,048,124 |
| Maine..... | 1900 1890 | 61 40 | 420,510 110,215 | 39 16 | 16,646 7,311 | 162 84 | 70,283 29,884 | 23,065 4,598 | 1,407,050 384,403 | 1,727,684 401,626 |
| New Hampshire..... | 1900 1890 | 53 23 | 311,308 71,992 | 34 15 | 11,490 10,044 | 119 51 | 58,323 24,495 | 21,229 7,777 | 1,226,388 420,767 | 1,467,608 494,466 |
| Vermont..... | 1900 1890 | 255 123 | 1,222,892 367,353 | 137 47 | 37,514 18,569 | 522 263 | 236,377 77,403 | 66,992 14,947 | 4,885,289 1,387,445 | 5,656,265 1,602,641 |
| Massachusetts..... | 1900 1890 | 50 29 | 324,382 118,781 | 24 7 | 12,513 3,632 | 99 84 | 61,636 48,122 | 15,240 10,951 | 1,024,575 484,798 | 1,198,159 576,742 |
| Rhode Island..... | 1900 1890 | 3 4 | 7,800 16,983 | 4 5 | 1,125 3,736 | 9 14 | 3,427 6,310 | 628 6,910 | 28,938 71,894 | 39,569 91,322 |
| Connecticut..... | 1900 1890 | 71 49 | 274,733 196,770 | 47 18 | 24,402 9,125 | 166 144 | 84,863 77,342 | 21,266 13,427 | 881,614 700,038 | 1,093,703 881,327 |
| Middle states..... | 1900 1890 | 2,616 1,653 | 10,678,755 5,508,329 | 391 773 | 181,670 260,376 | 3,636 3,320 | 1,686,732 938,165 | 478,445 219,823 | 32,428,452 17,184,432 | 38,404,587 20,178,862 |
| New York..... | 1900 1890 | 1,908 1,308 | 7,084,130 4,002,026 | 227 614 | 122,292 196,790 | 2,439 2,461 | 1,157,081 640,827 | 337,303 149,946 | 22,486,869 12,362,992 | 26,557,888 14,885,966 |
| New Jersey..... | 1900 1890 | 53 16 | 242,284 88,959 | 14 3 | 4,350 1,330 | 74 36 | 36,852 13,802 | 9,219 3,888 | 488,105 120,223 | 610,006 146,394 |
| Pennsylvania..... | 1900 1890 | 749 300 | 3,033,128 1,322,384 | 127 138 | 45,696 55,621 | 976 766 | 445,708 267,147 | 116,195 61,665 | 8,711,685 4,433,395 | 10,290,006 5,319,434 |
| Delaware..... | 1900 1890 | 22 5 | 85,155 19,085 | 5 4 | 2,120 1,575 | 34 15 | 13,098 5,265 | 4,577 1,642 | 184,196 107,542 | 252,892 124,780 |
| Maryland..... | 1900 1890 | 64 24 | 294,058 76,875 | 18 14 | 7,312 5,160 | 113 42 | 33,998 11,064 | 11,151 2,682 | 557,647 160,280 | 693,795 202,288 |
| Southern states..... | 1900 1890 | 68 22 | 183,597 93,057 | 13 8 | 5,986 1,346 | 81 66 | 27,298 16,141 | 6,126 2,106 | 263,762 185,921 | 370,846 238,062 |
| West Virginia..... | 1900 1890 | 4 3 | 5,835 6,906 | ..... ..... | ..... ..... | 2 4 | 480 630 | 80 148 | 10,228 5,242 | 12,284 6,540 |
| Virginia..... | 1900 1890 | 10 12 | 15,145 47,375 | 3 | 1,346 | 8 41 | 2,158 11,687 | 930 808 | 39,951 158,226 | 51,942 202,544 |
| Georgia..... | 1900 1890 | 4 2 | 13,497 | 1 | 400 | 4 | 1,860 | 360 | 10,515 | 14,166 |
| Kentucky..... | 1900 1890 | 9 3 | 18,640 ..... | ..... ..... | ..... ..... | 17 | 5,206 | 1,261 | 55,447 | 77,035 |
| Tennessee..... | 1900 1890 | 12 4 | 36,175 19,405 | 6 | 2,340 | 20 11 | 4,193 2,249 | 1,113 585 | 49,846 15,176 | 69,722 18,605 |
| Alabama..... | 1900 1890 | 4 2 | 13,670 ..... | ..... ..... | ..... ..... | 4 | 1,277 | 175 | 8,034 | 12,969 |
| Arkansas..... | 1900 1890 | 8 2 | 26,603 | 3 | 1,446 | 5 | 1,734 | 374 | 24,538 | 32,717 |
| Oklahoma..... | 1900 1890 | 5 2 | 12,762 ..... | ..... ..... | ..... ..... | 3 | 1,520 | 185 | 13,749 | 18,994 |
| Texas..... | 1900 1890 | 12 3 | 41,670 19,172 | 3 | 1,800 | 18 10 | 8,870 1,575 | 1,648 567 | 51,454 7,277 | 81,017 10,373 |
| Central states..... | 1900 1890 | 5,004 2,374 | 17,886,811 8,377,962 | 1,616 1,160 | 402,832 492,309 | 6,220 7,294 | 3,077,002 2,717,696 | 634,554 441,803 | 54,882,800 27,015,318 | 66,415,204 33,463,212 |
| Ohio..... | 1900 1890 | 479 330 | 1,041,093 819,720 | 89 116 | 19,088 36,281 | 389 774 | 189,804 228,348 | 35,214 41,223 | 3,054,764 2,481,872 | 3,808,996 3,001,606 |
| Michigan..... | 1900 1890 | 286 100 | 1,250,897 481,770 | 92 71 | 25,360 28,656 | 503 353 | 222,245 111,017 | 87,001 30,391 | 3,274,264 946,152 | 3,918,995 1,179,139 |
| Indiana..... | 1900 1890 | 112 52 | 287,360 129,414 | 23 32 | 6,542 14,327 | 118 155 | 56,751 56,420 | 15,724 5,888 | 711,059 299,599 | 929,853 402,556 |
| Illinois..... | 1900 1890 | 527 262 | 4,465,752 2,180,685 | 220 196 | 136,463 123,796 | 1,483 1,344 | 696,688 568,218 | 177,417 106,850 | 10,199,429 6,582,144 | 12,879,299 8,004,991 |
| Wisconsin..... | 1900 1890 | 2,018 966 | 4,917,940 1,833,988 | 414 444 | 69,676 140,134 | 1,780 1,373 | 893,499 405,227 | 157,123 75,721 | 16,623,859 5,876,680 | 20,120,147 6,960,711 |

¹ Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 11.)

² No establishments reported.

³ Included in "all other states."

TABLE 10.—COMPARATIVE SUMMARY, CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES
ARRANGED GEOGRAPHICALLY: 1890 AND 1900—Continued.

| STATES. | Year. | Number of establishments. | Capital. | SALARIED OFFICIALS, CLERKS, ETC. | | WAGE-EARNERS. | | Miscellaneous expenses. | Cost of materials used. | Value of products. |
|-------------------------------------|-------|---------------------------|-------------|----------------------------------|-----------|-----------------|--------------|-------------------------|-------------------------|--------------------|
| | | | | Number. | Salaries. | Average number. | Total wages. | | | |
| Central states—Continued. | | | | | | | | | | |
| Minnesota..... | 1900 | 596 | \$2,264,956 | 341 | \$59,284 | 740 | \$398,224 | \$102,096 | \$7,188,711 | \$8,479,896 |
| | 1890 | 106 | 606,184 | 72 | 43,917 | 783 | 353,701 | 50,849 | 2,108,307 | 2,958,476 |
| Iowa..... | 1900 | 907 | 3,459,017 | 413 | 81,425 | 1,133 | 588,853 | 153,990 | 13,501,556 | 15,846,077 |
| | 1890 | 497 | 2,074,177 | 190 | 87,904 | 2,355 | 944,895 | 121,160 | 8,360,689 | 10,546,182 |
| Missouri..... | 1900 | 79 | 199,796 | 24 | 4,994 | 74 | 31,138 | 5,989 | 329,158 | 481,936 |
| | 1890 | 61 | 252,024 | 29 | 11,294 | 157 | 49,870 | 9,721 | 299,925 | 400,551 |
| Western states..... | | | | | | | | | | |
| | 1900 | 551 | 3,282,193 | 966 | 133,555 | 1,170 | 526,414 | 166,468 | 7,378,983 | 8,951,447 |
| | 1890 | 198 | 922,980 | 108 | 56,927 | 813 | 277,855 | 80,148 | 1,826,247 | 2,436,190 |
| Montana..... | 1900 | 3 | 6,823 | | | 2 | 1,101 | 199 | 6,022 | 8,418 |
| | 1890 | | | | | | | | | |
| Idaho..... | 1900 | 19 | 74,093 | 8 | 3,395 | 14 | 7,076 | 1,411 | 85,140 | 116,056 |
| | 1890 | 4 | 25,175 | 3 | 775 | 13 | 2,025 | 1,314 | 11,461 | 17,805 |
| North Dakota..... | 1900 | 21 | 51,515 | 5 | 1,250 | 13 | 7,725 | 1,281 | 96,286 | 122,128 |
| | 1890 | 10 | 38,490 | 1 | 600 | 25 | 6,813 | 2,227 | 67,528 | 85,140 |
| South Dakota..... | 1900 | 188 | 460,932 | 95 | 11,786 | 148 | 77,401 | 18,523 | 1,065,237 | 1,199,493 |
| | 1890 | 16 | 33,993 | 5 | 1,487 | 55 | 13,122 | 1,552 | 76,157 | 100,884 |
| Nebraska..... | 1900 | 93 | 952,185 | 66 | 40,569 | 333 | 146,522 | 38,823 | 1,854,228 | 2,253,393 |
| | 1890 | 58 | 339,165 | 47 | 29,241 | 428 | 151,126 | 49,563 | 808,839 | 1,188,000 |
| Nevada..... | 1900 | 4 | 49,766 | 9 | 2,570 | 11 | 6,428 | 1,099 | 127,044 | 148,301 |
| | 1890 | | | | | | | | | |
| Utah..... | 1900 | 57 | 269,247 | 54 | 15,976 | 159 | 63,135 | 13,788 | 550,096 | 713,889 |
| | 1890 | 3 | 22,300 | 1 | 500 | 11 | 4,110 | 345 | 13,859 | 18,650 |
| Colorado..... | 1900 | 88 | 203,947 | 18 | 11,415 | 80 | 40,823 | 13,912 | 471,003 | 618,281 |
| | 1890 | 6 | 30,065 | 10 | 7,630 | 10 | 6,210 | 2,208 | 75,226 | 110,924 |
| Kansas..... | 1900 | 171 | 1,139,595 | 97 | 40,908 | 395 | 167,293 | 71,383 | 3,002,395 | 3,652,530 |
| | 1890 | 101 | 433,792 | 41 | 16,694 | 271 | 94,449 | 22,939 | 713,677 | 919,737 |
| Arizona..... | 1900 | 7 | 73,480 | 14 | 5,686 | 15 | 9,410 | 6,099 | 121,592 | 148,453 |
| | 1890 | | | | | | | | | |
| Pacific states..... | | | | | | | | | | |
| | 1900 | 306 | 1,684,677 | 145 | 83,604 | 610 | 311,596 | 90,529 | 4,421,945 | 5,412,493 |
| | 1890 | 34 | 221,790 | 8 | 3,776 | 82 | 34,189 | 11,061 | 261,923 | 272,105 |
| Washington..... | 1900 | 60 | 304,178 | 35 | 27,159 | 146 | 80,935 | 16,516 | 932,190 | 1,190,239 |
| | 1890 | 3 | 9,850 | 1 | 75 | 3 | 1,050 | 262 | 24,475 | 33,100 |
| Oregon..... | 1900 | 68 | 223,409 | 20 | 8,981 | 62 | 27,302 | 11,852 | 508,793 | 639,222 |
| | 1890 | 12 | 86,290 | 2 | 971 | 30 | 9,779 | 3,608 | 45,265 | 66,426 |
| California..... | 1900 | 178 | 1,157,090 | 90 | 47,464 | 402 | 203,359 | 62,161 | 2,980,962 | 3,582,942 |
| | 1890 | 19 | 125,650 | 5 | 2,730 | 49 | 23,360 | 7,191 | 131,283 | 172,579 |
| All other states ¹ | 1900 | 4 | 16,216 | 2 | 375 | 5 | 1,610 | 248 | 11,404 | 15,979 |
| | 1890 | 3 | 10,361 | | | 4 | 1,252 | 408 | 7,015 | 9,150 |

¹ Not included in "all other states."² No establishments reported.³ Includes establishments distributed as follows: 1900—Mississippi, 2; Wyoming, 2. 1890—Kentucky, 1; Montana, 1; Wyoming, 1.

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES: 1900.

| | United States. | Alabama. | Arizona. | Arkansas. | California. | Colorado. | Connecticut. | Delaware. |
|---|----------------|----------|-----------|-----------|-------------|------------|--------------|------------|
| Number of establishments | 9,242 | 4 | 7 | 8 | 178 | 38 | 71 | 22 |
| Character of organization: | | | | | | | | |
| Individual | 4,509 | 2 | 1 | 2 | 80 | 14 | 21 | 13 |
| Firm and limited partnership | 1,340 | 1 | 2 | 1 | 29 | 11 | 11 | 8 |
| Incorporated company | 1,628 | 1 | 4 | 5 | 62 | 13 | 16 | |
| Miscellaneous | 1,765 | | | | 7 | | 23 | 1 |
| Capital: | | | | | | | | |
| Total | \$36,303,164 | \$13,670 | \$73,460 | \$26,508 | \$1,157,090 | \$203,947 | \$274,783 | \$85,155 |
| Land | \$1,818,519 | \$700 | \$2,975 | \$885 | \$196,192 | \$12,092 | \$18,283 | \$11,575 |
| Buildings | \$11,514,198 | \$3,600 | \$16,125 | \$6,229 | \$259,832 | \$61,625 | \$91,513 | \$17,650 |
| Machinery, tools, and implements | \$18,827,667 | \$7,370 | \$25,494 | \$16,021 | \$460,270 | \$72,078 | \$76,572 | \$37,850 |
| Cash and sundries | \$9,142,780 | \$2,000 | \$28,866 | \$3,368 | \$240,796 | \$58,152 | \$88,360 | \$18,080 |
| Proprietors and firm members | 6,987 | 4 | 4 | 5 | 137 | 35 | 49 | 29 |
| Salaried officials, clerks, etc.: | | | | | | | | |
| Total number | 2,818 | | 14 | 3 | 90 | 18 | 47 | 5 |
| Total salaries | \$911,712 | | \$5,686 | \$1,446 | \$47,464 | \$11,415 | \$24,402 | \$2,120 |
| Officers of corporations— | | | | | | | | |
| Number | 1,014 | | 8 | | 19 | 6 | 16 | |
| Salaries | \$266,304 | | \$2,256 | | \$7,100 | \$4,000 | \$9,896 | |
| General superintendents, managers, clerks, etc.— | | | | | | | | |
| Total number | 1,804 | | 6 | 3 | 71 | 12 | 31 | 5 |
| Total salaries | \$645,408 | | \$3,420 | \$1,446 | \$40,364 | \$7,415 | \$17,506 | \$2,120 |
| Men— | | | | | | | | |
| Number | 1,717 | | 4 | 3 | 69 | 11 | 23 | 5 |
| Salaries | \$617,072 | | \$2,700 | \$1,446 | \$39,634 | \$6,990 | \$16,456 | \$2,120 |
| Women— | | | | | | | | |
| Number | 87 | | 2 | | 2 | 1 | 3 | |
| Salaries | \$28,336 | | \$720 | | \$730 | \$425 | \$1,050 | |
| Wage-earners, including pieceworkers, and total wages: | | | | | | | | |
| Greatest number employed at any one time during the year | 16,923 | 5 | 19 | 8 | 477 | 122 | 180 | 38 |
| Least number employed at any one time during the year | 13,722 | 5 | 12 | 6 | 366 | 82 | 161 | 33 |
| Average number | 12,799 | 4 | 15 | 5 | 402 | 80 | 166 | 34 |
| Wages | \$6,145,561 | \$1,277 | \$9,410 | \$1,734 | \$203,359 | \$40,323 | \$84,893 | \$13,033 |
| Men, 16 years and over— | | | | | | | | |
| Average number | 11,637 | 3 | 15 | 5 | 352 | 76 | 161 | 34 |
| Wages | \$5,838,939 | \$1,217 | \$9,410 | \$1,734 | \$187,848 | \$39,143 | \$83,793 | \$13,033 |
| Women, 16 years and over— | | | | | | | | |
| Average number | 1,041 | 1 | | | 50 | 4 | 4 | |
| Wages | \$289,190 | \$60 | | | \$15,511 | \$1,180 | \$1,020 | |
| Children, under 16 years— | | | | | | | | |
| Average number | 121 | | | | | | 1 | |
| Wages | \$17,382 | | | | | | \$50 | |
| Average number of wage-earners, including pieceworkers, employed during each month: | | | | | | | | |
| Men, 16 years and over— | | | | | | | | |
| January | 8,695 | 2 | 12 | 5 | 319 | 69 | 157 | 32 |
| February | 8,846 | 2 | 12 | 6 | 323 | 69 | 156 | 32 |
| March | 9,733 | 3 | 16 | 5 | 357 | 72 | 155 | 33 |
| April | 12,289 | 4 | 16 | 7 | 381 | 73 | 160 | 35 |
| May | 14,485 | 4 | 16 | 8 | 405 | 84 | 163 | 33 |
| June | 14,226 | 3 | 16 | 7 | 375 | 78 | 170 | 36 |
| July | 13,795 | 3 | 16 | 5 | 364 | 76 | 166 | 36 |
| August | 13,435 | 3 | 17 | 5 | 353 | 77 | 163 | 36 |
| September | 12,538 | 3 | 15 | 4 | 347 | 79 | 164 | 35 |
| October | 11,803 | 3 | 15 | 3 | 337 | 100 | 160 | 33 |
| November | 10,416 | 3 | 15 | 3 | 333 | 67 | 159 | 31 |
| December | 9,079 | 3 | 12 | 4 | 322 | 68 | 157 | 31 |
| Women, 16 years and over— | | | | | | | | |
| January | 942 | 1 | | | 47 | 5 | 4 | |
| February | 989 | 1 | | | 42 | 5 | 4 | |
| March | 1,040 | 1 | | | 42 | 4 | 4 | |
| April | 1,121 | 1 | | | 45 | 4 | 4 | |
| May | 1,297 | 1 | | | 56 | 4 | 4 | |
| June | 1,240 | 1 | | | 55 | 4 | 4 | |
| July | 1,123 | 1 | | | 56 | 5 | 4 | |
| August | 1,072 | 1 | | | 56 | 5 | 4 | |
| September | 992 | 1 | | | 49 | 5 | 4 | |
| October | 929 | 1 | | | 47 | 4 | 4 | |
| November | 874 | 1 | | | 54 | 4 | 4 | |
| December | 868 | 1 | | | 53 | 4 | 4 | |
| Children, under 16 years— | | | | | | | | |
| January | 90 | | | | | | 1 | |
| February | 101 | | | | | | 1 | |
| March | 114 | | | | | | 1 | |
| April | 117 | | | | | | 1 | |
| May | 150 | | | | | | 1 | |
| June | 151 | | | | | | 1 | |
| July | 146 | | | | | | 1 | |
| August | 137 | | | | | | 1 | |
| September | 127 | | | | | | 1 | |
| October | 118 | | | | | | 1 | |
| November | 102 | | | | | | 1 | |
| December | 99 | | | | | | 1 | |
| Miscellaneous expenses: | | | | | | | | |
| Total | \$1,574,790 | \$175 | \$6,099 | \$874 | \$62,181 | \$13,912 | \$21,266 | \$4,577 |
| Rent of works | \$182,307 | | \$1,200 | | \$10,379 | \$2,194 | \$2,508 | \$580 |
| Taxes, not including internal revenue | \$173,464 | \$108 | \$467 | \$167 | \$6,098 | \$1,267 | \$1,376 | \$357 |
| Rent of offices, interest, insurance, and all sundry expenses not hitherto included | \$1,189,915 | \$67 | \$2,932 | \$187 | \$44,764 | \$10,133 | \$14,820 | \$3,640 |
| Contract work | \$28,604 | | \$1,500 | \$20 | \$920 | \$318 | \$3,062 | |
| Materials used: | | | | | | | | |
| Total cost | \$108,841,200 | \$8,034 | \$121,592 | \$24,538 | \$2,980,962 | \$471,003 | \$881,614 | \$184,196 |
| In making butter— | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | |
| Pounds | 8,514,806,634 | 663,998 | 9,380,494 | 3,479,767 | 281,686,502 | 29,569,674 | 14,020,591 | 21,676,468 |
| Cost | \$65,336,287 | \$6,158 | \$77,534 | \$22,442 | \$2,392,620 | \$230,222 | \$151,159 | \$170,341 |
| Gathered cream— | | | | | | | | |
| Pounds | 203,673,958 | | | | 1,151,300 | 2,033,425 | 15,356,688 | 102,400 |
| Cost | \$3,154,063 | | | | \$38,985 | \$108,372 | \$684,971 | \$5,120 |
| Tubs, boxes, color, salt, etc. | \$1,984,894 | \$307 | \$1,274 | \$710 | \$36,384 | \$3,200 | \$12,200 | \$2,498 |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES: 1900—Continued.

| | United States. | Alabama. | Arizona. | Arkansas. | California. | Colorado. | Connecticut. | Delaware. |
|---|----------------|----------|-----------|-----------|-------------|------------|--------------|-----------|
| Materials used—Continued. | | | | | | | | |
| Total cost—Continued. | | | | | | | | |
| In making cheese— | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | |
| Pounds..... | 2,741,898,114 | 100,000 | 4,788,520 | 105,000 | 24,781,215 | 13,337,856 | 2,111,039 | 150,000 |
| Cost..... | \$21,258,712 | \$700 | \$37,176 | \$735 | \$212,192 | \$111,297 | \$13,243 | \$1,650 |
| Boxes, salt, etc..... | \$703,225 | \$20 | \$604 | \$30 | \$8,528 | \$4,341 | \$155 | \$96 |
| In making condensed milk— | | | | | | | | |
| Milk— | | | | | | | | |
| Pounds..... | 421,878,073 | | | | 9,869,335 | | | |
| Cost..... | \$4,662,487 | | | | \$112,939 | | | |
| Sugar— | | | | | | | | |
| Pounds..... | 50,873,859 | | | | 136,100 | | | |
| Cost..... | \$2,689,687 | | | | \$6,030 | | | |
| Cans, labels, etc..... | \$1,654,694 | | | | \$69,031 | | | |
| Fuel..... | \$1,708,694 | \$616 | \$4,493 | \$550 | \$65,187 | \$6,800 | \$3,442 | \$3,552 |
| Rent of power and heat..... | \$17,285 | | | | \$423 | \$218 | \$300 | |
| Mill supplies..... | \$249,556 | \$233 | \$539 | \$56 | \$6,237 | \$1,524 | \$2,191 | \$665 |
| Freight..... | \$522,618 | | \$12 | \$15 | \$7,106 | \$7,027 | \$3,653 | \$100 |
| Products: | | | | | | | | |
| Total value..... | \$130,783,349 | \$12,939 | \$148,458 | \$32,717 | \$3,582,942 | \$618,281 | \$1,093,703 | \$252,692 |
| Creameries— | | | | | | | | |
| Packed solid— | | | | | | | | |
| Pounds..... | 323,956,500 | 15,757 | 72,974 | 134,184 | 2,983,262 | 536,908 | 456,626 | 533,694 |
| Value..... | \$63,961,893 | \$3,560 | \$15,092 | \$24,131 | \$584,478 | \$112,336 | \$105,521 | \$116,452 |
| Prints or rolls— | | | | | | | | |
| Pounds..... | 91,163,056 | 1,690 | \$51,109 | \$4,321 | 10,163,875 | 1,029,676 | 3,431,779 | 436,195 |
| Value..... | \$20,117,861 | \$376 | \$78,812 | \$6,732 | \$2,270,154 | \$238,299 | \$845,879 | \$110,982 |
| Cream sold— | | | | | | | | |
| Gallons..... | 7,720,569 | 8,266 | 15,063 | | 129,575 | 137,114 | 136,695 | 5,708 |
| Value..... | \$4,435,444 | \$5,752 | \$9,578 | | \$120,283 | \$78,099 | \$91,078 | \$3,308 |
| Skimmed milk sold, fed, or returned to patrons— | | | | | | | | |
| Pounds..... | 2,253,494,156 | 280,820 | 4,000,000 | 309,000 | 61,422,468 | 3,874,330 | 4,793,552 | 908,500 |
| Value..... | \$2,581,460 | \$1,241 | \$1,200 | \$802 | \$17,271 | \$6,888 | \$14,191 | \$2,565 |
| Casein dried, from skimmed milk— | | | | | | | | |
| Pounds..... | 12,298,405 | | 16,800 | | 8,500 | | 800 | 133,800 |
| Value..... | \$333,581 | | \$1,000 | | \$239 | | \$39 | \$4,221 |
| All other creamery products..... | \$639,821 | \$900 | \$10,453 | | \$17,333 | \$15,678 | \$6,111 | \$12,724 |
| Cheese factories— | | | | | | | | |
| Standard factory (cheddar)— | | | | | | | | |
| Pounds..... | 225,776,105 | 10,000 | 363,652 | 12,600 | 2,424,705 | 817,409 | 167,000 | 16,000 |
| Value..... | \$21,363,477 | \$1,200 | \$37,005 | \$1,008 | \$244,510 | \$91,715 | \$15,780 | \$2,400 |
| Other kinds— | | | | | | | | |
| Pounds..... | 56,136,219 | | 4,100 | | 251,338 | 647,848 | 154,263 | |
| Value..... | \$5,156,352 | | \$250 | | \$34,615 | \$70,245 | \$14,269 | |
| Whey— | | | | | | | | |
| Sold— | | | | | | | | |
| Pounds..... | 44,590,752 | | | 90,000 | 24,832 | | | |
| Value..... | \$28,923 | | | \$44 | \$8 | | | |
| Otherwise used— | | | | | | | | |
| Pounds..... | 164,476,915 | | | | 558,346 | 4,438,000 | | |
| Value..... | \$175,354 | | | | \$503 | \$200 | | |
| All other cheese factory products..... | \$66,711 | | \$68 | | \$422 | \$1,850 | | \$600 |
| Condensed milk factories— | | | | | | | | |
| Condensed milk— | | | | | | | | |
| Pounds..... | 186,921,787 | | | | 4,314,666 | | | |
| Value..... | \$11,888,792 | | | | \$261,936 | | | |
| All other condensed milk factory products..... | \$33,680 | | | | \$1,430 | | | |
| Comparison of products: | | | | | | | | |
| Number of establishments reporting for both years..... | 3,281 | 1 | 8 | 3 | 66 | 16 | 45 | 8 |
| Value for census year..... | \$63,595,564 | \$3,394 | \$33,916 | \$13,457 | \$1,643,873 | \$345,508 | \$650,508 | \$111,710 |
| Value for preceding business year..... | \$56,795,604 | \$3,394 | \$31,465 | \$8,053 | \$1,291,112 | \$317,775 | \$608,802 | \$67,040 |
| Branches: | | | | | | | | |
| Cream separators..... | | | | | | | | |
| Number..... | 9,701 | 2 | 6 | 6 | 243 | 96 | 31 | 15 |
| Factories..... | | | | | | | | |
| Number..... | 659 | | | | 25 | 20 | 4 | 1 |
| Separating stations..... | | | | | | | | |
| Number..... | 1,059 | | 1 | | 51 | 13 | 2 | 1 |
| Skimming stations..... | | | | | | | | |
| Number..... | 961 | | | | 44 | | 2 | 1 |
| Ice-cream plants..... | | | | | | | | |
| Number..... | 78 | | 2 | | | | 1 | |
| Power: | | | | | | | | |
| Number of establishments reporting..... | 6,924 | 4 | 4 | 7 | 160 | 33 | 69 | 20 |
| Total horsepower..... | | | | | | | | |
| Owned— | 88,373 | 48 | 101 | 72 | 1,932 | 103 | 631 | 254 |
| Engines— | | | | | | | | |
| Steam— | | | | | | | | |
| Number..... | 7,808 | 3 | 7 | 7 | 177 | 41 | 70 | 23 |
| Horsepower..... | 84,666 | 42 | 101 | 72 | 1,707 | 350 | 501 | 246 |
| Gas or gasoline— | | | | | | | | |
| Number..... | 137 | | | | 8 | | | 1 |
| Horsepower..... | 325 | | | | 39 | | | 8 |
| Water wheels— | | | | | | | | |
| Number..... | 110 | | | | 6 | | | |
| Horsepower..... | 1,594 | | | | 31 | | | |
| Electric motors— | | | | | | | | |
| Number..... | 41 | | | | 1 | | | |
| Horsepower..... | 311 | | | | 10 | | | |
| Other power— | | | | | | | | |
| Number..... | 30 | 1 | | | 3 | | | |
| Horsepower..... | 844 | 5 | | | 126 | | | |
| Rented— | | | | | | | | |
| Electric horsepower..... | 316 | | | | 19 | 23 | | |
| Other kinds of horsepower..... | 817 | | | | 1 | | 30 | |
| Furnished to other establishments, horsepower..... | 84 | | | | | | | |
| Establishments classified by number of persons employed, not including proprietors and firm members: | | | | | | | | |
| Total number of establishments..... | 9,242 | 4 | 7 | 8 | 178 | 38 | 71 | 22 |
| No employees..... | 1,820 | | 1 | 3 | 24 | 3 | 7 | 3 |
| Under 5..... | 7,462 | 4 | 5 | 5 | 125 | 29 | 44 | 12 |
| 5 to 20..... | 401 | | | | 26 | 5 | 20 | 2 |
| 21 to 50..... | 85 | | 1 | | 2 | 1 | | |
| 51 to 100..... | 11 | | | | 1 | | | |
| 101 to 250..... | 10 | | | | | | | |
| 251 to 500..... | 1 | | | | | | | |
| 501 to 1,000..... | 2 | | | | | | | |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES: 1900—Continued.

| | Georgia. | Idaho. | Illinois. | Indiana. | Iowa. | Kansas. | Kentucky. | Maine. |
|--|----------|----------|-------------|-----------|--------------|-------------|-----------|-----------|
| Number of establishments..... | 4 | 19 | 527 | 112 | 907 | 171 | 9 | 61 |
| Character of organization: | | | | | | | | |
| Individual..... | 1 | 5 | 224 | 55 | 328 | 60 | 6 | 22 |
| Firm and limited partnership..... | 1 | 4 | 96 | 18 | 133 | 23 | 3 | 9 |
| Incorporated company..... | 2 | 10 | 127 | 17 | 187 | 76 | ..... | 25 |
| Miscellaneous..... | ..... | ..... | 80 | 22 | 259 | 12 | ..... | 5 |
| Capital: | | | | | | | | |
| Total..... | \$18,497 | \$74,093 | \$4,465,752 | \$287,360 | \$3,450,017 | \$1,189,595 | \$18,640 | \$429,510 |
| Land..... | \$450 | \$3,350 | \$224,494 | \$18,310 | \$145,198 | \$41,280 | \$165 | \$16,951 |
| Buildings..... | \$3,100 | \$28,415 | \$1,394,116 | \$85,585 | \$61,095,429 | \$366,271 | \$1,450 | \$117,260 |
| Machinery, tools, and implements..... | \$8,910 | \$33,240 | \$1,559,197 | \$131,058 | \$1,499,183 | \$492,663 | \$5,665 | \$81,654 |
| Cash and sundries..... | \$1,037 | \$9,682 | \$1,287,945 | \$49,407 | \$719,207 | \$289,381 | \$11,360 | \$213,645 |
| Proprietors and firm members..... | 3 | 11 | 394 | 92 | 565 | 106 | 14 | 39 |
| Salaried officials, clerks, etc.: | | | | | | | | |
| Total number..... | 1 | 8 | 220 | 23 | 413 | 97 | ..... | 89 |
| Total salaries..... | \$400 | \$9,395 | \$130,463 | \$6,642 | \$81,425 | \$40,908 | ..... | \$16,646 |
| Officers of corporations— | | | | | | | | |
| Number..... | 1 | 3 | 58 | 6 | 277 | 45 | ..... | 20 |
| Salaries..... | \$400 | \$1,300 | \$33,186 | \$1,075 | \$37,606 | \$15,933 | ..... | \$6,385 |
| General superintendents, managers, clerks, etc.— | | | | | | | | |
| Total number..... | ..... | 5 | 162 | 17 | 136 | 52 | ..... | 19 |
| Total salaries..... | ..... | \$2,095 | \$103,277 | \$5,467 | \$43,819 | \$24,975 | ..... | \$10,261 |
| Men— | | | | | | | | |
| Number..... | ..... | 5 | 154 | 17 | 131 | 46 | ..... | 12 |
| Salaries..... | ..... | \$2,065 | \$99,967 | \$5,467 | \$42,859 | \$22,975 | ..... | \$7,417 |
| Women— | | | | | | | | |
| Number..... | ..... | ..... | 8 | ..... | 5 | 6 | ..... | 7 |
| Salaries..... | ..... | ..... | \$3,310 | ..... | \$960 | \$2,000 | ..... | \$2,844 |
| Wage-earners, including pieceworkers, and total wages: | | | | | | | | |
| Greatest number employed at any one time during the year..... | 4 | 22 | 1,751 | 142 | 1,369 | 468 | 18 | 192 |
| Least number employed at any one time during the year..... | 4 | 16 | 1,400 | 132 | 1,195 | 385 | 17 | 154 |
| Average number..... | 4 | 14 | 1,483 | 118 | 1,133 | 395 | 17 | 162 |
| Wages..... | \$1,860 | \$7,076 | \$696,088 | \$56,751 | \$588,653 | \$167,293 | \$5,206 | \$70,283 |
| Men, 16 years and over— | | | | | | | | |
| Average number..... | 4 | 14 | 1,136 | 105 | 1,069 | 386 | 14 | 141 |
| Wages..... | \$1,860 | \$7,076 | \$599,022 | \$54,516 | \$582,144 | \$164,908 | \$4,916 | \$64,707 |
| Women, 16 years and over— | | | | | | | | |
| Average number..... | ..... | ..... | 318 | 5 | 22 | 7 | 2 | 21 |
| Wages..... | ..... | ..... | \$92,065 | \$1,236 | \$4,951 | \$2,035 | \$160 | \$5,576 |
| Children, under 16 years— | | | | | | | | |
| Average number..... | ..... | ..... | 29 | 8 | 12 | 2 | 1 | ..... |
| Wages..... | ..... | ..... | \$5,031 | \$969 | \$1,558 | \$350 | \$180 | ..... |
| Average number of wage-earners, including pieceworkers, employed during each month: | | | | | | | | |
| Men, 16 years and over— | | | | | | | | |
| January..... | 4 | 16 | 1,054 | 95 | 952 | 348 | 14 | 121 |
| February..... | 4 | 16 | 1,071 | 95 | 978 | 349 | 14 | 122 |
| March..... | 4 | 13 | 1,107 | 95 | 1,027 | 357 | 14 | 126 |
| April..... | 4 | 13 | 1,181 | 103 | 1,151 | 399 | 15 | 143 |
| May..... | 4 | 14 | 1,270 | 121 | 1,256 | 438 | 15 | 157 |
| June..... | 4 | 16 | 1,232 | 122 | 1,233 | 423 | 14 | 163 |
| July..... | 4 | 16 | 1,211 | 120 | 1,190 | 419 | 14 | 165 |
| August..... | 4 | 13 | 1,187 | 112 | 1,163 | 419 | 14 | 161 |
| September..... | 4 | 13 | 1,132 | 105 | 1,133 | 403 | 15 | 150 |
| October..... | 4 | 13 | 1,093 | 98 | 1,064 | 368 | 15 | 137 |
| November..... | 4 | 13 | 1,048 | 97 | 1,026 | 357 | 15 | 126 |
| December..... | 4 | 15 | 1,046 | 97 | 1,013 | 351 | 14 | 122 |
| Women, 16 years and over— | | | | | | | | |
| January..... | ..... | ..... | 328 | 3 | 14 | 8 | 2 | 20 |
| February..... | ..... | ..... | 329 | 3 | 18 | 8 | 2 | 20 |
| March..... | ..... | ..... | 340 | 4 | 22 | 8 | 2 | 19 |
| April..... | ..... | ..... | 345 | 4 | 27 | 8 | 2 | 20 |
| May..... | ..... | ..... | 338 | 7 | 33 | 8 | 2 | 20 |
| June..... | ..... | ..... | 341 | 7 | 31 | 7 | 2 | 22 |
| July..... | ..... | ..... | 330 | 7 | 29 | 6 | 2 | 22 |
| August..... | ..... | ..... | 326 | 6 | 22 | 7 | 2 | 22 |
| September..... | ..... | ..... | 310 | 6 | 19 | 7 | 2 | 20 |
| October..... | ..... | ..... | 281 | 6 | 17 | 6 | 2 | 22 |
| November..... | ..... | ..... | 266 | 4 | 17 | 6 | 2 | 22 |
| December..... | ..... | ..... | 284 | 3 | 15 | 6 | 1 | 21 |
| Children, under 16 years— | | | | | | | | |
| January..... | ..... | ..... | 18 | 7 | 8 | 1 | 1 | ..... |
| February..... | ..... | ..... | 21 | 8 | 11 | 1 | 1 | ..... |
| March..... | ..... | ..... | 24 | 8 | 14 | 1 | 1 | ..... |
| April..... | ..... | ..... | 24 | 8 | 15 | 2 | 1 | ..... |
| May..... | ..... | ..... | 34 | 8 | 19 | 3 | 1 | ..... |
| June..... | ..... | ..... | 35 | 8 | 19 | 4 | 1 | ..... |
| July..... | ..... | ..... | 31 | 8 | 16 | 4 | 1 | ..... |
| August..... | ..... | ..... | 33 | 8 | 13 | 3 | 1 | ..... |
| September..... | ..... | ..... | 31 | 8 | 7 | 2 | 1 | ..... |
| October..... | ..... | ..... | 35 | 8 | 8 | 1 | 1 | ..... |
| November..... | ..... | ..... | 29 | 7 | 7 | 1 | 1 | ..... |
| December..... | ..... | ..... | 33 | 8 | 7 | 1 | 1 | ..... |
| Miscellaneous expenses: | | | | | | | | |
| Total..... | \$360 | \$1,411 | \$177,417 | \$15,724 | \$153,900 | \$71,338 | \$1,261 | \$23,065 |
| Rent of works..... | ..... | \$48 | \$10,936 | \$1,085 | \$12,089 | \$5,569 | \$326 | \$1,643 |
| Taxes, not including internal revenue..... | \$72 | \$599 | \$21,981 | \$1,668 | \$17,039 | \$7,456 | \$59 | \$2,291 |
| Rent of offices, interest, insurance, and all sundry expenses not hitherto included..... | \$288 | \$764 | \$142,145 | \$12,667 | \$121,816 | \$57,946 | \$376 | \$15,278 |
| Contract work..... | ..... | ..... | \$2,305 | \$304 | \$3,046 | \$412 | ..... | \$3,248 |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES:
1900—Continued.

| | Georgia. | Idaho. | Illinois. | Indiana. | Iowa. | Kansas. | Kentucky. | Maine. |
|--|-----------|-----------|--------------|------------|---------------|-------------|-----------|-------------|
| Materials used: | | | | | | | | |
| Total cost..... | \$10,515 | \$85,140 | \$10,199,429 | \$711,059 | \$13,501,556 | \$3,062,335 | \$53,447 | \$1,407,050 |
| In making butter— | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | |
| Pounds..... | 1,079,040 | 9,431,718 | 791,890,312 | 77,424,878 | 1,542,368,223 | 393,132,184 | 593,485 | 63,459,701 |
| Cost..... | \$9,792 | \$62,806 | \$6,118,253 | \$527,849 | \$10,900,707 | \$2,501,074 | \$5,532 | \$578,989 |
| Gathered cream— | | | | | | | | |
| Pounds..... | | 53,988 | 4,171,210 | 1,219,764 | 45,621,241 | 5,521,231 | 919,372 | 18,761,653 |
| Cost..... | | \$3,131 | \$156,172 | \$46,784 | \$1,559,184 | \$181,579 | \$45,968 | \$620,016 |
| Tubs, boxes, color, salt, etc..... | \$135 | \$1,874 | \$154,937 | \$17,189 | \$378,105 | \$123,401 | \$1,163 | \$24,397 |
| In making cheese— | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | |
| Pounds..... | | 1,890,938 | 76,167,122 | 12,742,929 | 43,676,392 | 22,145,872 | 272,000 | 5,179,813 |
| Cost..... | | \$12,694 | \$393,328 | \$92,946 | \$312,657 | \$155,899 | \$2,318 | \$41,989 |
| Boxes, salt, etc..... | | \$519 | \$22,436 | \$2,829 | \$13,205 | \$7,149 | \$49 | \$1,566 |
| In making condensed milk— | | | | | | | | |
| Milk— | | | | | | | | |
| Pounds..... | | | 170,785,967 | 712,000 | | 361,600 | | 5,930,000 |
| Cost..... | | | \$1,645,363 | \$5,350 | | \$2,892 | | \$32,965 |
| Sugar— | | | | | | | | |
| Pounds..... | | | 14,486,574 | | | | | 785,370 |
| Cost..... | | | \$757,394 | | | | | \$39,268 |
| Cans, labels, etc..... | | | \$572,356 | \$100 | | \$25 | | \$24,180 |
| Fuel..... | \$551 | \$3,300 | \$205,416 | \$13,744 | \$244,332 | \$57,768 | \$370 | \$12,112 |
| Rent of power and heat..... | | | \$315 | \$97 | \$1,280 | \$770 | | \$169 |
| Mill supplies..... | \$32 | \$176 | \$60,493 | \$1,803 | \$35,298 | \$5,858 | \$42 | \$2,680 |
| Freight..... | \$5 | \$640 | \$112,966 | \$2,068 | \$56,788 | \$25,920 | \$5 | \$7,728 |
| Products: | | | | | | | | |
| Total value..... | \$14,166 | \$116,056 | \$12,879,299 | \$929,858 | \$15,846,077 | \$3,652,530 | \$77,035 | \$1,727,634 |
| Creameries— | | | | | | | | |
| Packed solid— | | | | | | | | |
| Pounds..... | 7,560 | 140,925 | 30,238,587 | 3,104,595 | 74,795,240 | 15,299,548 | 15,500 | 1,434,029 |
| Value..... | \$1,598 | \$30,430 | \$6,108,308 | \$607,730 | \$14,484,216 | \$2,650,731 | \$3,485 | \$367,720 |
| Prints or rolls— | | | | | | | | |
| Pounds..... | 41,400 | 291,645 | 3,816,725 | 448,888 | 2,438,024 | 2,896,935 | 109,103 | 3,027,370 |
| Value..... | \$9,552 | \$59,699 | \$782,725 | \$92,220 | \$477,323 | \$574,587 | \$43,014 | \$637,275 |
| Cream sold— | | | | | | | | |
| Gallons..... | 2,496 | 3,206 | 1,190,125 | 108,763 | 91,875 | 112,212 | 17,663 | 755,845 |
| Value..... | \$1,978 | \$1,865 | \$669,185 | \$58,605 | \$44,776 | \$58,395 | \$9,000 | \$534,235 |
| Skimmed milk sold, fed, or returned to patrons— | | | | | | | | |
| Pounds..... | 884,000 | 2,261,966 | 215,740,194 | 15,578,808 | 477,164,867 | 106,027,436 | 1,147,600 | 8,536,314 |
| Value..... | \$960 | \$3,493 | \$277,093 | \$21,526 | \$449,355 | \$81,830 | \$7,304 | \$21,672 |
| Casein dried, from skimmed milk— | | | | | | | | |
| Pounds..... | | | 1,784,559 | 5,760 | 3,800 | 20,000 | | 12,500 |
| Value..... | | | \$60,132 | \$238 | \$70 | \$460 | | \$360 |
| All other creamery products..... | \$78 | | \$23,373 | \$12,409 | \$12,033 | \$33,594 | \$11,372 | \$3,433 |
| Cheese factories— | | | | | | | | |
| Standard factory (cheddar)— | | | | | | | | |
| Pounds..... | | 150,932 | 4,324,461 | 988,985 | 3,787,490 | 2,192,516 | 8,000 | 553,916 |
| Value..... | | \$13,562 | \$388,723 | \$100,220 | \$369,622 | \$219,160 | \$300 | \$56,609 |
| Other kinds— | | | | | | | | |
| Pounds..... | | 43,448 | 4,730,658 | 271,183 | 475,147 | 230,194 | 20,000 | |
| Value..... | | \$4,032 | \$288,261 | \$25,605 | \$55,056 | \$23,038 | \$2,000 | |
| Whay— | | | | | | | | |
| Sold— | | | | | | | | |
| Pounds..... | | | 7,828,516 | 263,000 | 674,318 | 535,000 | | 120,000 |
| Value..... | | | \$4,390 | \$444 | \$198 | \$406 | | \$39 |
| Otherwise used— | | | | | | | | |
| Pounds..... | | 412,695 | 1,754,500 | 1,700,880 | 4,304,428 | 603,638 | | 45,292 |
| Value..... | | \$1,375 | \$1,236 | \$715 | \$3,422 | \$656 | | \$75 |
| All other cheese, factory products..... | | \$1,600 | \$10,571 | \$856 | | | | |
| Condensed milk factories— | | | | | | | | |
| Pounds..... | | | 71,257,449 | 204,000 | | 144,640 | | 2,373,736 |
| Value..... | | | \$4,303,597 | \$9,240 | | \$14,623 | | \$166,165 |
| All other condensed milk, factory products..... | | | \$10,700 | | | | | |
| Comparison of products: | | | | | | | | |
| Number of establishments reporting for both years..... | 1 | 5 | 171 | 41 | 313 | 62 | 6 | 33 |
| Value for census year..... | \$3,640 | \$17,157 | \$6,782,241 | \$345,054 | \$6,424,916 | \$3,639,087 | \$74,317 | \$1,251,743 |
| Value for preceding business year..... | \$7,840 | \$15,287 | \$6,504,720 | \$321,492 | \$5,867,222 | \$1,429,546 | \$67,215 | \$1,227,303 |
| Branches: | | | | | | | | |
| Cream separators..... | 3 | 13 | 793 | 113 | 1,434 | 474 | 8 | 44 |
| Factories..... | | 1 | 41 | 5 | 54 | 49 | | 3 |
| Separating stations..... | | 2 | 28 | 18 | 60 | 132 | | 1 |
| Skimming stations..... | | 1 | 29 | 6 | 116 | 126 | 2 | 4 |
| Ice-cream plants..... | | | 1 | | | 12 | | 1 |
| Power: | | | | | | | | |
| Number of establishments reporting..... | 3 | 16 | 492 | 95 | 843 | 152 | 4 | 47 |
| Total horsepower..... | 30 | 140 | 7,035 | 1,000 | 11,853 | 3,302 | 37 | 502 |
| Owned— | | | | | | | | |
| Engines— | | | | | | | | |
| Steam— | | | | | | | | |
| Number..... | 3 | 16 | 543 | 105 | 913 | 320 | 4 | 49 |
| Horsepower..... | 30 | 140 | 6,798 | 977 | 11,716 | 3,200 | 37 | 485 |
| Gas or gasoline— | | | | | | | | |
| Number..... | | | 11 | 3 | 18 | 8 | | |
| Horsepower..... | | | 78 | 10 | 89 | 47 | | |
| Water wheels— | | | | | | | | |
| Number..... | | | | | | 1 | | 2 |
| Horsepower..... | | | | | | 20 | | 11 |
| Electric motors— | | | | | | | | |
| Number..... | | | 30 | | | 2 | | 1 |
| Horsepower..... | | | 209 | | | 14 | | 6 |
| Other power— | | | | | | | | |
| Number..... | | | | 1 | | 1 | | |
| Horsepower..... | | | | 5 | | 20 | | |
| Rented— | | | | | | | | |
| Electric, horsepower..... | | | | | | | | |
| Other kinds, horsepower..... | | | | | 48 | 1 | | |
| Furnished to other establishments, horsepower..... | | | 10 | | | | | |
| | | | | 15 | 2 | | | |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES: 1900—Continued.

| | Georgia. | Idaho. | Illinois. | Indiana. | Iowa. | Kansas. | Kentucky. | Maine. | |
|--|-----------|----------------|-------------|-------------|-----------|----------|-----------|----------|----------------|
| Establishments classified by number of persons employed, not including proprietors and firm members: | | | | | | | | | |
| Total number of establishments..... | 4 | 19 | 527 | 112 | 907 | 171 | 9 | 61 | |
| No employees..... | 2 | 5 | 66 | 21 | 91 | 8 | 1 | 8 | |
| Under 5..... | 2 | 13 | 426 | 87 | 778 | 144 | 6 | 39 | |
| 5 to 20..... | | 1 | 26 | 4 | 94 | 14 | 2 | 12 | |
| 21 to 50..... | | | 3 | | 1 | 4 | | 2 | |
| 51 to 100..... | | | 1 | | | 1 | | | |
| 101 to 250..... | | | 4 | | | | | | |
| 251 to 500..... | | | 1 | | | | | | |
| 501 to 1,000..... | | | | | | | | | |
| | Maryland. | Massachusetts. | Michigan. | Minnesota. | Missouri. | Montana. | Nebraska. | Nevada. | New Hampshire. |
| Number of establishments..... | 84 | 50 | 286 | 596 | 79 | 3 | 93 | 4 | 53 |
| Character of organization: | | | | | | | | | |
| Individual..... | 53 | 15 | 121 | 116 | 29 | 1 | 32 | | 17 |
| Firm and limited partnership..... | 19 | | 37 | 50 | 17 | | 8 | 1 | 4 |
| Incorporated company..... | 11 | 4 | 57 | 92 | 22 | 2 | 33 | 3 | 27 |
| Miscellaneous..... | 1 | 31 | 71 | 338 | 11 | | 20 | | 5 |
| Capital: | | | | | | | | | |
| Total..... | \$234,058 | \$324,382 | \$1,250,897 | \$2,264,956 | \$199,796 | \$6,823 | \$952,185 | \$49,766 | \$311,908 |
| Land..... | \$12,541 | \$19,945 | \$52,656 | \$70,101 | \$11,166 | \$25 | \$29,891 | \$2,745 | \$15,725 |
| Buildings..... | \$47,770 | \$85,483 | \$340,299 | \$680,629 | \$67,255 | \$800 | \$318,572 | \$25,000 | \$123,414 |
| Machinery, tools, and implements..... | \$118,440 | \$76,854 | \$446,224 | \$1,089,986 | \$90,209 | \$3,493 | \$312,816 | \$9,300 | \$86,816 |
| Cash and sundries..... | \$55,307 | \$142,100 | \$411,718 | \$474,240 | \$31,166 | \$2,565 | \$290,906 | \$12,721 | \$80,353 |
| Proprietors and firm members: | 91 | 18 | 203 | 210 | 66 | 1 | 47 | | 27 |
| Salaried officials, clerks, etc.: | | | | | | | | | |
| Total number..... | 18 | 24 | 92 | 341 | 24 | | 66 | 9 | 34 |
| Total salaries..... | \$7,312 | \$12,613 | \$25,360 | \$50,284 | \$4,994 | | \$40,569 | \$2,870 | \$11,490 |
| Officers of corporations— | | | | | | | | | |
| Number..... | 3 | 4 | 25 | 28 | 6 | | 11 | 6 | 19 |
| Salaries..... | \$210 | \$1,925 | \$5,599 | \$7,852 | \$296 | | \$7,750 | \$620 | \$2,930 |
| General superintendents, managers, clerks, etc.— | | | | | | | | | |
| Total number..... | 15 | 20 | 67 | 313 | 18 | | 55 | 3 | 15 |
| Total salaries..... | \$7,102 | \$10,588 | \$19,761 | \$51,432 | \$4,698 | | \$32,819 | \$1,950 | \$8,560 |
| Men— | | | | | | | | | |
| Number..... | 15 | 19 | 63 | 307 | 18 | | 48 | 3 | 14 |
| Salaries..... | \$7,102 | \$10,488 | \$18,607 | \$49,902 | \$4,698 | | \$27,919 | \$1,950 | \$8,155 |
| Women— | | | | | | | | | |
| Number..... | | 1 | 4 | 6 | | | 7 | | 1 |
| Salaries..... | | \$150 | \$1,154 | \$1,530 | | | \$4,900 | | \$405 |
| Wage-earners, including pieceworkers, and total wages: | | | | | | | | | |
| Greatest number employed at any one time during the year..... | 126 | 112 | 669 | 909 | 91 | 4 | 396 | 12 | 138 |
| Least number employed at any one time during the year..... | 117 | 100 | 547 | 802 | 79 | 3 | 306 | 9 | 115 |
| Average number..... | 113 | 99 | 503 | 740 | 74 | 2 | 333 | 11 | 119 |
| Wages..... | \$33,998 | \$61,636 | \$222,245 | \$398,224 | \$31,138 | \$1,101 | \$146,522 | \$6,428 | \$58,323 |
| Men, 16 years and over— | | | | | | | | | |
| Average number..... | 109 | 99 | 392 | 724 | 66 | 2 | 324 | 11 | 99 |
| Wages..... | \$33,205 | \$61,636 | \$186,596 | \$395,179 | \$29,775 | \$1,101 | \$144,676 | \$6,428 | \$52,562 |
| Women, 16 years and over— | | | | | | | | | |
| Average number..... | 2 | | 109 | 7 | 5 | | 8 | | 19 |
| Wages..... | \$602 | | \$85,328 | \$1,560 | \$963 | | \$1,726 | | \$5,611 |
| Children under 16 years— | | | | | | | | | |
| Average number..... | 2 | | 2 | 9 | 3 | | 1 | | 1 |
| Wages..... | \$191 | | \$321 | \$1,485 | \$400 | | \$120 | | \$150 |
| Average number of wage-earners, including pieceworkers, employed during each month: | | | | | | | | | |
| Men, 16 years and over— | | | | | | | | | |
| January..... | 104 | 92 | 280 | 600 | 60 | 1 | 274 | 10 | 89 |
| February..... | 103 | 92 | 293 | 610 | 59 | 1 | 275 | 10 | 89 |
| March..... | 103 | 94 | 334 | 641 | 60 | 2 | 279 | 9 | 82 |
| April..... | 107 | 105 | 409 | 749 | 64 | 2 | 350 | 11 | 98 |
| May..... | 117 | 108 | 504 | 847 | 74 | 3 | 382 | 11 | 107 |
| June..... | 116 | 108 | 497 | 839 | 72 | 2 | 369 | 11 | 111 |
| July..... | 113 | 106 | 478 | 816 | 69 | 2 | 370 | 11 | 109 |
| August..... | 112 | 101 | 457 | 802 | 72 | 2 | 367 | 11 | 105 |
| September..... | 112 | 99 | 434 | 769 | 68 | 2 | 362 | 11 | 102 |
| October..... | 107 | 94 | 384 | 702 | 69 | 2 | 292 | 11 | 98 |
| November..... | 107 | 91 | 343 | 669 | 63 | 1 | 282 | 9 | 96 |
| December..... | 107 | 92 | 296 | 649 | 61 | 1 | 278 | 11 | 91 |
| Women, 16 years and over— | | | | | | | | | |
| January..... | 2 | | 112 | 3 | 3 | | 8 | | 17 |
| February..... | 2 | | 114 | 3 | 5 | | 8 | | 17 |
| March..... | 2 | | 114 | 3 | 5 | | 8 | | 18 |
| April..... | 3 | | 113 | 10 | 5 | | 8 | | 18 |
| May..... | 3 | | 129 | 12 | 6 | | 10 | | 18 |
| June..... | 3 | | 124 | 12 | 6 | | 8 | | 21 |
| July..... | 3 | | 112 | 12 | 9 | | 8 | | 27 |
| August..... | 3 | | 99 | 10 | 5 | | 8 | | 21 |
| September..... | 3 | | 91 | 6 | 3 | | 8 | | 18 |
| October..... | 2 | | 92 | 5 | 3 | | 8 | | 18 |
| November..... | 2 | | 100 | 4 | 3 | | 7 | | 19 |
| December..... | 2 | | 104 | 4 | 3 | | 7 | | 17 |
| Children, under 16 years— | | | | | | | | | |
| January..... | 2 | | | 6 | 3 | | 1 | | 1 |
| February..... | 2 | | | 6 | 3 | | 1 | | 1 |
| March..... | 2 | | | 7 | 3 | | 1 | | 1 |
| April..... | 2 | | | 9 | 3 | | 1 | | 1 |
| May..... | 2 | | | 5 | 3 | | 1 | | 1 |
| June..... | 2 | | | 5 | 3 | | 1 | | 1 |
| July..... | 2 | | | 6 | 3 | | 1 | | 1 |
| August..... | 2 | | | 6 | 3 | | 1 | | 1 |
| September..... | 2 | | | 2 | 3 | | 1 | | 1 |
| October..... | 2 | | | 11 | 3 | | 1 | | 1 |
| November..... | 2 | | | 8 | 3 | | 1 | | 1 |
| December..... | 2 | | | 7 | 3 | | 1 | | 1 |
| | 2 | | | 6 | 3 | | 1 | | 1 |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT BY STATES AND TERRITORIES:
1900—Continued.

| | Maryland. | Massachusetts. | Michigan. | Minnesota. | Missouri. | Montana. | Nebraska. | Nevada. | New Hampshire. |
|---|------------|----------------|-------------|-------------|------------|----------|-------------|------------|----------------|
| Miscellaneous expenses: | | | | | | | | | |
| Total | \$11,151 | \$15,240 | \$37,001 | \$102,096 | \$5,989 | \$199 | \$33,823 | \$1,099 | \$21,229 |
| Rent of works | \$4,158 | \$5,974 | \$3,424 | \$12,794 | \$1,843 | \$147 | \$4,976 | | \$1,112 |
| Taxes, not including internal revenue | \$1,072 | \$1,916 | \$6,367 | \$10,214 | \$912 | \$50 | \$4,212 | \$279 | \$1,980 |
| Rent of offices, interest, insurance, and all sundry expenses not hitherto included | \$5,891 | \$8,520 | \$27,085 | \$75,326 | \$3,234 | \$22 | \$29,583 | \$820 | \$18,127 |
| Contract work | \$30 | \$830 | \$125 | \$3,762 | | | \$102 | | \$10 |
| Materials used: | | | | | | | | | |
| Total cost | \$557,647 | \$1,024,575 | \$3,274,264 | \$7,188,711 | \$329,158 | \$6,022 | \$1,854,228 | \$127,044 | \$1,226,388 |
| In making butter— | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | |
| Pounds | 61,470,380 | 24,096,955 | 168,778,899 | 827,582,793 | 29,425,255 | 804,395 | 176,321,039 | 13,960,646 | 99,580,600 |
| Cost | \$497,842 | \$218,027 | \$1,198,949 | \$5,941,138 | \$198,833 | \$5,467 | \$1,303,697 | \$107,636 | \$923,600 |
| Gathered cream— | | | | | | | | | |
| Pounds | 862,069 | 15,709,294 | 2,816,106 | 14,816,175 | 569,905 | | 9,941,850 | | 2,149,851 |
| Cost | \$37,800 | \$746,985 | \$103,464 | \$622,292 | \$25,040 | | \$376,326 | | \$37,803 |
| Tubs, boxes, color, salt, etc | \$5,788 | \$20,017 | \$39,110 | \$282,134 | \$7,504 | \$221 | \$53,345 | \$3,421 | \$26,865 |
| In making cheese— | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | |
| Pounds | | 2,761,420 | 99,985,822 | 25,145,631 | 10,879,869 | | 3,140,000 | 688,425 | 1,200,623 |
| Cost | | \$19,433 | \$760,550 | \$176,359 | \$73,513 | | \$21,242 | \$4,901 | \$9,932 |
| Boxes, salt, etc | | \$630 | \$26,681 | \$6,785 | \$2,728 | | \$390 | \$78 | \$247 |
| In making condensed milk— | | | | | | | | | |
| Milk— | | | | | | | | | |
| Pounds | | 324,000 | 45,107,250 | | 737,140 | | | | 6,351,829 |
| Cost | | \$4,820 | \$447,268 | | \$6,200 | | | | \$36,518 |
| Sugar— | | | | | | | | | |
| Pounds | | | 7,599,220 | | 8,000 | | | | 975,651 |
| Cost | | | \$379,961 | | \$440 | | | | \$48,732 |
| Cans, labels, etc | | \$500 | \$245,816 | | \$5,000 | | | | \$29,121 |
| Fuel | \$9,279 | \$9,051 | \$48,121 | \$146,806 | \$3,439 | \$296 | \$45,439 | \$3,707 | \$12,925 |
| Rent of power and heat | \$270 | \$48 | \$900 | \$1,480 | \$108 | \$13 | \$2,900 | | \$4,745 |
| Mill supplies | \$1,382 | \$1,777 | \$4,126 | \$15,969 | \$1,000 | \$18 | \$3,106 | \$480 | \$3,007 |
| Freight | \$5,286 | \$3,787 | \$19,618 | \$46,748 | \$1,353 | \$17 | \$43,183 | \$6,821 | \$5,813 |
| Products: | | | | | | | | | |
| Total value | \$693,795 | \$1,108,159 | \$3,918,995 | \$8,479,896 | \$431,936 | \$8,418 | \$2,253,893 | \$148,301 | \$1,467,503 |
| Creameries— | | | | | | | | | |
| Packed solid— | | | | | | | | | |
| Pounds | 1,121,807 | 1,888,570 | 7,553,059 | 39,145,380 | 1,270,604 | 2,000 | 10,077,362 | | 2,255,816 |
| Value | \$256,076 | \$448,304 | \$1,472,672 | \$7,820,401 | \$240,222 | \$400 | \$1,864,748 | | \$484,684 |
| Prints or rolls— | | | | | | | | | |
| Pounds | 1,419,909 | 2,703,349 | 267,653 | 2,029,089 | 170,012 | 32,238 | 1,648,818 | 628,402 | 2,778,454 |
| Value | \$304,087 | \$637,139 | \$53,139 | \$414,944 | \$34,898 | \$7,558 | \$310,852 | \$182,916 | \$615,212 |
| Cream sold— | | | | | | | | | |
| Gallons | 167,857 | 86,849 | 131,164 | 370,899 | 12,829 | 502 | 62,158 | 857 | 102,695 |
| Value | \$93,201 | \$58,461 | \$60,032 | \$195,102 | \$7,601 | \$376 | \$30,138 | \$535 | \$83,693 |
| Skimmed milk sold, fed, or returned to patrons— | | | | | | | | | |
| Pounds | 10,561,974 | 3,221,968 | 62,942,908 | 129,883,119 | 10,271,866 | | 5,503,184 | 10,401,275 | 19,353,460 |
| Value | \$14,196 | \$8,090 | \$64,708 | \$152,559 | \$12,883 | | \$4,801 | \$5,562 | \$51,266 |
| Casein dried, from skimmed milk— | | | | | | | | | |
| Pounds | 72,350 | 152,267 | | 50,000 | | | | | 114,933 |
| Value | \$3,461 | \$7,613 | | \$2,000 | | | | | \$3,249 |
| All other creamery products | \$22,774 | \$6,073 | \$11,079 | \$148,127 | \$9,948 | \$84 | \$11,999 | \$400 | \$16,107 |
| Cheese factories— | | | | | | | | | |
| Standard factory (cheddar)— | | | | | | | | | |
| Pounds | | 238,542 | 9,995,766 | 3,033,693 | 1,022,751 | | 294,800 | 80,150 | 116,741 |
| Value | | \$23,639 | \$932,776 | \$217,647 | \$98,163 | | \$29,430 | \$5,888 | \$11,651 |
| Other kinds— | | | | | | | | | |
| Pounds | | 12,000 | 426,816 | 251,326 | 50,000 | | 19,300 | | |
| Value | | \$1,200 | \$49,783 | \$28,807 | \$4,600 | | \$1,930 | | |
| Whey— | | | | | | | | | |
| Sold— | | | | | | | | | |
| Pounds | | | 12,400,814 | 18,000 | | | | | |
| Value | | | \$4,608 | \$20 | | | | | |
| Otherwise used— | | | | | | | | | |
| Pounds | | | 9,857,733 | 1,125,680 | 448,100 | | | | |
| Value | | | \$5,910 | \$722 | \$321 | | | | |
| All other cheese factory products | | | \$1,421 | \$67 | | | | | |
| Condensed-milk factories— | | | | | | | | | |
| Condensed milk— | | | | | | | | | |
| Pounds | | 108,000 | 13,378,869 | | 380,500 | | | | 2,876,157 |
| Value | | \$5,480 | \$1,262,317 | | \$23,300 | | | | \$201,331 |
| All other condensed-milk factory products | | | | | | | | | |
| Comparison of products: | | | | | | | | | |
| Number of establishments reporting for both years | 38 | 31 | 93 | 193 | 28 | | 26 | 2 | 28 |
| Value for census year | \$324,309 | \$339,456 | \$2,202,719 | \$3,355,033 | \$199,485 | | \$1,181,688 | \$104,466 | \$692,350 |
| Value for preceding business year | \$282,071 | \$315,390 | \$2,165,987 | \$2,898,052 | \$183,056 | | \$938,532 | \$89,831 | \$633,070 |
| Branches: | | | | | | | | | |
| Cream separators | 101 | 28 | 242 | 940 | 60 | 4 | 325 | 9 | 74 |
| Factories | 10 | 1 | 19 | 25 | 4 | | 19 | | 3 |
| Separating stations | 25 | | 14 | 45 | 1 | | 123 | | 15 |
| Skimming stations | 12 | 3 | 5 | 21 | 7 | | 137 | | 3 |
| Ice-cream plants | | | 2 | | 2 | | | | |
| Power: | | | | | | | | | |
| Number of establishments reporting | 79 | 48 | 217 | 570 | 61 | 3 | 92 | 4 | 47 |
| Total horsepower | 800 | 449 | 2,371 | 8,053 | 639 | 16 | 2,263 | 46 | 711 |
| Owned— | | | | | | | | | |
| Engines— | | | | | | | | | |
| Steam— | | | | | | | | | |
| Number | 88 | 45 | 217 | 594 | 63 | 2 | 218 | 4 | 43 |
| Horsepower | 767 | 435 | 2,324 | 7,876 | 639 | 14 | 2,126 | 45 | 551 |
| Gas or gasoline— | | | | | | | | | |
| Number | 1 | | 7 | 2 | | 1 | 25 | | |
| Horsepower | 15 | | 17 | 30 | | 2 | 122 | | |
| Water wheels— | | | | | | | | | |
| Number | 3 | 1 | 1 | 2 | | | | | 1 |
| Horsepower | 18 | 10 | 10 | 29 | | | | | 60 |
| Electric motors— | | | | | | | | | |
| Number | | | | 2 | | | | | |
| Horsepower | | | | 28 | | | | | |
| Other power— | | | | | | | | | |
| Number | | | | 3 | | | | | |
| Horsepower | | | | 23 | | | | | |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES: 1900—Continued.

| | Maryland. | Massachu- sotts. | Michigan. | Minnesota. | Missouri. | Montana. | Nebraska. | Nevada. | New Hampshire. |
|---|-------------|---------------------|------------------|-------------|-----------|-----------|-------------------|------------------|-------------------|
| Power—Continued. | | | | | | | | | |
| Total horsepower—Continued. | | | | | | | | | |
| Rented— | | | | | | | | | |
| Electric horsepower..... | | 3 | 20 | 14 | | | 15 | | 10 |
| Other kinds of horsepower..... | 10 | 1 | | 53 | | | | | 100 |
| Furnished to other establishments, horse- power..... | | | | | | | 12 | | |
| Establishments classified by number of persons employed, not including proprietors and firm members: | | | | | | | | | |
| Total number of establishments..... | 84 | 50 | 286 | 596 | 79 | 3 | 98 | 4 | 58 |
| No employees..... | 11 | 1 | 35 | 30 | 15 | | 2 | | 4 |
| Under 5..... | 71 | 41 | 238 | 552 | 62 | 3 | 78 | 3 | 37 |
| 5 to 20..... | 2 | 8 | 11 | 13 | 2 | | 11 | 1 | 11 |
| 21 to 50..... | | | | 1 | | | | | 1 |
| 51 to 100..... | | | 1 | | | | 1 | | |
| 101 to 250..... | | | | | | | | | |
| 251 to 500..... | | | | | | | | | |
| 501 to 1,000..... | | | | | | | | | |
| | New Jersey. | New York. | North Dakota. | Ohio. | Oklahoma. | Oregon. | Pennsylva- na. | Rhode Island. | South Dakota. |
| Number of establishments..... | 58 | 1,908 | 21 | 479 | 5 | 68 | 749 | 3 | 138 |
| Character of organization: | | | | | | | | | |
| Individual..... | 32 | 1,274 | 10 | 232 | | 40 | 394 | | 25 |
| Firm and limited partnership..... | 9 | 280 | 3 | 97 | 3 | 14 | 153 | | 14 |
| Incorporated company..... | 5 | 195 | 6 | 63 | 2 | 9 | 83 | 2 | 41 |
| Miscellaneous..... | 7 | 159 | 2 | 87 | | 5 | 119 | 1 | 58 |
| Capital: | | | | | | | | | |
| Total..... | \$242,284 | \$7,084,180 | \$51,515 | \$1,041,008 | \$12,762 | \$223,409 | \$3,083,128 | \$7,800 | \$460,982 |
| Land..... | \$18,735 | \$359,122 | \$1,095 | \$55,547 | \$1,320 | \$10,355 | \$126,836 | \$400 | \$12,192 |
| Buildings..... | \$73,810 | \$2,571,475 | \$14,750 | \$324,312 | \$3,900 | \$12,257 | \$896,458 | \$1,850 | \$150,143 |
| Machinery, tools, and implements..... | \$97,040 | \$2,342,306 | \$26,800 | \$385,546 | \$5,600 | \$98,944 | \$1,268,416 | \$3,350 | \$243,390 |
| Cash and sundries..... | \$52,699 | \$1,811,227 | \$3,870 | \$275,688 | \$1,942 | \$71,858 | \$741,423 | \$2,200 | \$56,207 |
| Proprietors and firm members..... | 55 | 1,772 | 13 | 391 | 5 | 60 | 692 | | 44 |
| Salaries of officials, clerks, etc.: | | | | | | | | | |
| Total number..... | 14 | 227 | 5 | 89 | | 20 | 127 | 4 | 95 |
| Total salaries..... | \$4,350 | \$122,292 | \$1,250 | \$19,088 | | \$8,981 | \$45,596 | \$1,125 | \$11,786 |
| Officers of corporations— | | | | | | | | | |
| Number..... | 4 | 70 | 1 | 21 | | 8 | 40 | | 59 |
| Salaries..... | \$320 | \$51,017 | \$60 | \$5,655 | | \$4,533 | \$10,024 | | \$6,056 |
| General superintendents, managers, clerks, etc.— | | | | | | | | | |
| Total number..... | 10 | 157 | 4 | 68 | | 12 | 87 | 4 | 36 |
| Total salaries..... | \$4,030 | \$71,275 | \$1,190 | \$13,433 | | \$4,448 | \$35,572 | \$1,125 | \$5,730 |
| Men— | | | | | | | | | |
| Number..... | 9 | 146 | 4 | 66 | | 10 | 79 | 3 | 35 |
| Salaries..... | \$3,910 | \$67,746 | \$1,190 | \$13,273 | | \$4,185 | \$34,016 | \$1,085 | \$5,250 |
| Women— | | | | | | | | | |
| Number..... | 1 | 11 | | 2 | | 2 | 8 | 1 | 1 |
| Salaries..... | \$120 | \$3,529 | | \$160 | | \$263 | \$1,556 | \$40 | \$480 |
| Wage-earners, including pieceworkers, and total wages: | | | | | | | | | |
| Greatest number employed at any one time during the year..... | 94 | 3,609 | 20 | 627 | 5 | 93 | 1,294 | 9 | 206 |
| Least number employed at any one time dur- ing the year..... | 84 | 2,853 | 19 | 515 | 3 | 82 | 1,120 | 9 | 163 |
| Average number..... | 74 | 2,489 | 18 | 389 | 3 | 62 | 976 | 9 | 148 |
| Wages..... | \$36,852 | \$1,157,081 | \$7,725 | \$189,304 | \$1,520 | \$27,802 | \$445,708 | \$3,427 | \$77,401 |
| Men, 16 years and over— | | | | | | | | | |
| Average number..... | 74 | 2,085 | 18 | 376 | 3 | 61 | 922 | 9 | 147 |
| Wages..... | \$36,852 | \$1,063,837 | \$7,725 | \$186,621 | \$1,520 | \$27,202 | \$435,101 | \$3,427 | \$77,201 |
| Women, 16 years and over— | | | | | | | | | |
| Average number..... | | 345 | | 11 | | 1 | 35 | | |
| Wages..... | | \$91,917 | | \$2,913 | | \$100 | \$8,629 | | |
| Children, under 16 years— | | | | | | | | | |
| Average number..... | | 9 | | 2 | | | 19 | | 1 |
| Wages..... | | \$1,327 | | \$270 | | | \$1,078 | | \$200 |
| Average number of wage-earners, including pieceworkers, employed during each month: | | | | | | | | | |
| Men, 16 years and over— | | | | | | | | | |
| January..... | 76 | 1,119 | 9 | 194 | 3 | 47 | 711 | 9 | 117 |
| February..... | 76 | 1,165 | 9 | 193 | 3 | 48 | 725 | 9 | 117 |
| March..... | 78 | 1,481 | 9 | 223 | 3 | 51 | 798 | 9 | 125 |
| April..... | 80 | 2,354 | 11 | 392 | 3 | 67 | 993 | 9 | 156 |
| May..... | 85 | 2,940 | 16 | 553 | 5 | 83 | 1,154 | 9 | 186 |
| June..... | 75 | 2,865 | 16 | 546 | 3 | 72 | 1,105 | 9 | 183 |
| July..... | 73 | 2,749 | 18 | 529 | 3 | 71 | 1,072 | 9 | 173 |
| August..... | 72 | 2,646 | 19 | 494 | 3 | 69 | 1,042 | 9 | 169 |
| September..... | 66 | 2,483 | 15 | 471 | 3 | 62 | 987 | 9 | 156 |
| October..... | 69 | 2,267 | 14 | 393 | 3 | 62 | 921 | 9 | 139 |
| November..... | 68 | 1,745 | 11 | 293 | 3 | 52 | 820 | 9 | 124 |
| December..... | 70 | 1,214 | 9 | 211 | 3 | 48 | 735 | 9 | 116 |
| Women, 16 years and over— | | | | | | | | | |
| January..... | | 275 | | 4 | | 1 | 26 | | |
| February..... | | 313 | | 5 | | 1 | 31 | | |
| March..... | | 340 | | 6 | | 1 | 32 | | |
| April..... | | 393 | | 12 | | 1 | 38 | | |
| May..... | | 478 | | 17 | | 1 | 47 | | |
| June..... | | 434 | | 19 | | 1 | 43 | | |
| July..... | | 369 | | 17 | | 1 | 39 | | |
| August..... | | 352 | | 16 | | 1 | 40 | | |
| September..... | | 329 | | 9 | | 1 | 43 | | |
| October..... | | 314 | | 6 | | 1 | 41 | | |
| November..... | | 279 | | 3 | | 1 | 31 | | |
| December..... | | 266 | | 3 | | 1 | 29 | | |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES:
1900—Continued.

| | New Jersey. | New York. | North Dakota. | Ohio. | Oklahoma. | Oregon. | Pennsylvania. | Rhode Island. | South Dakota. |
|---|-------------|---------------|---------------|-------------|-----------|------------|---------------|---------------|---------------|
| Average number of wage-earners, including pieceworkers, employed during each month—Continued. | | | | | | | | | |
| Children, under 16 years— | | | | | | | | | |
| January | | 4 | | 2 | | | 23 | | 1 |
| February | | 4 | | 2 | | | 25 | | 1 |
| March | | 8 | | 2 | | | 26 | | 1 |
| April | | 8 | | 2 | | | 18 | | 1 |
| May | | 15 | | 2 | | | 19 | | 1 |
| June | | 10 | | 2 | | | 20 | | 1 |
| July | | 11 | | 2 | | | 20 | | 1 |
| August | | 9 | | 2 | | | 20 | | 1 |
| September | | 13 | | 2 | | | 16 | | 1 |
| October | | 11 | | 2 | | | 16 | | 1 |
| November | | 7 | | 2 | | | 15 | | 1 |
| December | | 5 | | 2 | | | 15 | | 1 |
| Miscellaneous expenses: | | | | | | | | | |
| Total | \$9,219 | \$337,303 | \$1,231 | \$35,214 | \$185 | \$11,852 | \$116,195 | \$698 | \$18,423 |
| Rent of works | \$1,372 | \$31,270 | \$55 | \$9,865 | \$58 | \$3,314 | \$23,828 | \$315 | \$588 |
| Taxes, not including internal revenue | \$1,105 | \$31,715 | \$208 | \$5,205 | \$97 | \$1,118 | \$11,868 | \$30 | \$2,556 |
| Rent of offices, interest, insurance, and all sundry expenses not hitherto included | \$6,632 | \$273,752 | \$968 | \$22,884 | \$30 | \$7,230 | \$79,344 | \$283 | \$14,856 |
| Contract work | \$50 | \$566 | | \$260 | | \$190 | \$1,155 | | \$524 |
| Materials used: | | | | | | | | | |
| Total cost | \$488,105 | \$22,486,869 | \$96,286 | \$3,054,764 | \$13,749 | \$508,793 | \$8,711,635 | \$28,938 | \$1,005,237 |
| In making butter— | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | |
| Pounds | 45,776,228 | 908,604,425 | 9,622,423 | 197,557,284 | 1,322,000 | 39,178,740 | \$24,301,194 | | 136,419,366 |
| Cost | \$420,319 | \$7,448,865 | \$71,971 | \$1,477,372 | \$7,752 | \$331,035 | \$7,336,725 | | \$887,767 |
| Gathered cream— | | | | | | | | | |
| Pounds | 40,000 | 2,496,730 | | 5,700,296 | | 1,200,505 | 3,587,909 | 530,112 | 114,357 |
| Cost | \$1,600 | \$107,103 | | \$154,935 | | \$60,817 | \$151,363 | \$28,252 | \$13,507 |
| Tubs, boxes, color, salt, etc. | \$6,118 | \$186,421 | \$4,352 | \$37,019 | \$232 | \$5,124 | \$114,126 | \$292 | \$31,006 |
| In making cheese— | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | |
| Pounds | 1,000,000 | 1,252,585,286 | 2,258,736 | 177,156,588 | 652,570 | 11,324,119 | 96,578,519 | | 4,322,623 |
| Cost | \$7,000 | \$10,354,330 | \$14,845 | \$1,283,449 | \$4,722 | \$94,201 | \$694,691 | | \$27,627 |
| Boxes, salt, etc. | \$260 | \$305,981 | \$710 | \$11,493 | \$178 | \$3,104 | \$26,180 | | \$929 |
| In making condensed milk— | | | | | | | | | |
| Milk— | | | | | | | | | |
| Pounds | 3,835,500 | 148,409,886 | | 300,000 | | | 7,075,622 | | |
| Cost | \$38,350 | \$2,091,794 | | \$2,100 | | | \$81,129 | | |
| Sugar— | | | | | | | | | |
| Pounds | 20,000 | 23,811,929 | | 50,000 | | | 994,000 | | |
| Cost | \$1,000 | \$1,217,102 | | \$2,550 | | | \$49,700 | | |
| Cans, labels, etc. | \$300 | \$517,883 | | \$1,600 | | | \$55,716 | | |
| Fuel | \$10,640 | \$256,402 | \$2,639 | \$38,120 | \$705 | \$6,669 | \$108,658 | \$307 | \$33,091 |
| Rent of power and heat | | \$417 | | \$149 | | \$266 | \$914 | | \$76 |
| Mill supplies | \$1,152 | \$36,494 | \$1,146 | \$4,749 | \$125 | \$896 | \$16,629 | \$32 | \$3,225 |
| Freight | \$1,366 | \$54,077 | \$623 | \$11,228 | \$35 | \$6,631 | \$26,804 | \$5 | \$7,707 |
| Products: | | | | | | | | | |
| Total value | \$610,006 | \$26,557,888 | \$122,128 | \$3,808,996 | \$18,994 | \$639,222 | \$10,290,006 | \$39,569 | \$1,169,493 |
| Creameries— | | | | | | | | | |
| Packed solid— | | | | | | | | | |
| Pounds | 587,424 | 33,068,820 | 361,224 | 6,802,419 | | 425,727 | 13,458,287 | 6,000 | 6,110,723 |
| Value | \$128,435 | \$6,471,615 | \$74,339 | \$1,335,512 | | \$95,738 | \$2,767,190 | \$1,200 | \$1,134,223 |
| Prints or rolls— | | | | | | | | | |
| Pounds | 738,095 | 7,025,026 | 101,964 | 1,285,212 | 53,200 | 1,549,630 | 23,678,874 | 142,195 | 61,881 |
| Value | \$173,606 | \$1,615,095 | \$20,393 | \$304,039 | \$10,040 | \$344,866 | \$5,536,722 | \$34,789 | \$14,739 |
| Cream sold— | | | | | | | | | |
| Gallons | 404,917 | 1,492,926 | 300 | 787,331 | 227 | 58,750 | 686,316 | 3,991 | 1,566 |
| Value | \$212,570 | \$784,623 | \$120 | \$396,743 | \$158 | \$40,141 | \$396,108 | \$2,980 | \$1,070 |
| Skimmed milk sold, fed, or returned to patrons— | | | | | | | | | |
| Pounds | 10,301,835 | 294,465,866 | 3,690,083 | 50,554,932 | | 3,479,764 | 200,182,662 | | 9,600,349 |
| Value | \$16,482 | \$326,726 | \$5,285 | \$1,453 | | \$19,056 | \$244,100 | | \$8,670 |
| Casein dried, from skimmed milk— | | | | | | | | | |
| Pounds | 21,320 | 6,223,085 | | 73,600 | | | 3,103,281 | | |
| Value | \$1,061 | \$154,272 | | \$3,632 | | | \$116,730 | | |
| All other creamery products | \$16,782 | \$70,034 | \$90 | \$25,955 | \$1,000 | \$2,790 | \$78,003 | \$600 | \$3,457 |
| Cheese factories— | | | | | | | | | |
| Standard factory (cheddar)— | | | | | | | | | |
| Pounds | 100,000 | 113,629,093 | 225,899 | 14,570,866 | 26,578 | 1,106,505 | 9,333,008 | | 420,779 |
| Value | \$9,000 | \$10,913,498 | \$21,291 | \$1,304,795 | \$3,163 | \$126,327 | \$334,724 | | \$37,299 |
| Other kinds— | | | | | | | | | |
| Pounds | | 13,756,939 | | 3,585,661 | 39,800 | 89,059 | 934,435 | | |
| Value | | \$1,313,285 | | \$350,928 | \$4,033 | \$9,054 | \$54,009 | | |
| Whey— | | | | | | | | | |
| Sold— | | | | | | | | | |
| Pounds | | 10,176,310 | | 5,276,552 | | 350,000 | 94,950 | | |
| Value | | \$3,707 | | \$3,836 | | \$335 | \$475 | | |
| Otherwise used— | | | | | | | | | |
| Pounds | | 25,246,487 | 596,300 | 16,814,646 | | 755,391 | 6,364,328 | | |
| Value | | \$37,314 | \$110 | \$3,231 | | \$420 | \$4,762 | | |
| All other cheese factory products | | \$10,906 | | \$15,822 | | | \$1,318 | | |
| Condensed milk factories— | | | | | | | | | |
| Condensed milk— | | | | | | | | | |
| Pounds | 1,072,000 | 75,447,148 | | 100,000 | | | 2,862,000 | | |
| Value | \$52,040 | \$4,801,223 | | \$6,500 | | | \$255,835 | | |
| All other condensed milk factory products | | | | \$1,550 | | | | | |
| Comparison of products: | | | | | | | | | |
| Number of establishments reporting for both years | 20 | 763 | 2 | 179 | 1 | 33 | 313 | 3 | 55 |
| Value for census year | \$262,252 | \$14,557,565 | \$32,889 | \$1,499,035 | \$2,000 | \$467,344 | \$5,748,044 | \$30,569 | \$590,576 |
| Value for preceding business year | \$249,585 | \$13,994,247 | \$25,125 | \$1,316,282 | \$2,000 | \$376,586 | \$5,612,391 | \$41,669 | \$480,710 |
| Branches: | | | | | | | | | |
| Cream separators | 58 | 1,081 | 16 | 261 | 3 | 51 | 1,033 | 2 | 165 |
| Factories | 2 | 159 | | 20 | | 7 | 50 | | 6 |
| Separating stations | 3 | 114 | | 5 | | 5 | 169 | | 19 |
| Skimming stations | 1 | 87 | | 31 | | 5 | 81 | | 6 |
| Ice-cream plants | | 22 | | | | | 3 | | |

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES:
1900—Continued.

| | Tennessee. | Texas. | Utah. | Vermont. | Virginia. | Washing- ton. | West Virginia. | Wisconsin. | All other states. ¹ |
|--|------------|-----------|------------|-------------|-----------|------------------|-------------------|---------------|-----------------------------------|
| Average number of wage-earners, including pieceworkers, employed during each month— Continued. | | | | | | | | | |
| Women, 16 years and over— | | | | | | | | | |
| January | 2 | | 6 | 9 | | 28 | | 14 | |
| February | 2 | | 6 | 9 | | 26 | | 15 | |
| March | 2 | | 6 | 10 | | 29 | | 18 | |
| April | 3 | | 6 | 12 | | 27 | | 22 | |
| May | 3 | | 10 | 20 | | 28 | 2 | 32 | |
| June | 3 | | 10 | 20 | | 28 | 2 | 35 | |
| July | 3 | | 9 | 20 | | 3 | 2 | 32 | |
| August | 3 | | 17 | 17 | | 3 | 2 | 32 | |
| September | 3 | | 6 | 14 | | 3 | | 32 | |
| October | 2 | | 6 | 10 | | 3 | | 28 | |
| November | 2 | | 6 | 9 | | 3 | | 29 | |
| December | 2 | | 6 | 8 | | 10 | | 14 | |
| Children, under 16 years— | | | | | | | | | |
| January | 3 | | | | | 2 | | 6 | |
| February | 3 | | | | | 2 | | 6 | |
| March | 3 | | | | | 3 | | 6 | |
| April | 3 | | | | | 3 | | 10 | |
| May | 3 | | | | | 3 | | 19 | |
| June | 3 | | | | | 3 | | 20 | |
| July | 3 | | | | | 3 | | 20 | |
| August | 3 | | | | | 3 | | 19 | |
| September | 3 | | | | | 3 | | 19 | |
| October | 3 | | | | | 3 | | 13 | |
| November | 3 | | | | | 2 | | 11 | |
| December | 3 | | | | | 2 | | 7 | |
| Miscellaneous expenses: | | | | | | | | | |
| Total | \$1,113 | \$1,648 | \$13,788 | \$66,902 | \$930 | \$16,516 | \$80 | \$157,123 | \$248 |
| Rent of works | \$100 | \$870 | \$3,544 | \$4,905 | \$243 | \$4,615 | \$40 | \$19,285 | |
| Taxes, not including internal revenue | \$144 | \$292 | \$1,628 | \$5,873 | \$107 | \$1,904 | \$15 | \$22,022 | \$91 |
| Rent of offices, interest, insurance, and all sundry expenses not hitherto included | \$869 | \$546 | \$8,060 | \$54,511 | \$580 | \$9,997 | \$25 | \$113,810 | \$157 |
| Contract work | | | \$556 | \$2,208 | | | | \$2,506 | |
| Materials used: | | | | | | | | | |
| Total cost | \$49,846 | \$51,454 | \$550,006 | \$4,885,289 | \$39,951 | \$932,190 | \$10,228 | \$16,023,859 | \$11,404 |
| In making butter— | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | |
| Pounds | 5,621,753 | 6,304,350 | 59,373,117 | 332,646,771 | 4,511,081 | 50,075,824 | 882,000 | 1,193,209,152 | 1,528,076 |
| Cost | \$46,728 | \$42,193 | \$387,651 | \$3,262,211 | \$34,100 | \$433,250 | \$6,720 | \$8,929,413 | \$10,508 |
| Gathered cream— | | | | | | | | | |
| Pounds | | 58,400 | 151,780 | 22,868,877 | | 3,071,243 | | 27,026,227 | |
| Cost | | \$2,338 | \$9,300 | \$888,955 | | \$206,173 | | \$1,047,375 | |
| Tubs, boxes, color, salt, etc. | \$829 | \$774 | \$8,542 | \$153,103 | \$783 | \$11,644 | \$203 | \$275,272 | \$325 |
| In making cheese— | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | |
| Pounds | 68,900 | 582,900 | 18,549,169 | 44,691,588 | 600,000 | 14,785,570 | 346,252 | 705,184,808 | 10,000 |
| Cost | \$447 | \$8,966 | \$124,701 | \$378,071 | \$3,600 | \$130,636 | \$3,121 | \$5,673,436 | \$65 |
| Boxes, salt, etc. | \$20 | \$213 | \$4,634 | \$13,516 | \$112 | \$8,924 | \$66 | \$202,190 | \$15 |
| In making condensed milk— | | | | | | | | | |
| Milk— | | | | | | | | | |
| Pounds | | | | 4,940,744 | | 7,200,000 | | 9,368,200 | |
| Cost | | | | \$47,987 | | \$64,800 | | \$86,052 | |
| Sugar— | | | | | | | | | |
| Pounds | | | | 769,010 | | | | 1,238,005 | |
| Cost | | | | \$38,450 | | | | \$48,090 | |
| Cans, labels, etc. | | | | \$22,870 | | \$59,900 | | \$50,299 | |
| Fuel | \$1,175 | \$1,751 | \$3,570 | \$57,687 | \$790 | \$11,945 | \$113 | \$257,376 | \$137 |
| Rent of power and heat | | | \$316 | \$472 | \$60 | \$904 | | \$825 | |
| Mill supplies | \$132 | \$176 | \$1,866 | \$3,627 | \$98 | \$1,649 | \$5 | \$24,507 | \$34 |
| Freight | \$615 | \$45 | \$4,556 | \$13,360 | \$458 | \$7,305 | | \$28,724 | \$20 |
| Products: | | | | | | | | | |
| Total value | \$69,722 | \$81,017 | \$713,883 | \$5,656,265 | \$51,942 | \$1,190,289 | \$12,284 | \$20,120,147 | \$15,979 |
| Creameries— | | | | | | | | | |
| Packed solid— | | | | | | | | | |
| Pounds | 154,071 | 70,450 | 332,865 | 17,366,750 | 87,700 | 1,100,070 | 40,000 | 55,826,290 | 73,725 |
| Value | \$32,768 | \$14,525 | \$62,872 | \$3,611,065 | \$17,536 | \$284,775 | \$3,000 | \$10,714,115 | \$14,150 |
| Prints or rolls— | | | | | | | | | |
| Pounds | 58,762 | 182,204 | 2,186,349 | 5,086,631 | 82,821 | 2,098,351 | 1,000 | 5,987,212 | 4,300 |
| Value | \$11,074 | \$42,460 | \$437,412 | \$1,101,226 | \$19,729 | \$508,003 | \$150 | \$1,207,799 | \$1,656 |
| Cream sold— | | | | | | | | | |
| Gallons | 87,257 | 21,665 | 89,860 | 215,839 | 12,623 | 54,634 | | 251,331 | 300 |
| Value | \$22,026 | \$9,063 | \$26,505 | \$152,209 | \$7,317 | \$48,977 | | \$123,578 | \$300 |
| Skimmed milk sold, fed, or returned to patrons— | | | | | | | | | |
| Pounds | 2,611,627 | 900,000 | 10,300,788 | 114,219,796 | 400,000 | 15,300,851 | | 391,665,003 | 58,000 |
| Value | \$2,420 | \$3,300 | \$10,939 | \$115,663 | \$1,000 | \$15,896 | | \$458,157 | \$297 |
| Casein dried, from skimmed milk— | | | | | | | | | |
| Pounds | | | | 399,200 | | | | 101,300 | |
| Value | | | | \$22,298 | | | | \$2,300 | |
| All other creamery products | | | | | | | | | |
| | \$774 | \$5,020 | \$1,106 | \$15,037 | \$900 | \$1,436 | | \$23,459 | \$6 |
| Cheese factories— | | | | | | | | | |
| Standard factory (cheddar)— | | | | | | | | | |
| Pounds | 6,201 | 58,290 | 1,874,179 | 4,068,063 | 57,000 | 1,436,127 | | 48,278,378 | 1,000 |
| Value | \$620 | \$6,574 | \$174,571 | \$406,764 | \$5,400 | \$169,285 | | \$4,534,908 | \$150 |
| Other kinds— | | | | | | | | | |
| Pounds | | | | 645,042 | | 46,000 | 40,860 | 29,470,302 | |
| Value | | | | \$66,814 | | \$4,740 | \$4,084 | \$2,746,273 | |
| Whey— | | | | | | | | | |
| Sold— | | | | | | | | | |
| Pounds | | | 320,200 | | | | | 6,410,260 | 8,600 |
| Value | | | \$200 | | | | | \$4,706 | \$21 |
| Otherwise used— | | | | | | | | | |
| Pounds | 51,000 | | 1,620,000 | 8,142,467 | | 72,000 | | 79,495,694 | |
| Value | \$40 | | \$172 | \$7,660 | | \$72 | | \$51,433 | |
| All other cheese factory products | | \$75 | \$112 | \$1,809 | | \$5 | \$50 | \$16,069 | |
| Condensed milk factories— | | | | | | | | | |
| Condensed milk— | | | | | | | | | |
| Pounds | | | | 1,973,556 | | 1,962,500 | | 3,466,516 | |
| Value | | | | \$195,720 | | \$187,000 | | \$231,225 | |
| All other condensed milk factory products | | | | \$20,000 | | | | | |

¹ Includes establishments distributed as follows: Mississippi, 2; Wyoming, 2.

TABLE 11.—CHEESE, BUTTER, AND CONDENSED MILK, FACTORY PRODUCT, BY STATES AND TERRITORIES:
1900—Continued.

| | Tennessee. | Texas. | Utah. | Vermont. | Virginia. | Washing- ton. | West Virginia. | Wisconsin. | All other states. ¹ |
|---|------------|----------|-----------|-------------|-----------|------------------|-------------------|-------------|-----------------------------------|
| Comparison of products: | | | | | | | | | |
| Number of establishments reporting for both years | 6 | 4 | 22 | 104 | 4 | 28 | 2 | 680 | 4 |
| Value for census year | \$31,124 | \$25,440 | \$365,555 | \$2,882,622 | \$22,807 | \$576,117 | \$3,052 | \$6,214,917 | \$15,079 |
| Value for preceding business year | \$29,150 | \$19,081 | \$310,620 | \$2,581,382 | \$21,090 | \$493,218 | \$2,932 | \$5,460,111 | \$15,350 |
| Branches: | | | | | | | | | |
| Cream separators | 13 | 7 | 54 | 382 | 5 | 74 | 1 | 1,374 | 2 |
| Factories | | | 2 | 22 | | 10 | | 113 | |
| Separating stations | | | 6 | 188 | | 9 | | 97 | |
| Skimming stations | 1 | | 8 | 24 | | 4 | | 181 | |
| Ice-cream plants | 1 | | | 24 | | | | 7 | |
| Power: | | | | | | | | | |
| Number | 9 | 6 | 55 | 209 | 7 | 47 | 1 | 992 | 3 |
| Total horsepower | 83 | 84 | 616 | 3,639 | 48 | 526 | 12 | 12,430 | 26 |
| Owned— | | | | | | | | | |
| Engines— | | | | | | | | | |
| Steam— | | | | | | | | | |
| Number | 9 | 6 | 58 | 247 | 6 | 51 | 1 | 1,109 | 3 |
| Horsepower | 83 | 64 | 546 | 3,217 | 43 | 476 | 12 | 12,187 | 26 |
| Gas or gasoline— | | | | | | | | | |
| Number | | 1 | | 1 | | 1 | | 20 | |
| Horsepower | | 20 | | 4 | | 2 | | 123 | |
| Water wheels— | | | | | | | | | |
| Number | | | 4 | 14 | | 4 | | 7 | |
| Horsepower | | | 60 | 255 | | 17 | | 79 | |
| Electric motors— | | | | | | | | | |
| Number | | | | 1 | | | | 2 | |
| Horsepower | | | | 15 | | | | 17 | |
| Other power— | | | | | | | | | |
| Number | | | | 7 | | | | 5 | |
| Horsepower | | | | 64 | | | | 20 | |
| Rented— | | | | | | | | | |
| Electric horsepower | | | 10 | | 5 | 31 | | 4 | |
| Other kinds of horsepower | | | | 84 | | | | | |
| Furnished to other establishments, horsepower | | | | | | | | | |
| Establishments classified by number of persons employed, not including proprietors and firm members: | | | | | | | | | |
| Total number of establishments | 12 | 12 | 57 | 255 | 10 | 60 | 4 | 2,018 | 4 |
| No employees | 1 | 1 | 6 | 28 | 3 | 15 | 2 | 373 | |
| Under 5 | 10 | 10 | 30 | 200 | 7 | 39 | 2 | 1,602 | 4 |
| 5 to 20 | 1 | 1 | 20 | 30 | | 4 | | 39 | |
| 21 to 50 | | | 1 | 1 | | 2 | | 4 | |
| 51 to 100 | | | | | | | | | |
| 101 to 250 | | | | 1 | | | | | |
| 251 to 500 | | | | | | | | | |
| 501 to 1,000 | | | | | | | | | |

¹Includes establishments distributed as follows: Mississippi, 2; Wyoming, 2.

TABLE 12.—CHEESE AND BUTTER, URBAN DAIRY PRODUCT: 1900.

| | United States. | California. | Illinois. | Kentucky. | Maryland. | Michigan. | Missouri. | New York. | Ohio. | Pennsylvania. | All other states. ¹ |
|--|----------------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|----------|---------------|--------------------------------|
| Number of establishments..... | 113 | 8 | 7 | 18 | 4 | 4 | 36 | 20 | 5 | 5 | 6 |
| Character of organization: | | | | | | | | | | | |
| Individual..... | 84 | 3 | 6 | 16 | 4 | 3 | 33 | 12 | 2 | 3 | 2 |
| Firm and limited partnership..... | 16 | 4 | 1 | 2 | | 1 | | 2 | 3 | 2 | 2 |
| Incorporated company..... | 13 | 1 | 1 | | | | 3 | 6 | | | 2 |
| Capital: | | | | | | | | | | | |
| Total..... | \$204,851 | \$12,798 | \$4,414 | \$4,022 | \$1,800 | \$15,900 | \$15,435 | \$64,161 | \$14,080 | \$11,682 | \$80,559 |
| Land..... | \$29,875 | | | \$175 | \$480 | \$5,000 | \$3,150 | \$4,860 | \$7,820 | \$2,500 | \$5,900 |
| Buildings..... | \$42,246 | \$500 | | \$250 | \$1,070 | \$6,250 | \$2,950 | \$11,391 | \$800 | \$4,500 | \$14,535 |
| Machinery, tools, and implements..... | \$39,485 | \$8,620 | \$2,914 | \$565 | \$195 | \$2,150 | \$4,735 | \$22,695 | \$2,925 | \$3,150 | \$21,536 |
| Cash and sundries..... | \$38,245 | \$3,678 | \$1,500 | \$3,032 | \$55 | \$2,500 | \$4,600 | \$26,225 | \$2,535 | \$1,532 | \$18,583 |
| Proprietors and firm members..... | 117 | 12 | 6 | 20 | 4 | 6 | 34 | 16 | 9 | 7 | 4 |
| Salaried officials, clerks, etc.: | | | | | | | | | | | |
| Total number..... | 10 | | 1 | 1 | | | | 4 | | 2 | 2 |
| Total salaries..... | \$9,730 | | \$800 | \$75 | | | | \$941 | | \$480 | \$1,434 |
| Officers of corporations— | | | | | | | | | | | |
| Number..... | 3 | | 1 | | | | | 2 | | | |
| Salaries..... | \$1,540 | | \$800 | | | | | \$740 | | | |
| General superintendents, managers, clerks, etc.— | | | | | | | | | | | |
| Total number..... | 7 | | | 1 | | | | 2 | | 2 | 2 |
| Total salaries..... | \$2,190 | | | \$75 | | | | \$201 | | \$480 | \$1,434 |
| Men— | | | | | | | | | | | |
| Number..... | 5 | | | | | | | 1 | | 2 | 2 |
| Salaries..... | \$2,011 | | | | | | | \$97 | | \$480 | \$1,434 |
| Women— | | | | | | | | | | | |
| Number..... | 2 | | | 1 | | | | 1 | | | |
| Salaries..... | \$179 | | | \$75 | | | | \$104 | | | |
| Wage-earners, including pieceworkers, and total wages: | | | | | | | | | | | |
| Greatest number employed at any one time during the year..... | 99 | 5 | 6 | 9 | | 3 | 15 | 35 | 8 | 4 | 14 |
| Least number employed at any one time during the year..... | 79 | 5 | 6 | 9 | | 3 | 15 | 19 | 8 | 4 | 10 |
| Average number..... | 66 | 4 | 3 | 9 | | 1 | 15 | 14 | 7 | 3 | 10 |
| Wages..... | \$25,109 | \$1,809 | \$990 | \$2,726 | | \$300 | \$4,897 | \$7,120 | \$2,152 | \$991 | \$4,124 |
| Men, 16 years and over— | | | | | | | | | | | |
| Average number..... | 57 | 3 | 3 | 9 | | 1 | 13 | 12 | 4 | 3 | 9 |
| Wages..... | \$23,237 | \$1,529 | \$990 | \$2,726 | | \$300 | \$4,527 | \$6,790 | \$1,440 | \$991 | \$3,974 |
| Women, 16 years and over— | | | | | | | | | | | |
| Average number..... | 8 | 1 | | | | | 2 | 2 | 3 | | |
| Wages..... | \$1,692 | \$280 | | | | | \$370 | \$330 | \$712 | | |
| Children, under 16 years— | | | | | | | | | | | |
| Average number..... | 1 | | | | | | | | | | 1 |
| Wages..... | \$150 | | | | | | | | | | \$150 |
| Average number of wage-earners, including pieceworkers employed during each month: | | | | | | | | | | | |
| Men 16 years and over— | | | | | | | | | | | |
| January..... | 47 | 2 | 2 | 9 | | | 13 | 10 | 3 | 1 | 7 |
| February..... | 48 | 2 | 3 | 9 | | | 13 | 9 | 3 | 2 | 7 |
| March..... | 53 | 4 | 3 | 9 | | | 13 | 9 | 3 | 2 | 10 |
| April..... | 62 | 4 | 4 | 9 | | 3 | 13 | 10 | 4 | 3 | 12 |
| May..... | 80 | 4 | 6 | 9 | | 3 | 13 | 21 | 5 | 4 | 12 |
| June..... | 77 | 3 | 4 | 9 | | 3 | 13 | 27 | 4 | 4 | 19 |
| July..... | 60 | 2 | 2 | 10 | | 3 | 13 | 12 | 4 | 4 | 10 |
| August..... | 55 | 3 | 2 | 10 | | 3 | 13 | 8 | 3 | 4 | 9 |
| September..... | 53 | 3 | 1 | 10 | | 3 | 13 | 8 | 4 | 4 | 7 |
| October..... | 48 | 3 | 1 | 10 | | 3 | 13 | 8 | 3 | 3 | 7 |
| November..... | 47 | 3 | 1 | 10 | | 3 | 13 | 7 | 3 | 3 | 7 |
| December..... | 54 | 3 | 1 | 10 | | 3 | 13 | 10 | 7 | 3 | 7 |
| Women 16 years and over— | | | | | | | | | | | |
| January..... | 7 | 1 | | | | | 2 | 1 | 3 | | |
| February..... | 7 | 1 | | | | | 2 | 1 | 3 | | |
| March..... | 7 | 1 | | | | | 2 | 1 | 3 | | |
| April..... | 7 | 1 | | | | | 2 | 1 | 3 | | |
| May..... | 9 | 1 | | | | | 2 | 3 | 3 | | |
| June..... | 9 | 1 | | | | | 2 | 3 | 3 | | |
| July..... | 4 | 1 | | | | | 2 | 1 | 1 | | |
| August..... | 10 | 1 | | | | | 2 | 4 | 3 | | |
| September..... | 10 | 1 | | | | | 2 | 4 | 3 | | |
| October..... | 10 | 1 | | | | | 2 | 4 | 3 | | |
| November..... | 9 | 1 | | | | | 2 | 3 | 3 | | |
| December..... | 7 | 1 | | | | | 2 | 1 | 3 | | |
| Children under 16 years— | | | | | | | | | | | |
| January..... | 1 | | | | | | | | | | 1 |
| February..... | 1 | | | | | | | | | | 1 |
| March..... | 1 | | | | | | | | | | 1 |
| April..... | 1 | | | | | | | | | | 1 |
| May..... | 1 | | | | | | | | | | 1 |
| June..... | 1 | | | | | | | | | | 1 |
| July..... | 1 | | | | | | | | | | 1 |
| August..... | 1 | | | | | | | | | | 1 |
| September..... | 1 | | | | | | | | | | 1 |
| October..... | 1 | | | | | | | | | | 1 |
| November..... | 1 | | | | | | | | | | 1 |
| December..... | 1 | | | | | | | | | | 1 |
| Miscellaneous expenses: | | | | | | | | | | | |
| Total..... | \$15,976 | \$1,297 | \$974 | \$1,992 | \$91 | \$213 | \$3,859 | \$4,128 | \$894 | \$452 | \$2,076 |
| Rent of works..... | \$9,056 | \$1,076 | \$594 | \$1,849 | \$60 | \$110 | \$2,272 | \$2,343 | \$160 | \$222 | \$370 |
| Taxes, not including internal revenue..... | \$948 | \$34 | \$30 | \$10 | \$25 | \$92 | \$147 | \$240 | \$124 | \$36 | \$210 |
| Rent of offices, insurance, interest, and all sundry expenses not hitherto included..... | \$5,722 | \$87 | \$350 | \$133 | \$6 | \$11 | \$1,440 | \$1,546 | \$610 | \$194 | \$1,336 |
| Contract work..... | \$250 | \$160 | | | | | | | | | \$100 |
| Materials used: | | | | | | | | | | | |
| Total cost..... | \$310,005 | \$43,525 | \$19,931 | \$27,440 | \$1,371 | \$12,225 | \$30,800 | \$111,793 | \$8,781 | \$8,411 | \$45,723 |
| In making butter— | | | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | | | |
| Pounds..... | 20,104,778 | 2,333,320 | 1,880,800 | 1,431,621 | 43,600 | 1,156,800 | 1,512,800 | 6,801,317 | 813,906 | 522,000 | 3,003,620 |
| Cost..... | \$197,021 | \$21,747 | \$17,676 | \$17,774 | \$486 | \$9,807 | \$12,704 | \$63,588 | \$6,939 | \$4,800 | \$36,450 |
| Gathered cream— | | | | | | | | | | | |
| Pounds..... | 1,066,756 | 309,544 | 37,000 | 198,445 | 15,252 | 25,584 | 260,751 | 13,300 | 28,760 | 76,430 | 96,600 |
| Cost..... | \$53,649 | \$20,640 | \$1,650 | \$9,069 | \$355 | \$1,248 | \$9,859 | \$1,074 | \$1,470 | \$5,057 | \$4,727 |
| Tubs, boxes, color, salt, etc..... | \$7,240 | \$93 | \$146 | \$457 | \$12 | \$170 | \$585 | \$1,648 | \$144 | \$250 | \$3,465 |

¹Includes establishments distributed as follows: Connecticut, 1; Indiana, 1; Massachusetts, 1; Tennessee, 1; West Virginia, 1; Wisconsin, 1.

TABLE 12.—CHEESE AND BUTTER, URBAN DAIRY PRODUCT: 1900—Continued.

| | United States. | California. | Illinois. | Kentucky. | Maryland. | Michigan. | Missouri. | New York. | Ohio. | Pennsylvania. | All other states. ¹ |
|---|----------------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|----------|---------------|--------------------------------|
| Materials used—Continued. | | | | | | | | | | | |
| Total cost—Continued. | | | | | | | | | | | |
| In making cheese— | | | | | | | | | | | |
| Milk bought or received from patrons— | | | | | | | | | | | |
| Pounds | 7,415,499 | | 88,000 | | | 25,500 | 3,670,188 | 8,681,861 | | | |
| Cost | \$44,755 | | \$140 | | | \$255 | \$6,983 | \$37,877 | | | |
| Boxes, salt, etc. | \$823 | | \$2 | | | \$7 | \$209 | \$605 | | | |
| Fuel | \$3,978 | \$423 | \$126 | \$140 | \$16 | \$214 | \$230 | \$1,669 | \$155 | \$275 | \$730 |
| Rent of power and heat | \$842 | \$185 | \$166 | | | | \$85 | \$310 | | | \$96 |
| Mill supplies | \$382 | \$57 | \$25 | | | | \$84 | \$134 | \$23 | \$29 | \$70 |
| Freight | \$1,315 | \$110 | | | \$2 | \$490 | \$135 | \$388 | | | \$190 |
| Products: | | | | | | | | | | | |
| Total value | \$415,928 | \$50,681 | \$26,494 | \$40,877 | \$2,120 | \$17,964 | \$44,276 | \$136,835 | \$16,745 | \$18,959 | \$61,027 |
| Butter— | | | | | | | | | | | |
| Packed solid— | | | | | | | | | | | |
| Pounds | 334,688 | 2,000 | 18,300 | 25,700 | 1,820 | 22,730 | 20,990 | 132,620 | 2,240 | 17,000 | 91,188 |
| Value | \$72,360 | \$600 | \$3,660 | \$5,005 | \$455 | \$4,609 | \$4,336 | \$27,293 | \$148 | \$4,250 | \$20,704 |
| Prints or rolls— | | | | | | | | | | | |
| Pounds | 492,882 | 163,636 | 33,100 | 81,296 | 2,980 | 6,000 | 57,200 | 66,188 | 27,450 | 19,720 | 35,362 |
| Value | \$123,302 | \$41,511 | \$8,174 | \$20,466 | \$670 | \$1,200 | \$13,852 | \$15,537 | \$6,860 | \$4,470 | \$10,622 |
| Cream sold— | | | | | | | | | | | |
| Gallons | 164,114 | 4,535 | 22,700 | 5,616 | | 13,500 | 17,918 | 54,815 | 4,850 | 16,850 | 23,830 |
| Value | \$112,092 | \$5,619 | \$11,880 | \$3,088 | | \$9,600 | \$8,700 | \$42,961 | \$3,090 | \$8,160 | \$18,994 |
| Skimmed milk, sold, fed, or returned to patrons— | | | | | | | | | | | |
| Pounds | 5,517,877 | 351,200 | 752,000 | 645,912 | | 1,745,000 | 591,800 | 476,285 | 284,000 | 14,760 | 656,920 |
| Value | \$24,008 | \$1,158 | \$2,605 | \$5,223 | | \$2,125 | \$6,924 | \$1,585 | \$940 | \$2,041 | \$1,407 |
| Casein dried from skimmed milk— | | | | | | | | | | | |
| Pounds | 12,889 | 310 | | 2,400 | | | | 9,179 | 1,000 | | |
| Value | \$710 | \$31 | | \$120 | | | | \$459 | \$100 | | |
| All other butter factory products | \$32,222 | \$1,712 | | \$6,035 | \$995 | \$130 | \$3,505 | \$5,200 | \$5,307 | \$38 | \$9,300 |
| Cheese— | | | | | | | | | | | |
| Standard factory (cheddar)— | | | | | | | | | | | |
| Pounds | 360,450 | | | | | | | 360,450 | | | |
| Value | \$36,050 | | | | | | | \$36,050 | | | |
| Other kinds— | | | | | | | | | | | |
| Pounds | 301,714 | | 3,300 | | | 3,000 | 246,701 | 48,713 | | | |
| Value | \$14,601 | | \$175 | | | \$300 | \$6,376 | \$7,750 | | | |
| Whey— | | | | | | | | | | | |
| Sold— | | | | | | | | | | | |
| Pounds | 75,000 | | | | | | 75,000 | | | | |
| Value | \$75 | | | | | | \$75 | | | | |
| All other cheese factory products | \$508 | | | | | | \$508 | | | | |
| Equipment: | | | | | | | | | | | |
| Cream separators | 36 | 5 | 3 | | | | | 11 | 4 | 4 | 9 |
| Branch factories | 1 | | | | | | | | | | 1 |
| Separating stations | 2 | | | | | | | 2 | | | |
| Comparison of products: | | | | | | | | | | | |
| Establishments reporting for both years | 81 | 4 | 3 | 13 | 2 | 2 | 34 | 12 | 3 | 4 | 4 |
| Value for census year | \$288,615 | \$35,052 | \$5,390 | \$32,823 | \$1,050 | \$2,734 | \$32,962 | \$111,474 | \$12,117 | \$16,344 | \$38,669 |
| Value for preceding business year | \$258,227 | \$28,802 | \$5,110 | \$28,742 | \$985 | \$2,600 | \$30,315 | \$100,164 | \$12,109 | \$14,400 | \$35,000 |
| Power: | | | | | | | | | | | |
| Number of establishments reporting | 45 | 8 | 3 | | | 4 | 4 | 12 | 4 | 5 | 5 |
| Total horsepower | 328 | 46 | 18 | | | 29 | 20 | 107 | 26 | 23 | 59 |
| Owned— | | | | | | | | | | | |
| Engines— | | | | | | | | | | | |
| Steam— | | | | | | | | | | | |
| Number | 35 | 4 | | | | 3 | 2 | 12 | 4 | 5 | 5 |
| Horsepower | 280 | 41 | | | | 27 | 9 | 99 | 26 | 23 | 55 |
| Gas or gasoline— | | | | | | | | | | | |
| Number | 3 | | | | | 1 | 1 | 1 | | | |
| Horsepower | 10 | | | | | 2 | 5 | 3 | | | |
| Electric motors— | | | | | | | | | | | |
| Number | 2 | | | | | | 1 | 1 | | | |
| Horsepower | 11 | | | | | | 6 | 5 | | | |
| Rented— | | | | | | | | | | | |
| Electric, horsepower | 27 | 5 | 18 | | | | | | | | 4 |
| Establishments classified by number of persons employed, not including proprietors or firm members: | | | | | | | | | | | |
| Total number of establishments | 113 | 8 | 7 | 18 | 4 | 4 | 36 | 20 | 5 | 5 | 6 |
| No employees | 47 | 1 | 1 | 10 | 4 | 1 | 26 | 2 | | 1 | 1 |
| Under 5 | 63 | 7 | 6 | 8 | | 3 | 9 | 17 | 5 | 4 | 4 |
| 5 to 20 | 3 | | | | | | 1 | 1 | | | 1 |

¹ Includes establishments distributed as follows: Connecticut, 1; Indiana, 1; Massachusetts, 1; Tennessee, 1; West Virginia, 1; Wisconsin, 1.

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MANUFACTURES.

THE UTILIZATION OF WASTES AND BY-PRODUCTS.

HON. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, a report upon the utilization of wastes and by-products in manufactures, prepared under my direction by Mr. Henry G. Kittredge, of Boston, Mass., a well-known expert in manufacturing processes.

It is not in the nature of a statistical report, but it covers a subject so intimately related to the development of our manufacturing industries, and regarding which so little is known by the general public, that it seems desirable to accompany a census of manufactures with a detailed report upon the progress recently made in the utilization of products that were once rejected as wastes or residues in the operations of manufacturing establishments. While methods and processes for utilizing wastes and by-products have been constantly developing for many years past, it appears from Mr. Kittredge's report that the advances made in these directions during the last decade have been particularly notable and advantageous in the economy of manufacturing.

It is impossible to measure statistically the addition to the wealth of the country created by turning to some useful purpose the residues and by-products which were formerly thrown away or left to rot, but the volume thus preserved and turned to some useful account must be enormous, and in every instance cited in this report this utilization has resulted in a definite cheapening of the cost of the products to the consumers. The subject is one that is vitally associated with the progress of every industry and inseparably connected with the development and prosperity of every form of manufacturing. It has engaged the time and attention of the chemist and incited the ingenuity of the inventor and

the skill of the artisan to effect economies and reveal new utilities. No branch of science has been appealed to and relied upon so persistently and so confidently as chemistry.

The utilization of wastes has only a secondary relation to mechanical processes, and where these occur they are, with few exceptions, supplementary, and means to chemical methods. It would be assuming too much to intimate that the profitable employment of wastes in manufactures has approximated the highest degree of attainment to which science is capable of carrying it. This point probably will never be reached, and further developments must be expected, even to the extent of converting by-products into the main product of an industry. This reversion is exemplified in notable instances within the last decades of the Nineteenth century, the most conspicuous of which is to be seen in the revelations of coal tar and the highly developed utilization of its many by-products. What has taken place within the last one hundred years must be accepted more as a forerunner, a prelude, of what is to come in the arts of manufacturing by the employment of materials now held in low estimation as contributory to a high standard of manufacture. Many of the occult resources of nature remain unknown as means to further progress in productive industry, and if this report should prove no more than suggestive of what should be and may be accomplished in raising our manufacturing industries to a higher and broader field of usefulness, it will serve a most useful purpose.

Very respectfully,



Chief Statistician for Manufactures.

THE UTILIZATION OF WASTES AND BY-PRODUCTS IN MANUFACTURES.

WITH SPECIAL REFERENCE TO THE DECADE OF 1890-1900.

By HENRY G. KITTREDGE.

Nothing in the arts of manufacture is more indicative of economic efficiencies than the utilization of products that have been rejected as wastes or residues in the industrial processes. The acme of industrial economy is the profitable employment of every atom of material in whatever form it may be presented or however obtained. Every particle of an organic or inorganic substance has a useful part to play in contributing to human necessities or pleasures, and when it performs no function toward some useful end, or remains dormant, it shows that the ingenuity and enterprise of man have not reached their fullest development or that the arts of the laboratory have not revealed all the secrets of nature. The refuse of today is a source of profit to-morrow; and this has been going on for years and probably will be going on for years to come, notwithstanding that even now there is little that is thrown aside as absolutely useless except as it may be utilized in the economies of nature. New revelations and new uses are constantly being found for substances of all kinds, whether in their original forms, or in their changed forms due to outside agencies. The world's increment of wealth is largely dependent upon finding new and more economical uses for materials, however exalted or humble they may be in the industrial scale, and especially the elevation of the humble to a higher plane of appreciated usefulness. If a thing is unused for man's enjoyment it is because it has not yet found its place of utility.

The signification of the word waste is given by different authorities as follows:

Rubbish; trash. Rejected as unfit for use. Refuse; hence of little or no value; useless. Stuff that is left over, or that is unfitted or can not readily be utilized for the purpose for which it was intended; overplus, useless, or rejected material; refuse, as paper scraps in a printing office or bindery, or shreds of yarn in a cotton or woolen mill.—*Century Dictionary*.

Something of little or no account or value, as the refuse of cotton or silk.—*Worcester's Dictionary*.

That which is of no value; worthless remnant; refuse; especially the refuse of cotton, silk, or the like.—*Webster's Dictionary*.

The refuse of a factory or shop; as a broken or spoiled casting; the refuse of wool, cotton, or silk resulting from the working of the fiber; paper scraps of an office, printing office, etc.—*American Encyclopedia Dictionary*.

Something rejected as worthless or not needed; overplus or useless stuff; especially the refuse of manufacturing process or industrial art.—*Standard Dictionary*.

In addition to the foregoing may be added the following views of economists:

By-products may be considered as a special case of joint-products; that in which one of the joint-products is of relatively small value. This incident does not invalidate the general theory that the prices of joint-products are such that (1) the supply of each commodity just meets the demand; (2) the net advantages of the producer are equal to those of any other occupation between which and the occupation under consideration there exists industrial competition.—*Dictionary of Political Economy*, edited by R. H. Inglis Palgrave, Vol. I, page 197.

Residual and waste products (by-products) may be defined as those materials which in the cultivation or manufacture of any given commodity remain over and which possess or can be brought to possess a market value of their own apart from the value of the article from whose manufacture or in connection with whose cultivation they have resulted. In this way, straw is a residual or by-product resulting from the cultivation of grain. J. E. Cairnes, *Some Leading Principles of Political Economy*, 1884, page 128, refers to them as "excessory products" and defines them as commodities which are produced, not separately but as parts of a common industry, and of which the most obvious examples are mutton and wool, beef, tallow, and hides, gas and coke, and the like.—*Dictionary of Political Economy*, edited by R. H. Inglis Palgrave, Vol. III, page 291.

Charles Babbage in his "Economy of Machinery and Manufacture," London, fourth edition, 1835, page 11, paragraph 9, refers to the employment of waste products, such as the hoofs of horses and cattle, and other horny refuse, in the production of prussiate of potash, and also to the re-use of old iron and old tinware.

The consumption of soap and paper, the quantity of letters exchanged, the extension of public libraries and the use made of them, etc., are often taken as a measure of the actual degree of civilization of a nation. An extensive and refined use made of the waste materials of industry and housekeeping might be considered with equal right as a measure of the degree of industrial development and capability. It would also scarcely be possible to find in the processes of manufacture and in agriculture an instance which shows to the same extent the really creative force of science and the characteristic tendency of a nation to economize, as its endeavor to keep, like nature, entirely within the circle of reproduction.—*Archduke Regnier, president of the Imperial Commission, Vienna International Exhibition for 1873*.

A nation's industrial greatness and wealth in the world's competition are definitely related to the skillful application of waste or residual materials in the arts and manufactures. The profits of industry are contingent upon the extent of the successful employment as materials of the by-products or wastes of industry. Success is oftentimes dependent on the superior utilization of that which is lowly in the scale of materials, so that it shall perform the functions of that which is more costly in a manner to satisfy the purpose for which the manufactured product is intended. There is nothing without an economic value for some purpose, if not in the industry in which it first appears, in some other where it can be turned to a profitable account. But while prevention of waste is of the highest importance in any process of manufacture, prevention of by-products is not always in the line of economy, rather it may be in the line of inexcusable waste. The valuable character of by-products is exemplified in the coal-tar products, from which exquisite colors and perfumes are obtained that minister to the caprices and pleasures of man, as well as to his needs. Matter that is the most unattractive, the most base, or the most offensive in its properties oftentimes contains the elements of the greatest usefulness and beauty.

Probably no science has done so much as chemistry in revealing the hidden possibilities of the wastes and by-products in manufactures. This science has been the most fruitful agent in the conversion of the refuse of manufacturing operations into products of industrial value. "Her magic wand has only to touch the most noisome substances and the most ethereal essences, the most heavenly hues, the most delicate flavors and odors instantly arise as if by magic." Chemistry is the intelligence department of industry.

Dr. Lyon Playfair said in one of his lectures:

Chemistry, like a prudent housewife, economizes every scrap. The clippings of the traveling tinker are mixed with the parings of horses' hoofs from the smithy or the cast-off woolen garments of the poorest inhabitants of a sister isle, and soon afterwards, in the form of dyes of the brightest blue, grace the dresses of courtly dames. The bones of dead animals yield the chief constituent of lucifer matches. The dregs of port wine, carefully rejected by the port-wine drinker in decanting his favorite beverage, are taken by him in the morning as Seidlitz powders to remove the effects of his debauch. The offal of the streets and the washings of coal gas reappear carefully preserved in the lady's smelling bottle or are used by her to flavor blanc manges for her friends. This economy of the chemistry of art is only an imitation of what we observe in the chemistry of nature. Animals live and die; their dead bodies passing into putridity, escape into the atmosphere, whence plants again mold them into forms of organic life; and these plants, actually consisting of a past generation of ancestors, form our present food.

For nearly a century the world's main supply of soap depended on soda, which was obtained as a product of the sulphuric-acid industry.¹ Notwithstanding soap

was known to the ancients, it was regarded even in the middle ages as a luxury, and when it was not readily obtained, the lack of cleanliness was concealed by fine clothes and by perfumes. The soda industry being brought to a standstill in France during the French Revolution, the national convention of that country appealed to the chemists to discover some method for making soda from common salt, which had been shown by Du Hamel, in 1736, to contain the same base as soda. About forty years thereafter, Scheele found that caustic soda could be obtained from salt by the action of lead oxide; but the production of soda by chemical processes was unimportant from an industrial standpoint until Le Blanc secured results that gave to the world one of its principal industries. His discovery was based upon the treatment of chloride of sodium with sulphuric acid, forming hydrochloric acid and sulphate of soda. The hydrochloric acid was regarded as a by-product of so little value that it was allowed to pass off into the air, to the great detriment of vegetation in the neighborhood. To remedy this evil the English Government took action against the soda works to compel them to condense the acid and keep it out of the way, and this led indirectly to the discovery that hydrochloric acid could be used as a valuable agent in the bleaching industry, which, however, was at that time far from having attained its present height of development. For use in this way it was found necessary to employ some agent to decompose hydrochloric acid, so that chlorine could be obtained from it, and the best agent was found to be the binoxide of manganese, which the acid dissolves, setting free a part of the original chlorine of the acid or of the salt and forming manganous chloride. Previous to about forty years ago this latter product was allowed to go to waste, and it was not until the demand for manganese oxide was so great and the price so high that a reclamation of the spent manganese was looked upon as desirable, that this was accomplished, adding greatly to the resources of the chlorine industry for bleaching.

The choicest perfumes that are placed upon the market are no doubt obtained from oils and ethers extracted from flowers; but there are many others which are artificially made, many out of bad-smelling elements. The fusel oil obtained in the distillation of spirits has an odor that is peculiarly disagreeable, yet it is used, after treatment with proper acids and oxidizing agents, in making the oil of apples and the oil of pears; and the oil of grapes, and the oil of cognac are little more than fusel oil diluted. Oil of pineapple is best made by the action of putrid cheese on sugar, or by distilling rancid butter with alcohol and sulphuric acid. One of the most popular perfumes has for one of its essential ingredients material which is obtained from the drainings of cow houses, though it may be obtained at a less cost from one of the products of gas tar, out of which is also obtained the oil of bitter

¹Prof. H. B. Cornwall in Chautauquan, vol. 20, page 419.

almonds, so largely consumed in the manufacture of perfumed soap and confectionery.¹

The refuse of cities throughout the civilized world is now generally collected and disposed of for sanitary reasons, though in many instances it is utilized to good advantage for industrial purposes. The collection of this refuse has been made only within a comparatively few years, but is now carried on systematically, being more or less self-supporting and advantageous from an industrial point of view. Formerly this refuse was simply accumulated and disposed of by burning, or casting into streams or onto waste land. Now, bones, glass, rags, iron, paper, and other articles are separately collected and sold. Old tin cans are used (1) for the recovery of solder, (2) for the recovery of the tin, and (3) for remelting in the manufacture of steel or iron. The waste heat from furnaces, into which the inflammable refuse is thrown, may be utilized for steam purposes in operating engines for electric lighting and power. The city of Glasgow, Scotland, obtains waste heat from such furnaces equivalent to nearly 9,000 horsepower per day of ten hours for power for manufacturing purposes.²

The food wastes of New York city are disposed of by what is known as the Arnold utilization process, which is, briefly, steam digestion and a separation of the cooked product into greases and fertilizer fillers. The greases are all, or nearly all, shipped abroad and, it is believed, refined and separated into several grades, such as "glycerin, red oil, lard oil, and inferior grades." It is not known that refineries in this country are as yet able to handle what is known as garbage grease, as the secret of the trade seems to be held abroad. The solids after being dried and screened are sold to the various manufacturers of "complete fertilizers," and by them made up into grades which seem to be particularly adapted for use in the cotton belt.

The process of utilization employed in New York is as follows: The garbage is delivered on the scows located along the water front and towed to a place of final disposition, which is at an average distance of about 25 miles from the dumps. It is there unloaded and placed immediately in steam-tight digesters and treated by steam under pressure varying from 30 to 80 pounds for about eight hours, the vapors of cooking being condensed and not permitted to reach the outer air. The cooked matter is then discharged from the digester into receiving tanks, and from the receiving tanks goes to presses, where the grease, together with a greater part of the water, is separated from the solids. The remainder of the moisture is taken from the solids in either steam or hot-air dryers. The grease and water are run into tanks or traps, and after gravity separation the grease is skimmed off, partially cleansed, and barreled for shipment. The solids taken from the dryers are

put through screens, where metals, bones, crockery, etc., are separated from the fertilizer filler proper. This filler is then cooled and bagged, and is then ready for shipment. The tailings from the screens go on the dumps. There is left then only the water which has been separated from the grease; this is evaporated to the consistency of a thick sirup, and as much of this sirup as can be so used is mixed with some of the solids before drying. This admixture with the evaporated "stick" produces a better grade of fertilizer filler than that which comes from the dryers without treatment

IRON AND STEEL INDUSTRY.

The economic uses of furnace slag have been greatly developed within the last few years. Formerly this slag was carted away from the furnace and disposed of in the most available place, as so much refuse material, hardly worth the cost of carting. It was considered an incumbrance of the smelting works, of no account except to fill up gullies and ravines, or to be thrown into the sea, if such a disposition could be made of it. Within very recent years it was estimated that the cost of removing this waste slag from the furnaces of England was no less than \$2,500,000 annually. The amount of slag made by the iron furnaces of Great Britain is certainly immense. A considerable portion of this waste is now put to some profitable use as a substitute for artificial porphyry in the construction of buildings and for street pavements. Paving stones are made from it for the streets of Metz, Brussels, and Paris, of a quality sufficiently durable to stand heavy traffic. Mr. T. Egleston, in a paper read in 1872 before the American Institute of Mining Engineers, on the uses of blast-furnace slag, described a process by which, at a small cost, good bricks may be made of it, and a cement equal to the best Portland cement.

In an article contributed by F. Luermann to the Engineering and Mining Journal, in 1898, it is stated that bricks manufactured from granulated blast-furnace slag are preferable, as building material for dwelling houses, to those made directly from fluid slag, since the former are porous, while the latter, being impermeable to air and steam, would cause the aqueous vapor exhaled by the occupants to condense on cold days, and thus render rooms damp and unhealthy. Good bricks may be produced from granulated slag mixed with dust from slag which has crumbled in the air, but the hardening process is rather slow. It is stated that slag brick is quite as strong as ordinary brick, while it may be heated, without injury to its strength, to a temperature at which carbonate of lime begins to decompose. Slag brick appears to be particularly adapted to the construction of chimneys, for lining limekilns, and for boiler setting. The manufacture of slag brick is carried on in Russia, and it is stated that the brick made there possesses strong hydraulic properties capable of

¹Lord Playfair in North American Review, vol. 155, page 565.

²Journal of State Medicine, vol. 5, page 501.

withstanding high and low temperatures, weighs less than stone, and requires less mortar when laid. Its tensile strength is about 312 pounds; its crushing strength, 1,250 to 5,600 pounds per square inch, according to the time of hardening.¹

At the Karl-Emil Hutte, in Koniginhof (Bohemia), bricks are said to be made from the cinder produced in a coke furnace smelting an oolitic impure clay ironstone. The slag is run from the cinder notch into water, where it is granulated to a gray-colored sand. It is then mixed in a mill with milk of lime and pressed into bricks, which must be left for eight days to harden before they will bear transporting. The bricks are made to stand a pressure of 256 pounds per square inch, though they are guaranteed only to carry two-thirds of this amount. The whole width of the brick should withstand a load of 5 tons.²

In a paper read very recently by Edwin C. Eckel, before the American Society of Civil Engineers, on slag-cement manufacture in Alabama, it was said:

American technical literature contains little upon the subject of slag cements. This is the more curious as the matter would seem to be of considerable importance to engineers. For whatever the value of slag cement may be as a structural material, the industry has become fairly well established in this country, at least six factories being at present in operation, and I believe that all the plants are in a comparatively prosperous condition. The materials used in the manufacture of slag cement are blast-furnace slag and slaked lime. Two slag-cement plants are now in operation in Alabama, both being located in the vicinity of Birmingham, in close proximity to large supplies of both lime and slag of proper composition.

Slag-cement works have been established in a number of European countries, but probably the greatest development has been reached in Germany. It was stated in a communication to the Architectural Association of Berlin, in 1892, that there were then in that country ten slag-cement factories, with an annual production of 600 tons. About this time the Maryland Steel Company intrusted R. W. Mahon with an investigation of the slag from their blast furnaces to determine its value for cement making, and laboratory experiments were made which became the subject of a paper that was read before the chemical section of the Franklin Institute, in 1893. The result of these experiments was to answer the question affirmatively whether it was possible to make from slag a cement. The slag used was the refuse of Mediterranean ores and an ore mined in the island of Cuba. The limestone came from a point near the city of Baltimore.

It has been found that an admixture of prepared slag with cement adds to its tensile strength in the end, but is apt to have the effect of slightly lowering the initial strength of the cement; i. e., the resistance to tension and compression which the cement acquires within, say, from one to seven days. This defect, however, says

A. D. Elbers in the Engineering and Mining Journal of 1897, can be overcome by treating the prepared slag with an aqueous solution of sodium carbonate, rendering it so efficient that a suitable admixture of it with Portland cement is apt to raise the tensile strength of the latter from 50 to 100 pounds per square inch.

Thomas or basic slag is now used by fertilizer manufacturers in large quantities instead of imported phosphate rock, especially in Germany, where the total consumption of basic slag in 1896 was estimated at 800,000 tons. During the same year there were 83,765 tons of this slag imported into Germany, while the exports, chiefly to Belgium, were 134,257 tons.¹

Reference is made in the Journal of the Society of Chemical Industry, 1897, to the recovery of tin from spent tin baths by the treatment of the oxide of tin with hydrochloric acid in the presence of metallic tin. The process is also utilized for the recovery of tin from the waste liquors of the dyehouse containing tin in solution. From such waste solutions the tin is precipitated by means of lime, sodium carbonate, sulphuric acid, sodium sulphate, etc. The oxides are digested in concentrated hydrochloric acid. As long ago as 1861, Messrs. Edward and Charles Kuhn, chemists of Sechsbaus, near Vienna, took out a patent for producing pure tin, good weldable iron, ammoniac, prussian blue, and some minor products from the waste clippings of white iron.² A firm at Manchester, England, utilizes the tin from waste tinned iron (scrap tin) in the manufacture of stannate of sodium.

A very important innovation in the metallurgical industry in Germany is the utilizing of the waste gases of blast furnaces for working gas engines. That the waste gases can now be made serviceable in their entire heating capacity by a rational burning in gas engines, is one of the most important steps that have been recently made in science in its adaptations to practical technics. What this improvement means, economically, is seen by a theoretic calculation according to which this use yields a profit of \$1.25 per ton of pig-iron production, which means for Germany alone, where the utilization of these waste gases is made, a gain of over \$10,000,000 on her entire wrought-iron production.

Gas machines for utilizing these gases were introduced into Germany about 1898. Good results were reported from all quarters, which lead to the belief that this is a material advance in the development of an important gas-machine industry. So confident are those who are interested in it, that blast furnace gas engines of large dimensions have already been erected at different places in that country. An establishment at Donnersmarch may be particularly mentioned as having erected a gas dynamo of 600 horsepower. The managers calculated that if the quantity of gases which hitherto, when burning

¹ Journal Society of Chemical Industry, vol. 17, page 1049.

² Journal Society of Chemical Industry, vol. 16, page 144.

¹ Engineering and Mining Journal, May 8, 1897.

² Waste Products and Undeveloped Substances, P. L. Simmonds.

under boilers, produced 1,000 horsepower in round figures, be used for burning in gas-power machines, the production would be increased to about 2,700 horsepower.

To utilize these gas engines to their greatest advantage it has been thought that electricity would have to be employed. The electric transmission of power acts as an auxiliary, which is regarded as an incalculable advantage, notwithstanding the loss of about 20 per cent in energy. The Cockerill Company, of Seraing, Belgium, with the cooperation of Mr. E. Delamare-Deboutteville, is said to be first to solve successfully the problem of the direct utilization of blast-furnace gases as a source of energy. Since 1895 a gas engine of this kind has been in operation at the works of this company, and their 600-horsepower single-cylinder gas engine exhibited at the Paris Exposition of 1900 attracted a great deal of attention from those interested in the metallurgical industry.¹

In 1899-1900 there were imported and entered for consumption into the United States, for remanufacture only, 26,307.46 tons foreign waste and refuse, scrap iron and steel.

LUMBER AND TIMBER PRODUCTS.

Nearly all of the formerly waste products of lumber and timber are now turned to some utility, and some of the new products thus formed are of considerable value. Of this latter class may be mentioned sawdust, which was formerly considered an absolute waste material, and was allowed to float down the stream or was thrown into a heap where it could be most conveniently disposed of. French cabinetmakers have found a way of preparing this material which gives it a value far above that of solid timber by a process that has been in vogue for at least twenty-five or thirty years, combining the use of the hydraulic press and the application of intense heat. By this process the particles of sawdust are formed into a solid mass capable of being molded into any shape and of receiving a brilliant polish, and possessing a durability and a beauty of appearance not found in ebony, rosewood, or mahogany. This product is known as "Bois durci." Artificial woodwork therefore seems to have a promising future. Alum, glue, and sawdust, kneaded with boiling water into a dough, and pressed into molds when dried, is hard and capable of taking on a fine polish. Ornaments of great beauty can be made from it very closely resembling carved woodwork.²

The production of acetic acid, wood naphtha, and tar from sawdust is one of the latest enterprises in Norway. A factory has been started at Fredrikstad capable of distilling 10,000 tons of sawdust in a year. It also manufactures charcoal briquettes, which are ex-

ported to the Netherlands. The acids are chiefly placed on the German market, while the tar is mostly consumed at home. The factory is said to be the first of its kind erected in that country.¹ According to an English patent of 1897, sawdust may be so prepared as to be noninflammable, and then applied to jacketing of boilers and other purposes.

In the Journal of the Society of Chemical Industry, for 1898, is described a series of experiments for obtaining alcohol from either coarse or fine sawdust, without affecting the yield. It was found that pine sawdust as compared with fir sawdust was superior as yielding a purer alcohol. It was also found that a high yield of sugar was obtained from birch sawdust, the yield of sugar being about 30.8 per cent of the quantity of birch wood used. The quantity of alcohol obtained from 220 pounds of air-dried sawdust (20 per cent water) was 7 to 8 quarts. The quality of the alcohol distilled from the fermented liquid was said to have been excellent, and the preliminary experiments indicated that the trifling impurities found in it could be readily removed.²

A patent taken out in England in 1896 for utilizing certain waste products of wood describes a process of constructing or manufacturing a product resembling wood from a mixture of sawdust or wood refuse and certain quantities of gums, resins, or other suitable agglutinants, either in a dry state or dissolved, the compound being subjected to pressure at a temperature sufficiently high to soften or melt the gums or resins.

According to the United States census of 1900 the amount of sawdust used in the clay and pottery industry of this country cost \$19,687, or 0.17 per cent of the total cost of all the raw materials used.

The utilization of wood pulp in the manufacture of paper is not new, but its increased use is very marked, as will be seen by comparing the statistics of the census of 1890 with those of 1900, in the amount of raw materials used in the manufacture of paper. Early in 1826 the brothers Cappucino, paper makers of Turin, discovered a means of supplying the need for paper-making material, caused by the scarcity of rags in the fabrication of paper, by substituting the thin bark of the poplar, willow, and other kinds of wood. The good quality of the paper made from this material was recognized by the Academy of Sciences, after an examination of the manufactured product, and so important was the discovery considered that the King granted the brothers an exclusive privilege for ten years for the manufacture of paper from ligneous materials.³ In 1833 a patent was granted in England to J. V. Desgrand for making paper and pasteboard from wood reduced to a state of paste. Poplar wood was thought at that time the best for this purpose, as it had been in Italy twelve years

¹ Journal of the Society of Arts, vol. 48, page 850.

² Waste Products and Undeveloped Substances, P. L. Simmonds, page 217.

¹ Journal Society of Chemical Industry, vol. 17, page 81.

² Journal Society of Chemical Industry, vol. 17, page 1154.

³ Waste Products and Undeveloped Substances, P. L. Simmonds.

previous. A patent was granted in 1855 to William Johnson for improvements in the application of various substances containing wood fiber, as the bast, or inner bark, of the lime tree, the willow, birch, and alder, to the manufacture of wood paper pulp. At the London International Exposition of 1862 Wurtemberg contributed several samples of paper made from wood pulp mixed with rags, the proportion of the former varying from 10 to 80 per cent; and the paper was reported to be serviceable although of a low grade. The wood was simply rubbed down into pulp against the periphery of a wheel prepared with a rough face. At the Paris Exposition, 1867, was to be seen in action a large machine of 50 horsepower for making wood pulp for paper. Only white woods were thought to be available for this purpose.

There is no limit to the range of wood suitable for paper making, though the pine family is most suitable for this purpose, and invention has been mainly directed to methods for reducing wood to a suitable condition for use in paper manufacture. The first method of preparing pulp from wood was to reduce the wood to thin shavings, which were soaked in water for a week or more, then dried, and then ground to powder by a crushing mill of some kind. This powder was mixed with rags to form a pulp, in which condition it was suitable for converting into paper. The principal defect in this method was the production of a very short fiber. Chemically produced pulp was resorted to as better preserving the natural fiber of the wood. The chief objection against it was its cost, but this has now been largely, if not entirely, overcome and the industry placed upon an economical basis.

The value of pulp wood entered for consumption in the United States for 1899-1900 was \$1,109,139.11; the wood pulp entered for consumption in 1899-1900 was as follows:

| | Pounds. | Value. |
|-----------------------------|-------------|--------------|
| Mechanically ground | 70,222,823 | \$491,889.36 |
| Chemically bleached | 20,112,995 | 476,456.00 |
| Chemically unbleached | 90,207,760 | 1,436,052.36 |
| Total | 180,543,578 | 2,404,397.72 |

The utilization of the needle-shaped leaflet of the pine tree, either alone or in combination with some other fiber, as cotton, for example, has frequently been attempted with more or less success to produce an article of commercial value for textile or other purposes. Near Breslau, in Silesia, there have been erected factories that convert the pine leaves into what is called "forest wool," for wadding. Other factories have been erected in other parts of Europe for a similar use of these leaflets, as in Sweden, Holland, and France. The products made from these pine-tree leaflets have been exhibited at a number of expositions, where they attracted more or less attention as furnishing suitable

material for stuffing mattresses and articles of furniture in place of horsehair, for manufacture into hygienic fabrics for medical use, and for articles of dress, such as inner vests, drawers, shirts, chest preservers, etc. In the preparation of the textile material an ethereal oil is produced, which is employed as a curative agent and oftentimes as a useful solvent. Some attempt has been made of late in the state of Oregon to make use of these leaflets by reducing them to a fibrous condition suitable for mixing with cotton, to be spun into yarn for weaving.

PAPER MANUFACTURE.

In the utilization of waste products there is a close relation between the manufacture of paper and that branch of the lumber and timber industry which reduces wood to a fibrous pulp. In fact, paper has always been made chiefly by the utilization of waste materials obtained from the vegetable world, such as rags, old rope, straw, etc. But there was a smaller quantity of cotton rags and other cotton substances used in 1900 than 1890, and a very much smaller quantity of such substances as manila stock, rope waste, etc. On the other hand, there was an increased use in 1900 over 1890 of such materials as straw, old waste paper, and particularly of wood pulp made either by a mechanical or a chemical process.

The best variety of fiber obtained from wood is that produced by chemical means, which renders the wood free from the resinous matter found in wood prepared by grinding. If resin is left in the fiber, it resists strongly the action of the bleaching agents, causing the paper to become yellow after a time. There are two processes chiefly in use for the chemical preparation of the wood fiber—the caustic soda and the bisulphite processes—the latter being much more widely employed than the former. There is another process, known as the Franke process, which uses bisulphite of lime. The efficacy of the bisulphite process is explained by Cross and Bevan, to the effect that the chief agency is the hydrolytic action of sulphurous acid, aided by conditions of high temperature and pressure. This process yields a large amount of pure fiber, preserving its original strength, which is not the case when the caustic soda process is used.¹ German chemists have found that an organic substance containing sulphur can be obtained from waste sulphite liquor in different ways, and the product has been proved to be similar by a corresponding amount of sulphur contained therein.²

From a sanitary, as well as industrial point of view, the recovery of the sulphite liquor as a waste from wood-cellulose factories is worth the attention and ingenuity of inventors. A prize of 10,000 marks was offered in Germany in 1894 for the best and most suc-

¹ Industrial Organic Chemistry, 3d edition, Sadtler.

² Journal of Society of Chemical Industry, vol. 17, page 596.

cessful method of treating waste sulphite liquors so as to prevent the pollution of the streams into which these liquors ran.

There has as yet been evolved no satisfactory application of the waste liquors from the bisulphite process.¹ Evaporation and combustion involve large losses of sulphur. A more complete regeneration of the sulphur has been the subject of a series of German patents, but the processes are inefficient through neglect of the actual state of combination of the sulphur, viz, as an organic sulphonate. The process of V. B. Drewson consists in heating with lime under pressure, yielding calcium monosulphite (with sulphate and lignone complex in insoluble form). The sulphite is redissolved as bisulphite by treatment with sulphurous acid. This process, however, is relatively costly and yields necessarily an impure lye. It has been proposed to employ the product as a food stuff both in its original form and in the form of benzoate, but its unsuitability is obvious from its composition. A method of destructive distillation has been patented in Germany, but Prof. H. Seidel, of Germany, has investigated the process and finds that the yield of useful products is much too low for its economical development. Fusion with alkaline hydrates for the production of oxalic acid is also excluded by the low yield of the product.

A number of German patents have been taken out for the recovery of the organic matter from waste sulphite liquor and for the production of useful products therefrom. Many of these patents have for their object the extraction of a tannin material as size for paper. By this latter process the solution containing tannin (simply waste lye) is added to the pulp in a beating engine, and, when well mixed, a solution of gelatine is added, the result being an insoluble coating of tannin size upon the fibers. In a later patent the addition of resin size is recommended. According to a German patent of 1891, a means of osmosis is proposed for obtaining a purer form of tannin suitable for tanning hides.

In the opinion of Prof. H. Seidel, the application of the waste liquors from the bisulphite process to tanning purposes appears promising from the fact that 28 per cent of the dry residue is removed by digestion with hide powder. This application, however, he says has been extensively investigated, but without practical success. Various uses are suggested by the viscosity of the evaporated extract. As a substitute for glue in joinery work, in bookbinding, etc., it has proved of little value. It is applied to some extent as a binding material in the manufacture of briquettes, and also as a substitute for gelatine in the petroleum industry.

According to Dr. L. Gottstein, Breslau, Germany, the isolation from the waste waters of the bisulphite process of a suitable tanning material for use in the

leather factories has not been so successful as was at first expected; and the attempts to make alcohol, acetic acid, and oxalic acid have not given satisfactory results. He says, too, that all the attempts to produce usable material by the dry distillation of the solid residue from the liquor have also failed. The daily production in Germany of about 1,000 tons of sulphite pulp means about ten or twelve times that amount of liquor, having from 9 to 10 per cent solid residue, giving about 1,000 tons as the daily production of this substance. It is on the average about one-fifth inorganic and four-fifths organic in composition.

A German patent has been granted for the production of a dressing compound for textile material, which the inventor calls "Dextron." The liquor is neutralized, and then concentrated by means of evaporation and saturated with magnesium sulphate. The solution of this salt throws out, in the form of a scum upon the surface, the so-called dextron, which is collected, dried, and ground. The material, it is said, can be largely used in the place of dextrin. It contains tannin and possesses antiseptic properties, and is sold chiefly to cotton-weaving mills and calico printers.

Prof. H. Seidel's application of soda salt from the lignone sulphonic acid as a reducing agent in chrome-mordanting wool and woolen goods is claimed to be successful in practice, and its industrial development shows, it is said, satisfactory progress. The product is known as ligno-rosin. Dr. Gottstein, in a recent address, observes that sodium lignin-sulphonic acid (ligno-rosin) as a substitute for tartaric or lactic acid for mordanting wool plays, in proportion to the great amount of sulphite liquor produced, a very small role in its utilization.

Waste liquors from the sulphite boiling process contain in solution about 50 per cent of the weight of the dry wood. It is probable that, with the further development of the sulphite process, methods will be worked out by which this large amount of waste material may be utilized. The most obvious direction for such methods will be toward the preparation of glucose, alcohol, and oxalic and pyroligneous acids.¹

A process (patented) has been communicated by Mr. W. Trippe, of Esson-on-the-Rhur, Germany, relating to the treatment of waste liquors from the manufacture of sulphite cellulose.² The lyes are inspissated in the usual manner by evaporation, though their inspissation is carried beyond the usual consistency of sirup, and is effected without the addition of any reagents calculated to promote the elimination of the solid compounds of sulphur. By the time the sirupy mass has been brought to contain only about 20 per cent of water, the sulphur compounds of the lye begin to decompose, yielding mainly sulphurous acid, and also, secondarily, some other volatile compounds of sulphur, such as mer-

¹ H. Seidel.

¹ The Chemistry of Paper Making, Griffen & Little, 1894.

² Paper Trade Review, July 5, 1901.

captanes, mercaptides, and the like. These gasiform products which, if desired, may be drawn off, may be utilized in a variety of ways, say in the manufacture of sulphurous acid, sulphuric acid, or compounds of such acids, or, if desired, in the production of sulphur and other sulphur compounds. The moment decomposition begins, a froth forms on the surface of the liquor, as a result of the first escape of gas, in the form of bubbles. The formation of froth discontinues after a resistant skin has developed on the surface. This is blown or distended, and hinders the rapid escape of the gases, thereby retarding the progress of the decomposition.

The physical effect—and also the chemical change—may be expedited by additions of organic substances capable of checking the formation of the resistant skin already mentioned. Among such substances may be mentioned the different varieties of pitch and similar tar products, resin, carbohydrates, hydrocarbons, glues, organic acids, and the ethers of such acids. These additions of organic matter are particularly effective when made in the form of solutions, the preferable solvents to be employed being benzine, petroleum, and other hydrocarbons or their derivatives. In order to expel the sulphur compounds, inspissation should be carried on to a point at which there shall remain behind a mass of paste which while hot (or warm) is, indeed, plastic and kneadable, but which, when allowed to cool, becomes hard and brittle and can be broken up or pounded into fragments, like resin, for example. Inspissation may be carried on even beyond this point, until there remains a perfectly dry, sandy residue. It is a somewhat remarkable fact that this residue still retains the viscous or adhesive property which it had been observed to possess in those forms in which alone it has been hitherto known to occur. The only forms in which, until the present time, the mass was known to be adhesive was the liquor, sirupy form, either cold or warm, and the kneadable form which the mass assumes when cold.

The residue, if not evaporated right down to desiccation, forms, while yet warm, a moldable mass or paste, which, however, has lost none of its adhesive qualities; and this adhesiveness subsists both when the residue is moistened, as it would in the case of glue, and when it is heated, as in the case of resin or pitch, so that it may immediately be used as a substitute for any of these substances. The development of these qualities may be favored by superadding to the mass, while yet in the process of formation, such other substances as are capable of increasing its adhesiveness; the nature of such additions, of course, depending upon the particular purpose which the adhesive mass is intended to serve. Among such substances, in addition to the organic compounds already referred to as agents for the prevention of skin formation, are the various albuminoids, albuminates, terpenes, resins, and tar products.

As a result of these additions, the residue will more closely resemble such adhesive substances as resin, pitch, or the like; but if the residue is readily soluble in water, the additions will be apt to diminish its adhesive property. Where the residue is treated with a view to its employment as a substitute for glue, resins, or the like, it is expedient to determine the degree of inspissation beforehand, with due regard to the qualities which the residue in its final form is desired to possess. Where, for example, it is to be used as a substitute for glue, inspissation should not be carried on as far as it would have to go if a substitute for resin were required.

As the residue has been freed from sulphur compounds, it is not only perfectly harmless to vegetation, but is fitted for use as manure, or as an addition to manure, by reason of the assimilable organic substances and of the lime in a finely divided state which it contains. Where, on general grounds or from local considerations, this treatment of the residue—which, economically speaking, is unobjectionable—is not deemed desirable, it may immediately be used as fuel; in which case the mineral ingredients of the lyes—in particular calcium or magnesium—should preferably be eliminated either before or during the process of inspissation, it being immaterial what particular mode of elimination is adopted.

A process of utilizing waste sulphite liquor and product therefrom has been very recently invented by Alexander Mitscherlich, of Freiburg, Germany, and patented in the United States.¹ The process is chiefly intended to collect these liquors and utilize their properties so as to yield products of increased commercial value, and extend their usefulness to various purposes other than the manufacture of paper pulp. The process is based upon the previous removal of the inorganic constituents of the spent liquor by an addition of lime and the subsequent separation of the organic bodies by dialysis or osmosis. A new article of manufacture also obtained from the spent liquors is a tanning agent.

A process of obtaining an adhesive substance from sulphite liquors suitable for sizing and mordanting was the subject of a patent in 1895.²

The use of a neutralized solution of the bisulphite waste waters free from the lime precipitates, as water for field irrigation, has proved a failure.³ The gummy liquor stops the pores of the ground, preventing filtration, and rendering the leached waters from fields on which it is used dark and ill smelling. On this account the storage of the liquor in cemented basins is not to be recommended, since, on standing, the basins became leaky and the surrounding water contaminated.

As to the durability of paper produced wholly or partially from wood cellulose, opinions are still divided, some holding that rag substitutes should never be used

¹United States patent No. 681241.

²United States patent No. 550712.

³Dr. L. Gottstein, Breslau, Germany.

for paper that is intended to remain in good condition for long periods. In the case of unbleached cellulose and ground wood no doubt seems to exist, as these materials are known to deteriorate rapidly. The question of durability, therefore, it would seem, can be definitely decided only by a series of systematic experiments extending over a long period of time.

A writer in the *Journal of the Society of Chemical Industry* for August 31, 1896, makes some comment on the durability of paper made from wood pulp, to the effect that pulp prepared by grinding wood contains ligneous and other incrusting matter, and the composition is similar to that of the wood itself. Paper made from this pulp turns brown, and becomes brittle and rotten when exposed to the action of light and air for any length of time. Pure wood-cellulose fibers are not affected by light or air, hence it is assumed that the above results are owing to the presence of the incrusting matters. Paper made from brown pulp is less sensitive to light, since the incrusting matter is partly removed by steaming and lixiviating. Cellulose made from wood by boiling with soda stands the action of light and air without turning brown, although it undergoes a change of another kind.

Some years ago blotting paper was made by an American firm from soda wood cellulose, but it was admitted by the makers that after a time the paper lost its absorbing qualities and in a few years it became rotten, the fibers becoming again incrustated. A test of blotting papers several years old confirmed this view. From this and other observations, it is suggested that certain cellulose pulps are liable to return by degrees into the state of the original ligneous fiber. Whether papers made of sulphite fiber will remain unaffected in the course of years, is as yet uncertain, although some paper makers assert that sulphite fiber is as suitable for documents as is rag fiber.

An English patent has been granted to W. J. Ward, Manchester (English patent 15986, September 8, 1900), for the manufacture of waterproof paper, also mineral oil, grease, soap, and the like. According to this patent the spent liquor from the sulphite treatment of wood is evaporated down to 30° Tw., with a definite proportion of sodium or potassium bichromate. It is then treated with more bichromate in a steam-jacketed pan, while paraffin, wax, or the like, previously melted with 2 or 3 per cent of tallow, or 1 per cent of boiled linseed oil, is mechanically incorporated. Finally the product is mixed with the paper pulp in the beaters at a temperature not exceeding 80° F. A mineral grease or soap is obtained in a similar way by removing the calcium salts from the spent liquor and adding 50 per cent or more of mineral oil, with 1 or 2 per cent of tallow, instead of the wax.

The recovery of soda is a valuable side product in the

manufacture of paper. The alkaline liquors in which rags and other paper-making material had been boiled were at one time allowed to run to waste. This is no longer permitted in economically conducted mills, as the alkali can be recovered in the form of a carbonate, by the evaporation of the waste liquors and the ignition of the residues, after which this carbonate can then be causticized and prepared for renewed use. The soda, during the process of boiling with the paper-making materials, takes up a large amount of noncellulose fiber constituents, such as resin, coloring matter, and silica. These on evaporation and ignition become either carbonate or silicate.¹

A patent was taken out in 1893 (United States patent No. 492927) for the manufacture of paper board, box board, and the like from old newspapers or other similar printed white paper. In the manufacture of the article preference was given to printed newspaper or other printed paper possessing the characteristic properties of the ordinary paper upon which newspapers are printed on account of its cheapness, its freedom from size, and its softness. Old copies of newspapers or the overissues can be bought up at low rates and utilized for this purpose. A new article made is a paper board manufactured from old newspapers ground to a pulp and having the permanent particles of the printers' ink minutely subdivided and uniformly distributed throughout it so that a smooth and even tint is imparted to the board.

According to the present census 356,193 tons of old waste paper were consumed in paper manufacturing, and crude paper stock, fit only to be converted into paper, was imported and entered for consumption in 1890-1900 to the value of \$3,261,407.21.

SLAUGHTERHOUSE PRODUCTS.

Slaughterhouses furnish a multitude of by-products which are utilized on a commercial scale of some importance. The products of the gray brain matter of calves are now employed in the treatment of affections of the nervous system,² known under different names, as, for example, neurasthenia (nervous debility; nervous exhaustion), agoraphobia (a dread of crossing open spaces, city parks, etc.), chorea (nervous disease; St. Vitus's dance), psychosis (mental disorder; insanity).

It was not until 1870 that the preservation of pork and beef products was practically carried further than the air-drying and salt-pickle curing of hams, bacon, mess pork, and dried and corned beef. The customary practice at that time of shipping the cattle from the West to the eastern markets, to be there slaughtered, entailed a heavy shrinkage in weight, and other losses. It was about this time that there was a commercial

¹Industrial Organic Chemistry, by Sadler; Text-Book of Paper Making, by Cross and Bevan.

²Journal Society of Chemical Industry, vol. 17, page 738.

demand from glue manufacturers for a part of the slaughtered offal, the disposition of which had become a source of expense, and a demand from fertilizer manufacturers for such parts as were not wanted by the glue maker opened the way for a utilization of by-products, which was greatly facilitated by the introduction of a system of ice refrigeration and transportation. This made it possible to slaughter live stock in the West and ship the edible portions to the consumer at distant points, allowing the conversion of the offal at the point of slaughter into by-products, such as soap, glue, fertilizers, etc., thus saving the cost of transportation as part of the live animal.

The blood from slaughtered animals has long been utilized for the production of albumen, for the use of the calico printer, the tanner, the sugar refiners, and others. The bones of animals are used for a score of different purposes; those coming from the cooked meat are boiled, and the residual fat and gelatin are extracted; the former is used in the manufacture of soap, and the latter, for various objects, as transparent coverings for chemical preparations, etc.¹

The bones from the feet of cattle are used in the manufacture of toothbrush handles, knife handles, chessmen, and for whatever purpose ivory is used, since the hard bone takes a very high polish. The knuckles from these bones are cut off and used in the manufacture of glues and for fertilizer. The tip of horns is sawed off, and the horn is split and pressed out into a flat plate under heat and pressure. These plates are used in the manufacture of combs, backs of brushes, large buttons, etc. The tip of the horn is made into mouth pieces for pipes and various other articles. The horn scrap is used for fertilizer.

Hoofs are sorted into three grades: White hoofs, which are sent to Japan and there used in the manufacture of various ornaments; striped hoofs, which are worked up into buttons and horn ornaments; and black hoofs, which are used in the manufacture of cyanide of potassium for gold extraction, and also ground up to make fertilizer for use of florists, grape growers, and others.

Neat's-foot oil is extracted from the feet, and various oils are taken from different portions of the animals. These all have a high commercial value.

A patent was granted in 1898 to Alexander Mitscherlich, of Germany (United States patent No. 602237), for a process and apparatus for converting bones at a small cost into useful adhesive matters; at the same time certain fermentable substances which can be used for producing alcohol and phlegma (distiller's wash) are by-products of the process. The process consists essentially in dissolving waste bony matter, such as horns, hoofs, hair, and the like, and precipitating this solution by the tanning principle found in the lyes obtained in the manufacture of sulphite cellulose.

A valuable branch of the utilization of fat of beef and hogs is the manufacture of substitutes for butter, toward which experiments have been made with more or less promising results within the last thirty years. In 1870 a French chemist found that carefully washed beef suet furnished a basis for an excellent substitute for dairy butter. Since then a large industry has grown up in the manufacture of such articles as butterine and oleomargarine.

An important article obtained from fat is glycerin, which is brought into commerce as refined or distilled glycerin, or as an element in glycerin soaps, toilet preparations, roller compositions, etc. Glycerin was once a waste article produced in the manufacture of candles from palm oil. It was found necessary to abstract this substance, as it caused an unpleasant smell when the charred end of the wick went out. This substance was at first allowed to float off into the river, the loss per week at some factories being estimated as high as \$2,000. This loss has been eliminated since the valuable qualities of the by-product have been ascertained. The application of glycerin in medicine, and for technical purposes, has made it important to extract and purify this article whenever possible, and now its value, in relation to other fat constituents, is great.

The two methods of saponification by which glycerin has been obtained on a large scale, are the processes of Wilson and Payne of decomposing the fats by superheated steam and after distillation, and the lime autoclave process of Milly.¹

Dr. S. P. Sadtler, in the third revised edition of his work on organic chemistry, says:

It is obvious that in soap making, as numerous quantities of the fats are decomposed, corresponding quantities of the glycerin go into the spent lyes. It is only very recently that it has been attempted to recover this glycerin, and no perfectly satisfactory process seems as yet to have been adopted. More practical, in the opinion of those qualified to judge, seems to be the idea recently put forward to deglycerinize all fats before saponifying them. The process of Michaud Freres, of Paris, realizes this idea very successfully.

A suggestive invention was patented in 1898 (Letters Patent No. 602725) for the recovery of glycerin from tank waters, that of utilizing of the waste products of slaughterhouses and rendering establishments. Tank water, as is well known, is a by-product of rendering establishments produced in cooking, under pressure, the scraps of meats, bone, sinews, lungs, intestines, and other nitrogenous matter containing more or less fat; such cooking being continued for several hours, until the substances in the tank are decomposed to a great extent and the fat liberated. A large part of the nitrogenous matter remains in solution in the liquid produced from the solids introduced into the tank and from the condensed steam. The fats rise to the surface, while the undissolved matter, to a great ex-

¹ Good Words, vol. 17, page 156.

¹ Industrial Organic Chemistry, Sadtler.

tent, settles to the bottom of the tank. The liquid lying between the fat and the solids, or "tankage," in the bottom of the tank is known as "tank water." After the fat has been skimmed off, the water is drawn off from the tankage and disposed of in various ways. This tank water was for many years discharged into the sewers, although it is known to contain valuable nitrogenous matter, and even at the present day it is thus disposed of in almost all houses of small capacity.

There was imported into the United States for the fiscal year 1899-1900, crude and refined glycerin to the value of \$2,128,670.50.

Red bone marrow is a valuable by-product of the slaughterhouses. The marrow found in young animals has the most active properties, and is obtained from the finer medullary substances of the rib bones of young cattle, and contains less fatty principles than that derived from the long bones, and must be extracted immediately after the animal has been killed, else molecular death of the marrow ensues. It unites with the unaltered proteids of the blood, and is of the highest nutritive value. Finely comminuted calves' ribs, being richest in bone material, are selected from recently killed animals and macerated or digested in chemically pure glycerin for several days, until extraction is complete. The medullary glyceride is then strained or filtered off for immediate use as a palatable preparation. This product stimulates the formative processes and increases the rate of production of the red blood corpuscles.

Gelatin, or, in its lower grades, glue, is a by-product of the slaughterhouse, as the bones of animals contain on an average nearly one-third of their weight of organic constituents, which may be extracted by boiling and converted into gelatin or glue. This, though inferior in adhesive power to that prepared from animal skins, is of much commercial value. The soft bones of the head, shoulders, ribs, legs, and breast, and the bony core of the horns of horned cattle, and especially deer's horns, yield a larger quantity of gelatin or glue than the hard thigh bones and the thick parts of the vertebra, which are principally composed of calcium phosphate and require a more prolonged treatment to extract the gelatin-making constituents.¹ The most important gelatin-yielding material is the hide of animals, obtained from the trimmings of ox, sheep, and calf skins, the refuse of the beam house, and scraps which have been softened and the hair removed by liming to get them in condition for boiling. The epidermis and the underlying fat tissue are not valued as glue stock. For gelatin, calves' hides are the most valuable, forming a special article of commerce after being limed and dried.

The following statistics pertaining to the manufacture of glue are from the 1900 census:

| | Total number of pounds. | Made from hide, trimmings, etc., fur, or neat's-foot stock. | Made from bone or bone liquor. |
|-----------------------------------|-------------------------|---|--------------------------------|
| Glue establishments | 34,984,448 | <i>Pounds.</i> 29,036,901 | <i>Pounds.</i> 3,109,165 |
| Slaughtering establishments | 84,516,761 | 12,780,882 | 20,183,562 |
| United States | 69,501,209 | 41,817,733 | 23,292,727 |

| | Made from cattle, hogs, etc. | Made from fish skins and waste. | Made from other materials. |
|-----------------------------------|------------------------------|---------------------------------|----------------------------|
| Glue establishments | <i>Pounds.</i> 66,666 | <i>Pounds.</i> 2,731,156 | <i>Pounds.</i> 40,560 |
| Slaughtering establishments | 1,282,867 | 270,000 | ..... |
| United States | 1,849,033 | 3,001,156 | 40,560 |

The value of imports of hide cuttings, raw, and all other glue stock and hide rope entered for consumption in the United States during the fiscal year of 1899-1900 was \$1,207,572.03, and the value of imports of glue was \$526,544.05.

Slaughterhouse by-products that are utilized include—

Gelatin,
Glue,
Fertilizers,
Hair,
Curled hair,
Bristles,
Blood,
Neat's-foot oil,
Bones,
Horns,
Hoofs,
Glands and membranes, out of which are obtained—
Pepsin,
Thymus,
Thyroids,
Pancreatin,
Parotid substances,
Suprarenal capsules, etc.,
Soap stock,
Glycerin from tallow,
Brewer's isinglass,
Albumen,
Hides,
Skins,
Wool,
Intestines.

WOOLEN INDUSTRY.

The woolen industry furnishes a number of materials formerly regarded as waste, that are now utilized in the industry itself and for pharmaceutical and other purposes. The principal articles of waste are rags and wool-grease. The former is reconverted into wool and used the same as the original raw material, while the latter is employed in other industries. The sheep obtains from the soil of the pastures upon which it feeds a considerable portion of potash, which, after circulating through the system of the animal, is excreted with other matter from the skin and becomes attached to the

¹ Industrial Organic Chemistry, by Sadtler.

wool. This excretion is known by the French as "suint," and oftentimes constitutes, together with the dirt that is mixed with it, two-thirds of the weight of the fleece. Formerly the suint was allowed to go to waste when the wool was cleaned; and even now a large portion of it that is taken from the fleece is allowed to go to waste with the wash waters. There is a disposition at present, however, to recover the grease from the wash waters and use it for industrial purposes. At first, attention was directed to the saving of suint for the purpose of obtaining the potash and potash salts contained in it, and with this object a special industry was established in the wool districts of France and Belgium for converting it into commercial products, which were exhibited at the several industrial expositions in Europe, and especial mention was made of them at the Paris Exposition of 1867, many of them receiving silver medals.

The encrusting matters attached to wool, besides the dirt, consist of wool fat, which is soluble in ether, and wool perspiration, which is soluble in water. The wool fat and the wool perspiration are together embraced under the name of the "yolk" of the wool. The wool fat is a mixture of a solid alcoholic body, cholesterine, together with iso-cholesterine, and the compounds of these bodies with several of the fatty acids. These free higher alcohols are soluble in boiling ethyl-alcohol, while the compounds they form with the fatty acids are insoluble in alcohol but soluble in ether. Wool perspiration consists essentially of the potassium salts of oleic and stearic acids, and possibly other fixed fatty acids, also potassium salts of volatile acids, like acetic and valerianic, and small quantities of chlorides, phosphates, and sulphates.¹ Thus it will be seen that the yolk of wool contains many elements of recognized value in arts and manufacturing.

When the potash salts are evaporated and ignited, they yield a product of potassium carbonate, and it is estimated that 2,200,000 pounds of this product is saved from the wool wash waters of the mills and scouring establishments of France and Belgium. When the yolk is submitted to dry distillation it yields a residue containing carbonate of potash, nitrogenous carbon of great value for the manufacture of yellow prussiate of potash. According to M. Chandelon, 2,200 pounds of raw wool may furnish 300 quarts of yolk solution of 1.25 specific gravity, having a value of \$3.75, while the cost of extraction does not exceed 60 cents.²

It is only within comparatively recent years that volatile solvents have been used for extracting the yolk from wool. By far the greater quantity of wool is still cleansed by the old process of scouring with alkalis and washing in a rapid current of water. The volatile-

solvent process, however, is coming into use, though now confined chiefly to establishments where large quantities of wool are cleansed. The great cost of the plant for cleansing wool by this method confines it to large establishments. Various volatile solvents can be used, such as fusel oil, ether, petroleum naphtha, and carbon disulphide. When these solvents are used they have to be followed by washing with water, as, while they dissolve fatty matters, they do not take up the oleates, etc., of the wool perspiration. The treatment of wool by these means is now confined to petroleum naphtha, and, as now conducted, according to the best methods in vogue, is found to be not only practicable but remunerative, both in the saving of a valuable product and in leaving the wool in an excellent condition for the various processes of manufacture.

In 1897 a bill was presented to the English Parliament, from the Bradford district, relating to the treatment and disposal of "suds" from the wool washbowls in combing sheds. At that time considerable interest was attached to a process which had been introduced at the works of Messrs. William Scaife & Co., wool combers, Laisterdyke. The process is described as exceedingly simple and apparently successful. The suds, after being run off from the washing bowl, are allowed to stand for about half an hour in a settling tank, to permit the sand and solid matter to fall to the bottom. The liquor is then pumped into a tank, very much like a washbowl, in the bottom of which is a system of pipes through which compressed air is forced. About one gallon of sulphuric acid is added to every 700 gallons of suds before the "blowing" begins. The violent aeration of the liquor which ensues quickly brings the grease to the surface in the form of a thick foam or froth, and a set of boards, carried on an endless chain, scrapes this off and carries it away over one end of the tank. The blowing is continued as long as any froth arises, which is just as long as there is any grease left in the water. The foam, which contains only about 5 per cent of water, is treated just as the magma, obtained in the usual way by precipitation, is dealt with—by pressure in a steam press.¹

Within the past five or six years, several methods for cleansing wool, and for the recovery of the grease, etc., from the wash liquors, have been introduced into England and on the continent, that have attracted considerable attention and comment from scientific journals. At the works of Thomas Biggart, of Dalry, Ayrshire, the recovery of grease and potash from the wash liquor is effected in the following manner: The suds from the first scouring bowl, containing about nine-tenths of the grease and potash, after standing about twelve hours to insure deposition of the sand, are evaporated in a pan until the liquid attains a sirupy consistency. The resultant liquid is then cooled in

¹ Industrial Organic Chemistry, 3d edition, Sadtler, page 306.

² Industrial Organic Chemistry, 3d edition, Sadtler.

¹ Public Health Journal, 1897.

shallow iron trays, and the grease which collects on top is removed at intervals. The semiliquid residue is then calcined in a brick oven and the heat produced from it is used to assist in the evaporation. A crude carbonate of potash is thus produced, which, after being completely carbonated, is boiled to dissolve out the potash salts. The solution is then concentrated to 100° Tw., the potassium sulphate and chloride crystallizing out on cooling. The potassium carbonate and grease obtained are sold.

In a recent type of machine—that of Emile Richard-Lagerie, of Roubaix, France—the wool is subjected successively to the action of liquors of diminishing strength, the last being clear water. The liquors, after having passed through the wool, are pumped into tanks for redistribution until they attain a density of 1.07, when they are evaporated and the residues calcined for the manufacture of potassium carbonate. Each machine is capable of dealing with about eight tons of wool per 24 hours.

The grease is extracted from the suds at the works of Alf. Matte & Co., Roubaix, by a mechanical process of "battage." The suds are, by means of a rotary agitator, beaten into a froth, which carries the fatty matters to the surface. These are skimmed off into conduits by a mechanical scraper, and are forced by a steam extractor into a wooden tank in which they are heated to 60° C. and treated with sulphuric acid in the proportion of 1 pound to 100 gallons. The acid is then removed by washing and the grease is filter pressed.

In the establishment of Thomas Fox, Wellington, Somerset, the soapy liquors are led into 6 acidifying tanks and treated with sufficient acid to liberate the fatty acids. These on separating, together with the wool fat, are drained on sawdust filters. They are afterwards taken off and purified by distillation for conversion into soap again. The dilute acid from the acidifying tanks is pumped into intermediate storage tanks for further settlement, after which it flows into the precipitation tanks and is treated with the general waste waters from the works, by aluminoferric sulphate, and lime.¹

There has been a patent granted in England (No. 20433, October 29, 1895) for improvements relating to removing, recovering, or separating certain constituents from the suint and obtaining certain valuable products therefrom. The solvent employed in this process for treating the wool is a heavy petroleum oil (specific gravity, 0.837 to 0.878) at a temperature of 120° F. On cooling the resultant liquid to about 70° F. the cholesterol of the suint separates out as a heavy deposit, while the glycerides remain in solution. This solution is found to be an efficient agent in scouring the wool, leaving it in a condition suitable for the subsequent carding, etc. The wool is treated with the petroleum oil in an ordi-

nary wool-scouring bowl fitted with pressure rollers. One-half to one gallon of solvent is employed for each pound of wool. After about twenty minutes' action the greater part of the liquid is drawn off, and the operation is repeated if necessary. The wool is then treated with water or neutral soap, rinsed, pressed, and dried. After filtration the liquid is cooled, the deposit is removed, and the clear solution used again. This solution may also be employed as a lubricant or for use on leather, and since it contains no free fatty acids, it would seem to be better adapted for either purpose than the analogous mixture of degrass and petroleum oil.

Among the most valuable improvements in treating wool fat and producing products therefrom are those covered by a United States patent (No. 539386) recently granted to William D. Hartshorne, of Methuen, Mass., and Emile Maertens, of Providence, R. I. By the methods employed by these inventors 5 resultant products are obtained from wool fat. The object of the invention is to more thoroughly separate or divide wool fat into products possessing different properties and characteristics, so that the constituent parts of the wool fat, when obtained in a comparatively pure isolated state, are in the best form to be put to the various uses to which each is best adapted. This separation is considerably affected by temperature and by concentration of the solution from which and by which they are extracted. The fat products obtained are applicable to the following uses: (1) As a base for ointments and other pharmaceutical and toilet preparations on account of its penetrating, lubricating, and softening qualities. (2) As a leather and belt dressing, and, when freed from resinous matter, as a lubricant in conjunction with certain lubricating oils. (3) As a lubricant for wool and other animal fibers. This can be used to advantage to increase the specific gravity and viscosity of certain lubricating oils.

The inventors refer to wool fat as chemically a mixture or combination of cholesterol or its isomers or allied substances or alcohols with various fatty acids of resinous matters, and sometimes of such matters in a free state. The exact chemical relationship of these as they exist in the original wool fat on the sheep is, in the opinion of the inventors, very complex, and probably has never been accurately determined, and in the nature of the case may be indeterminable.

A number of patents have been granted of late years for cleansing wool by some solvent process. Among the important ones are those based upon the patents of Emile Maertens, of Providence, R. I., all of which relate to methods of treating wool and refining wool fat. The apparatus employed relates essentially to the economical removal and saving of the solvent adhering to the materials after their extraction, and particularly to the economical and safe treatment of wool with volatile solvents.

¹ Journal Society of Chemical Industry, vol. 15, page 47.

The process employed for degreasing wool is that of treating the wool in close digesters with the volatile solvents until a complete extraction is effected. One of the principal features of the process is the employment of compressed gas as a forcing or motive power to circulate the solvent through the wool under treatment. It is used to press the liquid solvent out of the wool as well as to blow out of it such solvent as has not been removed by pressure. It is also used as a heat-carrying medium to the wool and as a solvent vapor-carrying medium from the wool. It is furthermore used as an atmosphere wherein to carry on the extracting operation, both for covering the solvents in the reservoirs and for taking the place of the solvent removed from any part of the apparatus, and thus prevents the ignition of the solvent vapors by any electric or other spark which might accidentally be communicated to it; and since the gas is always moved in a closed circuit, it prevents the loss of solvent vapors, and can be used repeatedly without limit. It may be explained that the gas referred to by the inventor is an inert gas, or one which does not form explosive compounds with the vapors of the solvent used or with atmospheric air.

The great importance and growing appreciation of the solvent process of cleaning wool and preparing it for dyeing and spinning permits of special and more extended observations. Scientists and technical experts who have studied the wool fiber are unanimous in the opinion that it should be freed from its fat by means of volatile solvents, and not by the use of soapy and alkaline solutions, as has been heretofore the universal practice.

The earlier attempts to carry on the process of degreasing wool by means of volatile solvents were none of them successful from a commercial standpoint, although the rationality of the process was fully demonstrated in almost every instance by the superior condition of the wool thus treated. The problem was a very complex one to solve, requiring considerable mechanical engineering skill, knowledge of the wool fiber, of chemistry, due regard for the healthfulness and safety of the operation, and the blending of all these requisites into a system, the result of which would show a saving which could be expressed in dollars and cents.

In 1895 a plant for treating wool by the "solvent process" was put in operation by the Arlington Mills, of Lawrence, Mass., and was the first plant of its kind in the world that was commercially and technically successful. This plant has the capacity of degreasing 50,000 pounds of wool every ten hours, and has been run to its full limit ever since it was started. After an experience of six years with the solvent process, the Arlington Mills are now building a new plant to treat wool by this process which will have the capacity of degreasing from 200,000 to 250,000 pounds of wool every ten hours.

The saving effected by the "solvent process" to establishments that degrease and work their own wool for worsted purposes can be expressed in round numbers as averaging 2 cents per pound, figured on the greasy wool. This saving is made in the cost of the soap, which is entirely dispensed with by the new process; in a greater yield of the wool fiber since none of it is dissolved by soap and alkali; in a larger proportion of top to noil, because the wool, being free from any felting, cards and combs freely without breaking of the fibers or the making of nibs; in a larger production on cards, combs, drawing, and spinning machinery; in the superior softness and appearance of the finished product; in the wool fat recovered, and in the potash recovered. The cost of the degreasing operation, including labor, solvent, power, interest, depreciation, etc., is, it is estimated, more than covered by the soap saved.

The average amount of fat taken out of such wools as are worked in the United States is 15 per cent, which at the minimum price of 3 cents per pound represents 45 cents on every 100 pounds of wool degreased, and if to this is added also the value of the carbonate of potash recovered from the rinsing waters, which on an average amounts to 25 cents net per 100 pounds of greasy wool treated, we have 70 cents as the average minimum value of the by-products recovered from every 100 pounds of raw wool, or seven-tenths of a cent per pound of wool treated.

It is safe to say that from two to three million dollars worth of wool fat and potash are run down the streams and wasted annually in the United States. If this wool fat instead of being wasted were recovered, refined, or separated into its constituent parts, its value would increase at least fivefold, and its uses would multiply. As the freighting expenses from some wool-producing districts to the mills or wool stores are often as high as 2 cents per pound, and average more than 1 cent per pound, for that part of the wool clip which is consumed in the Eastern and Middle states, and as the average shrinkage of the wool clip is 60 per cent, and and some wools shrink as high as 80 per cent, it will readily be seen that in some cases these freight charges amount to 10 cents per pound on the clean wool, and that they average $2\frac{1}{2}$ cents per pound on clean wool. By establishing degreasing plants at the principal Western shipping points, millions of dollars worth of wool fat and potash could be recovered annually, and from 60 to 80 per cent of the freight charges, amounting to several millions of dollars more could also be saved. Such a plan, if it were feasible, would have the further advantage of putting the wool upon the market absolutely clean, free from further shrinkage, and in the most perfect condition for working. In having wool cleaned at the shipping points, some system of grading or sorting the wool according to its qualities would

necessarily have to be established in order to meet the requirements of manufacturing.

More progress has been made in the United States in the practical employment of the solvent process than in any other country. Plants have been recently erected in Belgium and Saxony, but not on so large a scale as exist in this country. The chief opposition to them is that of first cost, and the revulsion of manufacturers to the giving up of old methods. The cost of erecting a suitable plant is undoubtedly a serious obstacle in the employment of the solvent process, and to bring the process within the scope of the industry this obstacle may have to be removed.

The application of wool grease in the leather industry is familiar. Some experiments performed in Europe and described in the *Journal of the Society of Chemical Industry* in its issue of February 28, 1898, in "stuffing" a number of samples of leather with a mixture of wool grease and tallow, showed that the neutral wool grease penetrated the leather better than other fats of the same consistency; that it left no sticky touch or ill odor; and that, in the case of chrome-tanned leathers especially, it gave a very good color.

Wool grease under the name of "degras" is very largely used for stuffing leather. The term "degras," as employed in the trade in the United States, and as used in paragraph 279 in the customs tariff—where it is spoken of as brown wool grease—applies to grease extracted from the wool of sheep. In general use, however, the term "degras" is applied to oils and greases used by tanners without any special distinction, including what is known as "sod oil." Sod oil and wool grease have entirely different constituents as well as characteristics, and hence should be easily distinguished. Wool grease is extracted from the wool of sheep. Sod oil is expressed or extracted from leather which has been curried with oils, particularly fish oils. Sod oil has no relation to wool grease in its derivation, but is related to it in its use; that is, for the currying of leather. Sod oil contains a resinous substance (not a resin) known as degras former, which is characteristic of sod oil. No other oil or grease (and this includes wool grease which is, scientifically speaking, an animal wax and not a grease at all) contains this degras former, which is therefore characteristic of sod oil.¹ Originally sod oil was called degras. Later, the term "degras" was made by the American oil trade to embrace wool grease, and was adopted less extensively by the English. The term has therefore come to embrace two substances, dissimilar in constitution, source, and chemical constants.

The amount of degras that was imported and entered for consumption into the United States for 1899-1900

¹Erastus Hopkins. *Journal of the American Chemical Society*, June, 1900.

was 13,263,480 pounds, valued at \$285,486.45, duties paid.

The most useful by-product of the woolen industry is undoubtedly woolen rags that may be reconverted into wool. Before these rags were used for this purpose, they were either thrown upon the waste heap to become manure or collected and used for the production of prussian blue and an inferior grade of paper. No waste of this kind is now permitted, but every woolen rag, in whatever form it may appear, unless completely worn out, is reused in manufacture, to appear again in clothing. Such rags are used and reused until there is absolutely nothing left of them that can be utilized, when they are mixed with hoofs, horns, and the blood from slaughterhouses, and melted with wood ashes and scrap iron for material out of which the beautiful prussian blue is made.¹

Shoddy has been a part of the woolen manufacture since about the beginning of the Nineteenth century, and its use is one of the necessary developments of the art of manufacturing, as, were it not for the supply from this source, there would not be a sufficient amount of raw material to meet the demands for clothing, except at very much increased prices over those that exist to-day.

Shoddy is not woolen rags ground to powder, but rags that are picked, leaving a good staple suitable for spinning. Some of the most substantial goods that are made, doing serviceable work for a number of years, contain a proportion of shoddy mixed with wool.

The largest amount of shoddy is utilized in the woolen industry of Great Britain; next to which comes that of the United States, where, in 1900, about 75,000,000 pounds were consumed, mostly in the manufacture of woolen fabrics, very little going into worsted fabrics, and that little placed upon the back of the goods, the worsted appearing upon the face. Practically all of the shoddy that is made in the United States comes from American rags. Only 314,597 pounds of wool waste were imported and entered for consumption into the United States for the year ending June 30, 1900. Very little of this consisted of rags, and still less of shoddy.

In recent years none but all-wool shoddy has been manufactured. During the Civil War and prior thereto much of the shoddy for low-grade goods consisted of that made from rags with more or less cotton in them, especially in the warp. The improvement in the manipulation of rags, particularly those that contain more or less vegetable matter, as cotton, is due to the methods of destroying the vegetable material by means of acids and high temperature, both of which are necessary. These methods come under the general head of what is known in the trade as "carbonizing," which

¹Lord Playfair.

term applies strictly to the destruction of vegetable substances without essentially affecting the manufacturing qualities of the wool fiber. The shoddy thus produced goes under the general trade term of "extract," meaning simply that the wool fiber is extracted from its impure mixtures.

The acid commonly employed in carbonizing rags and making "extract" is sulphuric acid, in which the rags are allowed to soak for a short period of time and then subjected to a heat of from 200° to 210° in a close chamber, when the rags are removed and the acid neutralized by an alkaline bath, after which they are dried and shaken, the latter process converting all of the vegetable matter into dust. The rags, thus left with nothing but pure wool, are then sorted, picked in a machine known as the "shoddy picker," and otherwise treated in the same manner as original "all-wool" rags. The shoddy, or extract, that is thus made is absolutely clean and free from all deleterious matter, without the slightest possibility of conveying disease germs, and, in this particular, is freer than the wool obtained from many countries in the tropical and semitropical parts of the world. There is a process of carbonizing rags in which the dry system rather than the wet system (that of submerging the rags in a sulphuric acid bath) is employed. The acid used for dry carbonization is generally hydrochloric. There have been several patents taken out for the treatment of the rags by this process.

In 1896 an English patent was issued for an improved apparatus for carbonizing rags by the hydrochloric acid process, which, if allowed to act on the rags when perfectly dry, does not alter their color. Where the retention of color is essential the process is a valuable one, as by the wet process the colors are destroyed. By means of this improved apparatus the rags are placed in a perforated drum fitted radially with arms which do not reach quite to the center. A hollow shaft, which is heated in an adjacent chamber by means of furnace gas, enters at one end. Compressed hot air is allowed to enter the chamber containing the drum with the rags, either by way of the hollow shaft and through the rags or from the outside into the space surrounding the drum. In this manner the rags are perfectly dried. After the drying, hydrochloric acid is allowed to drop slowly from a funnel through the heated part of the hollow shaft into the drum, where it carbonizes the cotton in the rags.¹

Preparation of acetone oil and ketones from wool washings is referred to in some of the European scientific journals.² A process is suggested for this purpose by making use of the volatile fatty acids contained in the liquid obtained by washing wool. The dry calcium salts of the volatile fatty acids thus obtained are distilled in the usual way, the yield being a mixture of ketones.

In the manufacture of cotton very little waste remains unutilized, but there have been great improvements of late in the methods for its more successful utilization for refabrication instead of being simply used for carpet linings, wadding, and batting. Nearly all cotton rags, and the same may be said of the linen rags, constitute valuable materials for the manufacture of paper. It is very difficult to destroy by mechanical means the physical identity of the cotton fiber. F. L. Simmonds in his "Waste Products and Undeveloped Substances," goes so far as to remark that—

In this utilizing age it can not reasonably be expected that a waste product, such as rags, which have been proved to possess a length of staple, when broken up, sufficient for the spinning of common stuff, will be much longer permitted to find its way exclusively to the paper mill. Like flock and shoddy, linen and cotton rags will be taken more and more from the paper maker, and raw vegetable fibers will have to be sought for or cultivated.

A large portion of the waste made in cotton mills, that is, such waste as has too short a staple for spinning, is used for such articles as batting and wadding. For this purpose 10,567,000 pounds were used during the census year of 1900, valued at \$864,016.

COTTONSEED OIL INDUSTRY.

Closely allied to cotton manufacturing is the cottonseed oil industry, in which there has been a great revolution within late years in the utilization of the cottonseed, in obtaining most valuable commercial by-products, that were at one time allowed to go to waste with the seed in the form of manure. Cottonseed was a garbage in 1860, a fertilizer in 1870, a cattle food in 1880, and a table food and many things else in 1890.¹

The manufacture of cottonseed oil and all of its resultant by-products furnishes one of the best examples of the development of a business based upon the utilization of a waste product.

The seed of the cotton plant, of which cotton oil is the fatty ingredient, was for many years a waste product of the cotton field. The first cotton-oil mill was established in 1837, but for many years after the business did not amount to much; in fact, the real advances in this industry have been made in the past twenty years, with the greatest development in the last ten years. Prior to the advent of the oil mill and during the interval of its development cottonseed was used in some localities as a fertilizer. Later on it was used to a certain extent as a cattle food; but the main proposition seems to have been how to get rid of the seed with the least trouble, and, in fact, laws were passed in certain states making it a punishable offense for ginners within certain limits of towns to allow cottonseed to lie around and rot, or to dump it into streams.

It is computed that as late as 1870 only 4 per cent of the seed produced (from a cotton crop of 3,011,996

¹ English patent 25703. 1896.

² Review of Chemical Industries, 1898.

¹ F. G. Mather, Popular Science Monthly, vol. 45, page 104.

bales) was utilized in the oil business. In 1890 this had increased to 25 per cent of the seed on a crop of 7,472,511 bales, and in 1900 it was 53 per cent on a crop of 9,645,974.

According to the census of 1900, the value of the entire cottonseed crop was 13.8 per cent of the total value of the cotton crop, including the value of the seed, while the value of the products from the manufacture of all the seed produced would have been 20.4 per cent of the total value of the cotton crop.¹ Thus it will be seen that the full benefit of the cottonseed product to the planting and commercial interests of the South is not yet fully realized; not within \$26,000,000 on the size of a crop equal to that in the census year of 1900. The seed which is not worked up in the oil mills is used for fertilizing, feeding, and planting. It has been unquestionably demonstrated that for feeding and fertilizing purposes the product of the cottonseed, after expressing the oil, has a greater economical value than does the whole seed, so that eventually the entire seed crop will be worked through the cotton-oil mills, with the exception of the amount reserved for planting.

The seed-cotton is brought from the fields to the ginneries, and there the fiber is removed, leaving adhering to the seed a short fiber, known as linters, the removal of which is the first process through which the seed passes in the oil mill, after the seed has been cleaned of trash, bolls, etc.

Cottonseed as it comes to the mill has a waste, due to sand, trash, etc., amounting to from 1 per cent to 3 per cent. The clean seed consists of about 2 per cent of linters, 48 per cent of hulls free from lint, and 50 per cent meats. These figures vary with different seasons and different localities, but they show the average of a number of localities and seasons.

The process of separating the different component parts of the seed is practically a continuous one. At the mills the seed is received into large houses and there distributed by means of conveyors and elevators to different parts of the shed or to the mill proper. All seed is thoroughly cleaned of bolls, trash, nails, etc., before going to the delinting machines. These consist of fine revolving saws closely set together, which tear off the short fiber left on the seed as it comes from the regular cotton gin. This product of the oil mill, known as linters, varies considerably as to quality and the quantity obtained, depending upon the seed worked. The average amount of linters taken from a ton of cleansed seed is from 20 to 30 pounds. It is of fairly good color and is used largely in the making of mattresses, felt hats, pillows, etc.

The seed, after passing through the delinting machines, is run through the hullers, which cut the seed so that when dropped upon the shakers and passed through the beaters the meats are thoroughly separated from the

hulls. A ton of seed yields about 1,000 pounds of hulls. Perhaps one of the greatest developments in the business during the past few years is the utilization of these hulls for cattle food. Previously they were considered a great nuisance around the mills, and in order to get rid of them the mills used them for fuel, the ashes being utilized for fertilizers, as they contain a large amount of potash. The feeding of the hulls is being recognized more and more every day, and from this has come a demand which has resulted in the baling and shipping of the hulls to great distances from the source of their production. There have also been developed, although not to any great extent as yet, processes for removing the fiber from the shell of the hull and making a fine paper stock from it, utilizing the bran in making mixed cattle food.

The separated meats pass from the shakers to rolls, where they are crushed, and from there they pass to cookers, where they are cooked to break up the oil cells. The cooked meats are then inclosed in camel's-hair mats and placed in hydraulic presses and subjected to a pressure of 2,000 to 4,000 pounds. The resultant crude oil is then pumped into settling tanks and certain impurities are allowed to settle out. The residue left in the press, after expressing the oil, is in the form of a hard cake. This is a most valuable by-product of cottonseed oil and amounts to about 725 pounds per ton of seed. The cake, either in the form of cake or after having been ground into meal (known as cottonseed meal), is used largely as a cattle food, or in the form of meal directly as a fertilizer, or as the principal ingredient in many prepared fertilizers. It is the best cattle food and fertilizer of any of the vegetable-oil cakes produced.

Mr. W. J. Booker, in "Flour and Feed," gives the following statement, based on a report of Prof. E. N. Jenkins, of the Connecticut State Experimental Station, showing the relative value of nitrogen, phosphoric acid, and potash contained in wheat bran, corn meal, linseed-oil meal, and cottonseed meal:

| | Nitrogen. | Phosphoric acid. | Potash. |
|--|----------------|------------------|----------------|
| | <i>Pounds.</i> | <i>Pounds.</i> | <i>Pounds.</i> |
| 2,000 pounds wheat bran contains | 47.4 | 60.2 | 32.0 |
| 2,000 pounds corn meal contains | 29.0 | 12.8 | 8.0 |
| 2,000 pounds linseed oil meal contains | 106.0 | 38.8 | 20.2 |
| 2,000 pounds cottonseed meal contains | 134.6 | 60.6 | 35.8 |

Taking the nitrogen at 17 cents per pound, phosphoric acid at 6 cents per pound, and potash at 4½ cents per pound (all of which are low valuations) gives the following as the manurial values:

| | Per ton of 2,000 pounds. |
|------------------------|-----------------------------|
| Wheat bran | \$13.03 |
| Corn meal | 6.04 |
| Linseed oil meal | 21.55 |
| Cottonseed meal | 28.04 |

In feeding, the animal retains from 5 per cent to 20 per cent of the above elements, so that, taking 20 per cent from the above values, and taking wheat bran at \$22 per ton, corn meal at \$24 per

¹Census Bulletin No. 129.

ton, linseed oil meal at \$28 per ton, and cottonseed meal at \$27 per ton, after deducting the cost of the manure, it costs to feed—

| | Per ton. |
|-----------------------|----------|
| Wheat bran..... | \$11.57 |
| Corn meal..... | 19.16 |
| Linseed oil meal..... | 6.45 |
| Cottonseed meal..... | 4.56 |

It will be seen from the foregoing that cottonseed meal contains, by a large percentage, a greater amount of nitrogen (protein) than any other food. It is, in fact, the most concentrated, cheapest, and most nutritious of foods, and in feeding, mixing it with bran, middlings, hulls, or other feeds, it produces an ideal cattle food. The tendency of the times is toward more scientific feeding, and the utilization of cottonseed meal, with its high percentage of flesh-forming properties, makes a great advancement over the old method of feeding the whole seed.

The foregoing products are all incidental to the production of crude cottonseed oil. The crude oil is allowed to stand in settling tanks for a number of hours, and is then ready for the refining process. There is obtained from a ton of seed approximately 275 pounds of crude oil. The oil varies in quality considerably, depending upon the condition of the seed and the locality from which it comes. It will vary in color from a light brown to a deep black. It contains varying proportions of red coloring matter and free fatty acids, depending upon the care with which the seed has been handled and the oil produced. The free fatty acids will vary from 0.4 per cent to as high as 30 per cent, but the average is in the neighborhood of 2 per cent.

The real advancement of the last twenty years in the cotton-oil industry has been made by the refinery. While there have been many improvements in the machinery of the crude oil mills, the process is to-day practically what it was many years ago, but when we turn to the refinery, the tremendous strides which have been made in the improvement of the refining methods result in a product so superior to the article produced years ago, that industries utilizing the oil, on account of this improvement, can use greater quantities of the oil than ever before.

Crude cottonseed oil, after its first process of refining, comes out in the shape of a clear, brilliant, yellow oil, known as summer yellow oil, having a specific gravity at 15° Centigrade of .92. Owing to the deterioration of the seed and to inferior methods of manufacture, all crude oil does not produce yellow oil of the same grade. The trade has classified summer yellow oil as choice, prime, off, and soap oil, the difference in these grades being in the color and flavor. Choice oil is a light lemon-colored oil, without any suggestion of red, and is mild and neutral in flavor. Prime oil is slightly darker in color and sweet in flavor, without any seedy flavor. These two grades are used for edible purposes. The off and

soap grades of oil are reddish in color and the flavor is very poor, due to bad seed, mustiness, etc. This oil is used for mechanical and soap purposes.

As intimated before, the amount of the different grades of oil produced depend largely upon the condition of the seed. It has varied from about 85 per cent to 35 per cent of choice and prime oil, and from 15 per cent to 65 per cent of off and soap oil.

With the improved refining methods of the past ten years has come increased demand and use for refined cottonseed oil. Summer yellow oil forms an important basis for a number of different products after being submitted to various processes, such as bleaching it to make it white and pressing it to extract the stearin.

One of the principal uses and development of cottonseed oil contingent upon the improvements in refining methods in the past decade is that of the manufacture of lard compound—a mixture of lard, oleo stearin, and refined cottonseed oil—making a most palatable and economical food. Another product of cottonseed oil, white cottolene, is a mixture of oleo stearin and specially processed cottonseed oil, marking, perhaps, the highest development of cotton oil as a food product.

Cotton oil is also used in the making of salad oils, packing sardines, in the oleomargarine industry, for miners' burning oil, cathedral burning oil, tempering oil, oil for heavy tool-cutting machines, mixing with putty, and, while not exactly a drying oil, yet for rough painting the crude oil can be and is used to a considerable extent. The cheapness of cotton oil compared with other fats, as well as its excellent soap-making properties, has caused it to be largely used by soap makers, both in America and abroad. It is also used in the manufacture of washing powders. Cottonseed oil is used to-day to a great extent by bakers. It is also used as a substitute for olive oil. Chemists and physicians now recognize cotton oil as a high-class food product.

In the refining process there is produced a loss amounting on an average to about 10 per cent of the crude oil. This forms an important by-product of the cotton-oil industry. This substance is known as soap stock, or foots. It has a fat acid content of from 40 per cent to 50 per cent, and is composed of free oil, coloring matter of the crude oil, and soap caused by saponification in the process of refining. It is used in making wool-scouring soaps and cheap grades of laundry soaps. It makes a most excellent soap. There is also produced from this substance glycerin, candle stock, olein, still pitch, etc. The number of uses of this last, though by no means least, by-product of the cotton-oil industry emphasizes the many uses to which this oil and its various products are put. It is of course impossible here to elaborate upon these, or even to fully enumerate them.

It should be borne in mind in dealing in or describing cottonseed products that in no two seasons are the con-

ditions exactly alike, and the quality and quantity vary so much, that it makes it a constant study and a most interesting business.

THE LEATHER INDUSTRY.

In the making of leather very little is allowed to go to waste. In 1896 a patent (No. 13,096) was granted in England for making leather-board material, suitable for being pressed into form for decorative and other purposes, or for use in substitution for leather floor cloth and the like, the waste of leather alone being used. Waste fibrous material and the wax, oil, albuminous and extractive matter derived from cottonseed and shell are made into a pulp, boiled together with silicate of soda, and the whole precipitated by the addition of milk of lime. The alkaline liquor is then drained off from the precipitate. Waste leather or other animal substance is separately treated with sulphurous acid, and then added and thoroughly mixed with the first-obtained pulp, together with tanning agents or chromium compounds. The mass is then made into boards, or pressed or molded as desired.

Among the side products of the tanning of leather may be mentioned the following: Spent tan and tan liquors; waste liquors containing lime salts; scrap and skin for glue manufacture; hair, sold for cheap blanket and cloth manufacture, or for use with lime in plaster; scrap for glue manufacture, and refuse washings. These side products are obtained in the conversion of softened hides into finished sole-leather sides.

Degras, which has been referred to in connection with the woolen industry as being obtained from wool grease, is also a by-product of great value in the leather industry, and a great demand for this material for currying purposes has led to the manufacture of it as a special industry. In this process the skins are treated exactly as in the manufacture of chamois leather, being used repeatedly until no longer capable of taking up the oil. The supply from this source is not sufficient for the demand, hence an artificial degreas is sometimes made from oleic acid, fat, and a little lime soap to which some tannic acid has been added.¹

Scraps of leather are now converted by means of a special apparatus into boot and shoe heels, as well as other things, such as inner soles, etc. Some of the small bits of leather are utilized for what is called "shoddy leather," which is made by reducing the bits to a pulp by grinding, and by maceration and conversion into solid "sides" of leather by pressure. This is used to a considerable extent as inner soles for shoes and boots. If leather scraps can not be used for any better purpose, they are utilized in the manufacture of glue.²

¹ Industrial Organic Chemistry, 3d edition, S. P. Sadtler, page 335.

² Waste Products and Undeveloped Substances, P. L. Simmonds.

THE DYEING INDUSTRY.

There are many by-products used in the dyehouse and in the dyeing industry which have contributed largely to the great progress that has been made in manufacturing within the last one or two decades. Of these by-products the most conspicuous and valuable are those obtained from coal tar or gas tar, which, not many years ago, was a waste material difficult to get rid of. It could not be thrown into streams because of its polluting the waters, nor could it be disposed of by burial because of its destructive effect upon vegetation, and had to be disposed of by burning.

These by-products have now become of the highest value, not only for the production of exquisite dyes, but for medicines and disinfectants, and for the production of a saccharine substance several hundred times sweeter than sugar. The list of uses to which these materials can now be converted is a long one. Naphthalene, one of the products of gas tar that was formerly a troublesome waste, choking gas pipes and otherwise making itself obnoxious, is now one of the most valuable substances for the preparation of dyestuffs. The manufacture of alizarin, an artificial preparation of the by-products of tar, has destroyed the madder industry of Europe, or practically so. The aniline by-product of gas tar is a most productive source of coloring matter, its derivatives being almost without number, and producing every shade of color imaginable. By means of a synthetic process, certain constituents of coal tar can be combined for the production of artificial indigo equal in all respects to natural indigo, at a cost that makes it an article of much commercial value. Naphtha is a well-known product of coal tar used in dissolving gums, resinous substances, etc., india rubber and gutta-percha, and for many other purposes. Perhaps the most important products of this tar are benzol, from which aniline colors are obtained, naphthalene, and anthracene, from which alizarin and purpurin are obtained.

The primary object of the coal-tar color industry has been to supplant dyewood extracts by artificial products. The manufacture of synthetic indigo is perhaps the highest attainment yet reached in this line, one involving great scientific research of immense commercial and industrial importance to textile manufacturing. It is thought by chemists that the greatest promise of ultimate success in supplanting dyewoods lies in the development of the azo-dyes as completely as artificial alizarin has supplanted madder. For most purposes, more especially for the dyeing of cotton, the dyewoods may already be dispensed with, since artificial substitutes give superior results and are more easy of application.¹

Where dyewoods are used, large quantities of them remain after the coloring matter has been extracted and

¹ Chem. Zeit., 20, 53-54.

are thrown away as useless, though this is not carried on to so large an extent now as was formerly the case. In France and in some other of the European countries, this apparently useless product is mixed with tar refuse and formed into compressed cakes for fuel. It is said that a large factory at Havre made at one time such utilization of their spent dyewoods. This firm produced about 120 tons of agglomerated wood per month. The product was distinguished by the relatively small quantity of coal tar (25 to 30 per cent) which they used, as well as by the low price at which they were able to sell it as compared with other artificial wood fuel. They produced also pyrolygnite of iron and wood acids, but afterwards gave into other hands the utilization of the waste residues of their manufacture, as it tended to interfere with their principal product.¹

Before 1870, after concentrating the coloring matter from the dyewoods, less than a dollar per ton could be obtained for the exhausted wood as a combustible, and in most cases it was thrown away as an absolute waste, so far as any use could be made of it for industrial purposes. The rational application of applied science turned this waste into a useful product. M. Chaudet, an ingenious chemist at Rouen, began to utilize this waste in a practical way, and obtained from the exhausted dyewoods various products of a commercial value. One of the most important was a paper pulp obtained by separating the incrusting substances. These, in their turn, combining with the chemical agents by which they were extracted, furnished a useful soda soap adapted to use in cotton printing. It is stated that some of the residual deposits, resulting from the exhausted campeachy and fustic woods, can be utilized in steam boilers for preventing calcareous deposits. The researches of Chaudet led him to discover that the wood of the chestnut and the beach yielded almost colorless mordants, preferable in many respects to those obtained from the ordinary dyewoods. It is claimed that the spent bark of tanneries submitted to a hydraulic press might be employed with equal advantages as an economical fuel and the derivatives made by distillation usefully applied.¹

The waste liquors in indigo dyeing are capable of being saved and reused. It is reported that at the works of the Pincroft Dyeing and Printing Company, Adlington, Lancashire, England, the waste liquors containing indigo in suspension are passed into precipitation tanks, receiving on the way between 10 and 15 grains of lime per gallon. The precipitated indigo is raised by an ejector from the bottom of the tanks and blown into the different vats to be used again.²

During the fiscal year ending June 30, 1900, there

¹Waste Products and Undeveloped Substances, P. L. Simmonds, page 219.

²Journal of the Society of Chemical Industry, January 31, 1896.

were imported and entered for consumption in the United States coal-tar colors and dyes to the value of \$4,792,103.09, upon which duties were paid to the amount of \$1,437,630.93.

The production of ammonia from animal matter is insufficient to meet the wants of the present day. Fortunately the deficiency of the supply from this source is met by an inexhaustible supply from the vegetable world, or from the plant life of former periods. In the bituminous coal fields and in the deposits of brown coal is stored up an unlimited supply of nitrogen capable of being converted into ammonia, which is now obtained incidentally in the production of illuminating gas, of coke, and of animal charcoal, the supply depending upon the extent of these industries. This is likely to prove something of an industrial embarrassment, as the consumption of ammonia has grown enormously during the last thirty-five or forty years, while on the other hand the manufacture of illuminating gas, upon which the main portion of the supply of ammonia depends, has been seriously affected by the introduction of electricity for illumination, and is likely to be further affected.

Coke production combined with the saving of the by-products is an established industry in Europe, and is increasing in the United States. The question, Will it pay to gain the by-products of the manufacture of coke? is no longer pertinent. The answer to this question has been practically solved in the affirmative. Coke production is the basis of the tar-color industry, and will further the growth of the soda industry based on the ammonia process. But it is not advocated that the production of coke should be only for the gain of ammonia; the higher yield of coke, the recovery of the tar, with the daily increasing demand for the same, and the gain of the ammoniacal water are the inducements held out by the new methods of production.¹

A new and interesting development in the chemical industry of the United States is the utilization of the sulphuretted hydrogen gas developed as a by-product in the refining of asphaltum at the California Asphaltum Company's works at Ventura, Cal. The gas is burned to sulphurous anhydride in the usual manner, and the product of the combustion conveyed to the lead chambers. Owing to the method of its production, the gas is of a high degree of purity, and the acid produced is also of a high grade. At present the output amounts to 10 tons per day when the works are running at their full capacity. Sulphuric acid is made on a large scale at one other plant, while the manufacture of bluestone and boracic acid, carbonic acid, epsom salts, magnesia, and numerous other products is now carried on. The state of California has great natural resources upon which to base an important chemical industry, and its geographical position gives it an

¹Dr. Bruno Terne's address before the chemical section of the Franklin Institute, Philadelphia, October 20, 1891.

advantage in supplying certain markets of the Pacific slope, so it is probable that such an industry will grow up there when the transportation problem is settled.¹

SILK.

There is a large amount of waste made in the manufacture of silk which at one time was considered of comparatively little value. Now the reworking of waste silk has become an important and profitable industry. At the Dublin Exposition of 1865, a concern of Milan, Italy, showed some silk waste carded by hand and power, and spun into yarn, that attracted a great deal of attention, and was the subject of interesting comments in the technical journals of that time. Silk-waste carding, however, was not an altogether new industry in Italy at that period, as there were then 10 or 12 manufacturers, employing upward of 2,000 men, women, and children, engaged in this occupation, with an annual production estimated at about 400,000 pounds. At the Paris exposition of 1867 the attention of the French jury was drawn to some exhibits in this line that were made at that time, and interesting mention was made of them in its report.

STARCH INDUSTRY.

There are a number of by-products produced in the manufacture of starches from cassava, potato, corn, wheat, and rice. By-products in the manufacture of rice starch are the rice hulls, which are used mainly as fuel and packing material, but are also ground up and used for the adulteration of spices and the higher grade feed stuffs. As a food product they are of little value, on account of their indigestibility and excessive amount of fiber. Pure rice starch is not made to any great extent, the rice flour being generally sold as rice starch.

Wheat starch is generally made by one of two processes: (A) Wheat flour is made into a dough and the starch washed out in suitable machines, the gluten conglomerating and separating as a tenacious, sticky mass. This is dried and forms the wheat gluten of commerce. It is used as a food article or as a mixing product to raise the percentage of proteids in low-grade feeds. Its utilization is still in its infancy, and its application to the arts is in the experimental stage. (B) Wheat flour is allowed to sour or ferment, and then the starch is separated mechanically on starch runs, the gluten being taken off as a thin fluid, which is generally not recovered. If recovered, it is dried and gives a product similar to that made in process A.

The cassava-starch industry is confined to Florida. The manufacture is still in the experimental stage, and no reliable data are at hand.

For potato starch the potatoes are peeled and ground and the starch washed out and separated by mechanical processes. The by-product is potato slop, which is

used as a cattle food in the immediate vicinity, in a wet condition. The potato and cassava industries are of small importance.¹

Corn starch.—About 99 per cent of the starch manufactured in the United States is made from corn, the daily maximum consumption being about 180,000 bushels, yielding 2,500,000 pounds of starch and 4,000,000 pounds of glucose or sugar. From a manufacturing standpoint the kernel consists of four parts: Starch, gluten, germ, and bran, of which the gluten, bran, and germ are by-products. These by-products are separated by mechanical means, the process being somewhat as follows: Corn is soaked in moderately warm water for from twenty-four to sixty hours, to which a very small amount of sulphurous acid has been added to prevent fermentation and to loosen the intercellular tissue between the starch and gluten cells. The excess of soak water is then run off and the wet corn ground in such a way that the germs are loosened without being cut up or broken. The whole mass is then run into separators, where the free germs are floated off as wet germs. These are dried in suitable driers, then ground to a flour and the oil extracted by hydraulic pressure, leaving the corn oil cake as a by-product. This product forms one of the staple cattle foods, and contains about 24 per cent protein and 10 per cent fat. The nutritive and digestible properties are very high. Ground oil cake is known as germ oil meal. The average production is about 2 to 2½ pounds per bushel. Over 50 per cent of it is exported.

The corn mass, free from the germs, is then ground very fine and run over bolting-cloth sieves. Here the bran of the corn is separated and remains on the sieves. The product that remains in the bolting-cloth sieves is pressed, and, combined with about 50 per cent of water, is sold for immediate consumption. It is known by various names, as "glucose food," "slop," "corn food," "sugar food," etc. It heats and quickly deteriorates in the wet condition, but can be preserved for a time during hot weather by salting. This same product dried is known as "corn bran," "dried glucose," or "sugar food," or some fancy name. The food is easily digested and competes directly with wheat bran. Its composition is about 11 per cent protein and 3 per cent fat. Mixed with the gluten meal described below, it forms gluten food. The yield per bushel is about 4½ pounds.

The substance passing through these sieves, mentioned above, is a mixture of starch and gluten. The starch is separated by gravity from the gluten, the mixture being run over long level planes, as starch tables, runs, or gutters, where the starch settles out as a firm mass and the gluten passes away at the ends. This gluten is settled and gives what is termed wet gluten. The starch taken from the tables is used as

¹The Engineering and Mining Journal, 1899.

¹Bulletin No. 58, Department of Agriculture: The Manufacture of Starch from Potatoes and Cassava, by W. H. Wiley, Ph. D.

the raw material for the manufacture of the various grades of commercial starches, or it is treated with acid and converted into the various grades of glucose or grape sugars. The wet gluten pressed and dried forms gluten meal, the composition of which is, protein 38 per cent, fat 3 per cent, and starch 40 per cent. This is one of the richest and best food products on the market. The nutritive value is very high, and the factor of digestibility ranges from 92 to 96 per cent. The yield per bushel of corn is about 5½ pounds. The gluten meal is treated for the recovery of its starch, and gives two new products, a concentrated food stuff, characterized by the large amount of proteids (60-70 per cent) it contains, and a maltose sirup. This food stuff is suitable for human consumption, and also for raising the percentage of proteids in foods that have a small amount of these substances. When the wet bran and the wet gluten are mixed in the proportions as obtained from the original corn and the mixture dried, the resulting food is known as gluten. This is the most common food product in the starch and glucose industry, and represents about 80 per cent of the food output. Its feeding value is very high and its digestibility above 90 per cent. Its composition is about 28 per cent protein and 3 per cent fat.

Corn oil cake and gluten meal are exported extensively. The bran and gluten food is used almost exclusively in the United States. The production per bushel of corn is about 12½ pounds of food, giving a maximum daily production of from 1,200 to 1,300 tons, valued at \$25,000.

OLD RUBBER.

Old rubber as a waste material is a thing of the past. Nothing containing rubber is discarded, but is utilized in some form of commercial utility. One thing that formerly rendered rubber comparatively valueless was because of its being vulcanized, which rendered it of little use for remanufacture, due to the fact that it could not be remelted for mixing with new gum because of the sulphuric treatment it had received. This difficulty is now overcome, and the old rubber is blended with the new in certain proportions with good results, enabling the manufacturer to reduce materially the price of his goods. Old rubber can be utilized, however, without being mixed with new material, by being steamed, passed between rollers, and in this softened condition applied to a strong, coarse fabric, or used for such purposes as stiffening the heels of boots.

In 1890 (United States Patent No. 420,820) a patent was granted to N. C. Mitchell, of Philadelphia, for a process of restoring rubber, with special reference to the treatment of rubber waste, such as old boots and shoes, for the purpose of recovering therefrom the rubber as a marketable product. By this process the old stock, after being ground between rolls and freed from foreign matters, such as metal, sand, and fiber, is

exposed to the action of heat, preferably steam heat, for the purpose of devulcanizing and desulphurizing the rubber. The steam acts mainly in softening the rubber and has but little effect in removing the sulphur. The inventor of the process discovered that desulphurization may be effected by mixing with the rubber small quantities of sulphide of calcium previous to the treatment with steam. When calcium sulphide is used alone, a very high degree of heat is required to effect desulphurization, which high degree of heat dries the rubber to an injurious extent. It is therefore desirable to mix with the calcium sulphide some substance which will keep the rubber in a moist condition. For this purpose heavy petroleum is used, usually in the proportion of 7 pints of the mixture of petroleum and sulphide calcium to 200 pounds of rubber scrap. Seven pints of the fluid contain one-fourth of a pound of the sulphide.

BREWERIES.

A patent was taken out in England in 1897 (Patent No. 3900) for a process to utilize the solid refuse of breweries, distilleries, starch and sugar factories, and the like. In the process described the refuse is treated with soda lye, and the pulp produced mixed with different kinds of finely powdered resins. The lye is then washed out with water, the remaining water is pressed out, and the residual mass is dried in a vacuum drying apparatus and finally pressed in molds while warm. The material is then claimed to be ready for use as laths, panels, wall coverings, etc.

The exhausted mash-ton grain in breweries is used for cattle food, and, while containing too much protein to be used alone, it is regarded as a most valuable food when mixed with hay. The amount of dry grains produced in breweries in the United States is estimated at 300,000 tons a year, and is all sold for cattle feed. Some breweries collect the carbonic-acid gas, that results in the process of fermentation, for soda water. There are consumed in the neighborhood of 50,000,000 pounds of hops annually in the United States in the manufacture of beer. These hops when they become exhausted are a veritable waste, and are buried or thrown on the refuse heap.

TIN AND MUSSEL SHELLS.

Among the materials used in the production of buttons are the remnants of the sheets of tin plate from which the bottoms and caps of cans for blacking and other boxes have been cut. After the button blanks have been punched from these tin remnants, the scraps which are left are made into sash weights. Another article that was considered of little or no value ten years ago is the fresh-water mussel shell, which is now extensively used in the manufacture of buttons. These shells were used in the button industry of the United States in 1900 to the amount of 4,830,112 pounds at a cost of \$238,046.

GLASS.

Broken glass is now being utilized in the manufacture of artificial stone as a building material, which has been tested in France with apparent satisfaction. The material is known as ceramic stone. The broken glass is first ground to a powder, and then devitrified by passing it through two furnaces, the second at a very high temperature, when the pasty mass is pressed, thereby acquiring form and solidity.¹

ASHES, ETC.

An artificial stone is said to be made in Germany of sifted ashes, potash, and other alkaline carbonates, gypsum, and slaked lime. It is said that this stone is not affected by atmospheric conditions. This mixture of sifted ashes and other materials is mixed with diluted sulphuric acid and hydrated sulphate of lime, forming potassium sulphate, which dissolves, leaving a plastic mass of gypsum to be molded by compression into the desired forms. To remove any alkali that may remain in the stone, it is immersed in a solution of alum, acidified with sulphuric acid; the alum is decomposed and alumina formed, and this still further hardens the stone.²

CORN PITH.

Among the uses of waste products may be mentioned the application of the pith of the cornstalk to naval and military uses for the protection of vessels, forts, or other structures from the injurious effects of collision, projectiles, or otherwise. Efforts have been made from time to time, for many years, for some means of readily and effectually closing openings made in the hulls of vessels by collisions or projectiles. Different substances have been proposed, and some have been adopted, that have proved more or less serviceable.

Masses of cork or other light material have been used, extending to the water line of the vessel, so that in the event of the place being pierced by shot, no more water could enter than would fill the place traversed by the shot, and thus the buoyancy of the vessel would be but slightly interfered with. The amorphous cellulose of the cocoon has been used with advantage as a barrier or cushion to protect vessels, forts, and other structures. The discovery that a material can be prepared from the pith of cornstalks, which possesses in a high degree all the qualities, desired was made by Mark W. Marston, of Philadelphia.³ He found that this substance had a capacity to absorb water or moisture of over twenty times its own weight, which exceeds the absorptive capacity of any known substance capable of like uses. Further, the rapidity with which the water is absorbed by this substance is said to be greater than

that shown by any other; thus a compressed body of this material will absorb water to fully one-half its capacity, or ten times its weight, almost as soon as water is brought into contact with it. The inventor found that if the substance were dried after being saturated, it substantially returned to its former condition and acted as before on again being wet.

GLYCERIN.

In the manufacture of soaps a large portion of the glycerin contained in the oils and fats employed, passes into the salty lye which is left at the end of the operation. A method has been suggested¹ for recovering from this waste, glycerin in a sufficiently pure condition for commercial purposes, ready for use without further treatment. The method employed consists in first treating the lye with an acid to neutralize partially the free alkali of the solution, and then to add sulphate of iron or sulphate of aluminum to complete the neutralization, and the precipitate is filtered or otherwise separated out. Evaporating is then employed to crystallize out the salt, and finally the resultant liquid is distilled to obtain the glycerin.

The wash resulting from the distillation of wine, molasses, beet root, and, speaking generally, from any alcoholic fermentative, contains glycerin, which is formed during the alcoholic fermentation at the expense of the sugar. A process of recovering the glycerine from these residues is a recent invention of a Frenchman.² The process consists in concentrating the wash by evaporation and treating it with an agent to neutralize the free acids contained therein, then subjecting the wash thus treated to the action of steam to carry off the glycerin contained therein, and finally condensing the glycerin. Aside from obtaining glycerin from the residues left from the distillation of wines and similar materials may be mentioned other by-products, such as ammonia, tars, and salts. A process for the utilization of distillers' wash is the subject of another French invention patented in this country.³

PRINTERS' INK ROLLERS.

There are now improved means of utilizing waste portions of printers' ink rollers, which have heretofore possessed but little commercial value, for the recovery of glycerin from the residuum of a process of distillation.⁴

POWDERED MILK.

The manufacture of powdered milk has become in late years an industry of considerable importance. The main difficulty heretofore has been that milk could not be shipped to countries where it was scarce, owing to

¹ Journal of the Society of Chemical Industry, vol. 16, page 44.

² English patent 20612. 1897.

³ United States patent No. 534611. 1895.

¹ United States patent No. 458647. 1891.

² United States Letters Patent No. 631396. 1899.

³ Letters Patent No. 669812. 1901.

⁴ United States patents Nos. 635821 and 649169.

the fact that even in the condensed form it would keep but a short time. In very hot climates it is almost impossible to use condensed milk, as, after a can is opened, it has to be consumed almost immediately. Condensed milk also contains a large percentage of sugar and water, which add to the expense of freight. In powdered milk there is no water and absolutely no foreign matter, no chemicals being used in the process of manufacture. The product is made from sweet skimmed milk, by a process of simple evaporation. Not until lately, it is believed, has a milk powder been manufactured which would remain soluble, owing to the action of the heat upon the albumen, but in the process now in use the heat is so regulated that there is obtained a perfectly soluble product with almost no odor, and by adding the required amount of hot water a perfect skim milk is obtained. This solution may be precipitated by rennet in the same way that ordinary skim milk is precipitated, or, if allowed to stand for some time, it will sour in the same manner.

CORN OIL.

Corn oil is a valuable by-product of breweries, distilleries, and starch works. It is adapted for illuminating purposes, and the claim is made that it may be

advantageously used for dressing wool, and also as a machine oil, and in the manufacture of soap. It might, in certain cases, be applicable as a lubricant, its low acidity and little tendency to deposit solid matter or to "gun" being properties that recommend it for this purpose. Donard and Boulet, at their works at Bapaume-Les Rouen, France,¹ have treated during the last seven years about 28,000,000 pounds of corn cake, from which 7,700,000 pounds of oil were extracted. Corn oil is the most valuable product obtained from the corn kernel in the manufacture of starch, being worth more than the main products—starch, glucose, or grape sugar. Corn oil can be treated with sulphur (vulcanized), giving a product similar to rubber, which is used to mix with rubber for the manufacture of all kinds of rubber goods. The oil itself is used in paints. It is a nondrying oil, very stable, and does not become rancid. The characteristic taste and smell are eliminated through refining. Seventy-five to 80 per cent of this oil made in the United States is exported.

The maximum daily production of corn oil in the United States is about 275,000 pounds, worth \$16,000. The value of the by-products, feed and oil, are about 20 cents per bushel of corn.

¹Journal of the Society of Chemical Industry, vol. 16, page 550.

Twelfth Census of the United States.

CENSUS BULLETIN.

No. 191.

WASHINGTON, D. C.

JUNE 17, 1902.

MANUFACTURES.

NEEDLES AND PINS.

Hon. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I transmit herewith, for publication in bulletin form, a report on the manufacture of needles and pins during the census year ending May 31, 1900, prepared under my direction by Mr. Charles M. Karch, of the Census Office.

The statistics included in this report were collected, as in previous censuses, upon the schedule used for the general statistics of manufactures. But, in order to present properly the important features of the industry, it was decided to supplement the canvass made by the enumerators and local special agents and to give it a more detailed treatment than is given to manufacturing industries in general, or than this industry has received heretofore.

The statistics are presented in 9 tables: Table 1 shows comparative figures for the industry at the several censuses, 1860 to 1900, inclusive; Table 2 is a comparative summary, by states, of the returns for the establishments engaged in the industry in 1890 and 1900; Table 3 shows the number of establishments in operation in 1890 and 1900, and the increase during the decade, by states, arranged geographically; Table 4 is a comparative summary of the statistics of capital for 1890 and 1900; Table 5 shows the statistics of miscellaneous expenses for 1900; Table 6 shows the cost of materials for 1900; Table 7 shows the quantities and value of the different varieties of needles and pins manufactured,

by states; Table 8 shows the importations of needles for consumption from 1891 to 1900, inclusive; Table 9 shows the detailed statistics for the industry in 1900, by states.

Table 1 shows the growth of the industry from 1860 to 1900. Owing to changes in the method of taking the census, statistics for the earlier and later decades given in Table 1 should be compared only in the most general way. The rate of growth in the manufacture of needles and pins, however, may be fairly inferred from the figures given.

In drafting the schedules of inquiry for the census of 1900 care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the items of inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital—that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries—was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of person

employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least numbers of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried

employees included in that group for the census of 1890.

In some instances the number of proprietors and firm members shown in the accompanying tables falls short of the number of establishments reported. This is accounted for by the fact that no proprietors or firm members are reported for corporations or cooperative establishments.

The reports show a capital of \$3,235,158 invested in the manufacture of needles and pins by the 43 establishments reporting for the United States. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the manufacturing corporations engaged in this industry. The value of the products is returned at \$2,738,439, the production of which involved an outlay of \$126,754 for salaries of officials, clerks, etc.; \$939,846 for wages; \$215,322 for miscellaneous expenses, including rent, taxes, etc.; and \$972,570 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products is in any sense indicative of the profits in the manufacture of needles and pins during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, of interest on capital invested, of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the works. This statement is necessary in order to prevent erroneous conclusions from the figures presented.

Very respectfully,



Chief Statistician for Manufactures.

NEEDLES AND PINS.

By CHARLES M. KARCH.

Although the manufacture of needles and pins was carried on in this country prior to 1860, the statistics of the censuses previous to that date were not sufficiently accurate to justify a comparison. The census of 1860 presented statistics for the manufacture of needles and pins separately, but for purposes of comparison the totals have been combined. Since 1860 the two industries have been reported under one classification. The manufacture of pins was of sufficient importance to be reported in 1850, and the census for that year shows that there were four establishments

with a capital of \$164,800 and a product valued at \$297,550. Needles were not reported in that census, as their manufacture did not begin until after the introduction and use of the sewing machine in 1852. The growth of the needle and pin industry since 1860 is shown by the statistics presented in the following tables.

Table 1 is a comparative summary of the statistics for the manufacture of needles and pins as returned at the censuses of 1860 to 1900, inclusive, with the percentage of increase for each decade.

TABLE 1.—COMPARATIVE SUMMARY: 1860 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

| | DATE OF CENSUS. | | | | | PER CENT OF INCREASE. | | | |
|---|-----------------|-------------|------------------|------------------|------------------|-----------------------|--------------|--------------|--------------|
| | 1900 | 1890 | 1880 | 1870 | 1860 | 1890 to 1900 | 1880 to 1890 | 1870 to 1880 | 1860 to 1870 |
| Number of establishments..... | 43 | 45 | 40 | 39 | 8 | 14.4 | 12.5 | 2.6 | 387.5 |
| Capital..... | \$3,235,158 | \$1,820,089 | \$1,144,560 | \$616,050 | \$266,700 | 77.7 | 59.0 | 85.8 | 131.0 |
| Salaried officials, clerks, etc., number..... | 101 | 271 | (³) | (³) | (³) | 42.3 | ..... | ..... | ..... |
| Salaries..... | \$126,754 | \$78,518 | (³) | (³) | (³) | 61.4 | ..... | ..... | ..... |
| Wage-earners, average number..... | 2,358 | 1,609 | 1,077 | 656 | 256 | 46.2 | 49.4 | 64.2 | 156.3 |
| Total wages..... | \$939,846 | \$649,484 | \$392,214 | \$286,023 | \$66,420 | 44.7 | 65.6 | 37.1 | 330.6 |
| Men, 16 years and over..... | 1,193 | 898 | 604 | 373 | 91 | 32.9 | 48.7 | 61.9 | 309.9 |
| Wages..... | \$611,891 | \$450,523 | (³) | (³) | (³) | 35.7 | ..... | ..... | ..... |
| Women, 16 years and over..... | 1,019 | 691 | 380 | 226 | 165 | 47.5 | 81.8 | 68.1 | 37.0 |
| Wages..... | \$303,464 | \$194,286 | (³) | (³) | (³) | 56.2 | ..... | ..... | ..... |
| Children, under 16 years..... | 141 | 20 | 93 | 57 | (³) | 605.0 | 178.5 | 63.2 | ..... |
| Wages..... | \$24,991 | \$4,675 | (³) | (³) | (³) | 434.6 | ..... | ..... | ..... |
| Miscellaneous expenses..... | \$215,322 | \$71,674 | (⁴) | (⁴) | (⁴) | 200.4 | ..... | ..... | ..... |
| Cost of materials used..... | \$972,570 | \$450,442 | \$591,013 | \$355,407 | \$272,732 | 115.9 | 123.8 | 66.3 | 30.3 |
| Value of products..... | \$2,738,439 | \$1,515,865 | \$1,376,023 | \$955,854 | \$433,500 | 86.7 | 10.0 | 44.2 | 120.5 |

¹ Decrease.

² Includes proprietors and firm members, with their salaries; number only reported in 1900. (See Table 9.)

³ Not reported separately.

⁴ Not reported.

In 1860 the 8 establishments engaged in this industry reported a capital of \$266,700, and products valued at \$433,500. In 1870 the number of establishments had increased to 39, the capital reported to \$616,050, and the value of products to \$955,854. In the next two decades the number of establishments increased only 6, but there was an increase of \$1,204,039 in the reported capital and \$560,011 in the value of products, indicating a steady and satisfactory development of the industry. In comparing, however, the capital as reported

at different censuses it should be borne in mind that no definite attempt was made to include live capital in the returns until the census of 1890.

The growth of the industry in previous decades has been far surpassed in the decade just completed. While the number of establishments was smaller by 2 than it was in 1890, the amount of capital was greater by \$1,415,069 and the value of the products was greater by \$1,222,574. There has been a rather noticeable increase in the number of children employed in the

industry. In 1890 there were only 20; in 1900 there were 141. It is evident from the figures that since 1870 the growth of the industry has been in the direction of the development of larger concerns rather than in the multiplication of independent establishments.

This exemplifies the modern tendency toward concentration of industrial enterprises.

Table 2 is a comparative summary, by states, of the returns for the establishments engaged in the manufacture of needles and pins in 1890 and 1900.

TABLE 2.—COMPARATIVE SUMMARY: BY STATES, 1890 AND 1900.

| STATES. | Year. | Number of establishments. | Capital. | SALARIED OFFICIALS, CLERKS, ETC. | | WAGE-EARNERS. | | Miscellaneous expenses. | Cost of materials used. | Value of products. |
|-----------------------|-------|---------------------------|-------------|----------------------------------|-----------|-----------------|--------------|-------------------------|-------------------------|--------------------|
| | | | | Number. | Salaries. | Average number. | Total wages. | | | |
| United States..... | 1900 | 43 | \$3,235,168 | 101 | \$126,754 | 2,353 | \$939,846 | \$215,322 | \$972,570 | \$2,733,439 |
| | 1890 | 45 | 1,820,089 | 71 | 178,518 | 1,609 | 649,484 | 71,674 | 450,442 | 1,515,865 |
| Connecticut..... | 1900 | 13 | 2,250,021 | 62 | 87,841 | 1,238 | 533,293 | 177,503 | 708,323 | 1,761,806 |
| | 1890 | 13 | 1,030,573 | 128 | 135,530 | 660 | 271,426 | 42,525 | 257,278 | 737,396 |
| Massachusetts..... | 1900 | 6 | 245,168 | 8 | 8,300 | 262 | 102,757 | 9,394 | 26,565 | 223,851 |
| | 1890 | 11 | 182,755 | 17 | 18,620 | 317 | 118,858 | 6,307 | 43,894 | 220,687 |
| New Hampshire..... | 1900 | 5 | 209,254 | 9 | 8,999 | 408 | 145,020 | 5,825 | 27,025 | 261,822 |
| | 1890 | 5 | 118,973 | 18 | 17,692 | 254 | 107,288 | 7,521 | 20,360 | 169,282 |
| New York..... | 1900 | 8 | 287,306 | 15 | 13,900 | 190 | 63,101 | 13,116 | 102,807 | 221,837 |
| | 1890 | 5 | 25,146 | 14 | 12,760 | 37 | 14,605 | 1,797 | 8,515 | 33,716 |
| Pennsylvania..... | 1900 | 4 | 15,665 | 1 | 720 | 13 | 7,976 | 781 | 2,029 | 22,100 |
| | 1890 | 6 | 70,384 | 19 | 18,400 | 65 | 21,965 | 3,793 | 9,914 | 79,303 |
| All other states..... | 1900 | 7 | 277,744 | 6 | 6,994 | 237 | 87,699 | 8,708 | 104,921 | 247,473 |
| | 1890 | 5 | 392,253 | 15 | 15,516 | 276 | 115,342 | 9,731 | 110,481 | 275,031 |

¹Includes proprietors and firm members, with their salaries; number only reported in 1900.

²Includes establishments distributed as follows: Illinois, 1; Maryland, 1; Michigan, 1; Missouri, 2; New Jersey, 1; Vermont, 1.

³Includes establishments distributed as follows: Michigan, 1; New Jersey, 1; Ohio, 2; Vermont, 1.

As shown in Table 2, the most notable increase appears in New York state, where there was an increase of 3 in the number of establishments, of \$212,160 in the capital, and of \$187,671 in the value of products. Massachusetts showed a substantial increase in capital and value of products, notwithstanding the marked decrease in the number of establishments. Connecticut and New Hampshire each had the same number of establishments in 1900 as in 1890, but each reported a striking increase in capital and in value of products. Pennsylvania showed a notable decrease in all items.

Table 3 presents the number of establishments actively engaged in the manufacture of needles and pins in 1890 and 1900, and the increase during the decade.

TABLE 3.—COMPARATIVE SUMMARY: NUMBER OF ACTIVE ESTABLISHMENTS IN 1890 AND 1900, AND THE INCREASE DURING THE DECADE, BY STATES, ARRANGED GEOGRAPHICALLY.

| STATES. | 1900 | 1890 | Increase 1890 to 1900. |
|-------------------------|------|-------|------------------------|
| United States..... | 43 | 45 | 12 |
| New England states..... | 25 | 30 | 15 |
| New Hampshire..... | 5 | 5 | ..... |
| Vermont..... | 1 | 1 | ..... |
| Massachusetts..... | 6 | 11 | 15 |
| Connecticut..... | 13 | 18 | ..... |
| Middle states..... | 14 | 12 | 2 |
| New York..... | 8 | 5 | 3 |
| New Jersey..... | 1 | 1 | ..... |
| Pennsylvania..... | 4 | 6 | 12 |
| Maryland..... | 1 | ..... | 1 |

¹Decrease.

TABLE 3.—COMPARATIVE SUMMARY: NUMBER OF ACTIVE ESTABLISHMENTS IN 1890 AND 1900, AND THE INCREASE DURING THE DECADE, BY STATES, ARRANGED GEOGRAPHICALLY—Continued.

| STATES. | 1900 | 1890 | Increase 1890 to 1900. |
|---------------------|-------|-------|------------------------|
| Central states..... | 4 | 3 | 1 |
| Ohio..... | ..... | 2 | 12 |
| Michigan..... | 1 | 1 | ..... |
| Illinois..... | 1 | ..... | 1 |
| Missouri..... | 2 | ..... | 2 |

¹Decrease.

As shown by Table 3, the number of establishments decreased 2, or 4.4 per cent, during the decade. A majority of the establishments, both in 1890 and in 1900, were located in the New England states, although the total number for this division of the country was smaller in 1900 than in 1890. Outside of New England the number of establishments increased from a total of 15 in 1890 to a total of 18 in 1900. Of the states reporting in 1890, New York was the only state showing an increase in the number of establishments. Maryland, Illinois, and Missouri reported no establishments in 1890. Massachusetts and Pennsylvania show decreases, and Ohio, which had 2 establishments in 1890, reported none in 1900.

Table 4 is a comparative summary of the capital in its several subdivisions, with the percentages of increase

and the percentages of the several subdivisions to the total for each decade for 1890 and 1900.

TABLE 4.—CAPITAL: 1890 AND 1900.

| | 1900 | | 1890 | | Per cent of increase. |
|---------------------------------------|-------------|--------------------|-------------|--------------------|-----------------------|
| | Amount. | Per cent of total. | Amount. | Per cent of total. | |
| Total..... | \$3,235,158 | 100.0 | \$1,820,089 | 100.0 | 77.7 |
| Land..... | 156,000 | 4.8 | 81,100 | 4.5 | 92.4 |
| Buildings..... | 257,968 | 8.0 | 222,900 | 12.2 | 15.7 |
| Machinery, tools, and implements..... | 671,798 | 20.8 | 650,609 | 35.7 | 3.3 |
| Cash and sundries..... | 2,149,392 | 66.4 | 865,480 | 47.6 | 148.3 |

The principal item reported under the head of capital, both in 1890 and 1900, and the item showing the greatest increase was that of cash and sundries, including cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries. The amounts reported for land and buildings represent only such as were owned, and constituted about the same proportion of the total in 1900 as in 1890. Although the item of machinery, tools, and implements represented a good proportion of the total capital, showing that machinery is extensively used in this industry, the small percentage of increase indicates that the extension of machinery during the past decade has been limited.

The statistics of the several items of miscellaneous expenses for 1900 are shown in Table 5.

TABLE 5.—MISCELLANEOUS EXPENSES: 1900.

| | Amount. | Per cent of total. |
|---|-----------|--------------------|
| Total..... | \$215,322 | 100.0 |
| Rent of works..... | 84,709 | 39.3 |
| Taxes, not including internal revenue..... | 14,178 | 6.6 |
| Rent of offices, insurance, interest, repairs, advertising, and other sundries..... | 115,641 | 53.7 |
| Contract work..... | 794 | 0.4 |

A number of the establishments engaged in this industry rent their plants. The amount paid for con-

tract work is small, as would be expected in an industry requiring the use of complicated machinery.

Table 6 shows the cost of materials used in the manufacture of needles and pins in 1900, the cost of each item, and its proportion to the total amount.

TABLE 6.—COST OF MATERIALS USED: 1900.

| | Amount. | Per cent of total. |
|--|-----------|--------------------|
| Total..... | \$972,570 | 100.0 |
| Principal materials ¹ | 940,124 | 96.7 |
| Fuel..... | 21,999 | 2.3 |
| Rent of power and heat..... | 4,280 | 0.4 |
| Freight..... | 6,167 | 0.6 |

¹ Includes "mill supplies" and "all other materials," which are shown separately in Table 9.

The largest item shown in Table 6 is that reported for principal materials, which includes not only the materials purchased in partially manufactured form—that is, materials upon which some manufacturing force has been expended—but also all other materials used and mill supplies. A very large proportion of this item consisted of material purchased in partially manufactured form, which cost \$754,942, or 77.6 per cent of the total cost of materials. Of this amount \$136,280 represented the cost of steel wire for the manufacture of needles; \$522,986 the cost of brass wire for the manufacture of pins, and the remainder, \$95,676, comprised the cost of iron wire, aluminum, aluminum bronze, bar steel, burr steel, sheet metal, and a variety of other materials used in the manufacture of certain varieties of needles and pins. Some establishments which were unable to separate the amount paid for freight from the cost of materials reported the two together. For this reason the \$6,167 shown in Table 6 does not represent the total cost of freight, and should be considered only in connection with the cost of materials.

Table 7 is a detailed statement, by states, of the quantity and value of the different varieties of needles and pins manufactured during the census year.

TABLE 7.—QUANTITY AND VALUE OF PRODUCTS: BY STATES, 1900.

| | United States. | Connecticut. | Massachusetts. | New Hampshire. | New York. | Pennsylvania. | All other states. ¹ |
|---|----------------|--------------|----------------|----------------|-----------|---------------|--------------------------------|
| Products: | | | | | | | |
| Aggregate value..... | \$2,738,489 | \$1,761,806 | \$228,851 | \$261,822 | \$221,887 | \$22,100 | \$247,478 |
| Needles and pins— | | | | | | | |
| Total value..... | \$1,926,008 | \$1,153,157 | \$222,141 | \$261,822 | \$171,803 | \$20,880 | \$96,200 |
| Needles— | | | | | | | |
| Total gross..... | 1,120,582 | 463,508 | 180,113 | 169,388 | 85,498 | 12,845 | 219,185 |
| Total value..... | \$1,027,949 | \$401,608 | \$222,141 | \$261,822 | \$30,208 | \$20,880 | \$91,200 |
| Knitting-machine latch— | | | | | | | |
| Gross..... | 276,141 | 66,860 | 18,888 | 160,146 | 14,285 | 10,068 | 10,894 |
| Value..... | \$414,504 | \$103,688 | \$16,000 | \$259,816 | \$6,000 | \$18,800 | \$11,200 |
| Common household dry-thread sewing-machine— | | | | | | | |
| Gross..... | 324,476 | 162,424 | 162,052 | | | | |
| Value..... | \$399,252 | \$212,508 | \$186,744 | | | | |
| Wax-thread sewing-machine— | | | | | | | |
| Gross..... | 212,649 | 208,476 | 4,178 | | | | |
| Value..... | \$99,533 | \$80,186 | \$19,897 | | | | |
| Knitting spring— | | | | | | | |
| Gross..... | 307,266 | 15,748 | | 9,242 | 71,218 | 2,777 | 208,291 |
| Value..... | \$114,660 | \$5,366 | | \$2,006 | \$26,208 | \$2,080 | \$80,000 |

¹ Includes establishments distributed as follows: Illinois, 1; Maryland, 1; Michigan, 1; Missouri, 2; New Jersey, 1; Vermont, 1.

TABLE 7.—QUANTITY AND VALUE OF PRODUCTS: BY STATES, 1900—Continued.

| | United States. | Connecticut. | Massachusetts. | New Hampshire. | New York. | Pennsylvania. | All other states. ¹ |
|-----------------------------|----------------|--------------|----------------|----------------|-----------|---------------|--------------------------------|
| Products—Continued. | | | | | | | |
| Aggregate value—Continued. | | | | | | | |
| Needles and pins—Continued. | | | | | | | |
| Total value—Continued. | | | | | | | |
| Pins— | | | | | | | |
| Total gross..... | 50,167,817 | 42,279,857 | | | 7,864,151 | | 23,809 |
| Total value..... | \$898,054 | \$751,459 | | | \$141,595 | | \$8,000 |
| Common or toilet— | | | | | | | |
| Gross..... | 47,838,429 | 39,752,846 | | | 7,585,533 | | |
| Value..... | \$465,605 | \$378,210 | | | \$87,395 | | |
| Hair— | | | | | | | |
| Gross..... | 1,189,104 | 1,183,104 | | | 6,000 | | |
| Value..... | \$73,155 | \$75,455 | | | \$2,700 | | |
| Safety— | | | | | | | |
| Gross..... | 1,640,284 | 1,343,007 | | | 272,568 | | 23,809 |
| Value..... | \$354,294 | \$297,794 | | | \$51,500 | | \$5,000 |
| All other products..... | \$812,436 | \$608,649 | \$1,710 | | \$19,584 | \$1,220 | \$151,273 |

¹ Includes establishments distributed as follows: Illinois, 1; Maryland, 1; Michigan, 1; Missouri, 2; New Jersey, 1; Vermont, 1.

There were produced 1,120,532 gross of needles and 50,167,817 gross of pins, or practically two-thirds of a gross of pins for every individual in the United States. These figures do not represent the total number of gross of needles and pins manufactured during the census year, as it is probable that many establishments engaged in the manufacture of needles and pins in connection with other industries failed to state that fact, and reported them under all other products. As far as this office has been able to ascertain, the quantity of needles manufactured in establishments engaged primarily in other industries amounted to 277,000 gross, valued at \$327,000, and the quantity of pins so manufactured amounted to 18,721,443 gross, valued at \$209,742. A combination of these quantities and values with those shown in the above table for the respective articles shows that there were 1,397,532 gross of needles, valued at \$1,107,796, and 68,889,260 gross of pins, valued at \$1,354,949, produced in the United States for the census year, as reported by establishments of any character. For those states which reported 3 or more establishments, the product is shown separately, but in order not to disclose the operations of individual establishments, the products for other states are shown collectively under the head of "all others." Connecticut,

with 13 establishments, reported 64.3 per cent of the aggregate value of products; Massachusetts, with 6 establishments, 8.2 per cent; New Hampshire, with 5 establishments, 9.6 per cent; New York, with 8 establishments, 8.1 per cent; and Pennsylvania, Illinois, Maryland, Michigan, Missouri, and Vermont, with 11 establishments, reported but 9.8 per cent of the aggregate for the industries. In Table 7 the product is divided into needles and pins, and these groups are in turn subdivided into the different varieties reported. The item "all other products" comprises the products for which separate quantities and values have not been given, by-products, and custom work and repairing. The principal by-product was hooks and eyes, which comprised 1,131,824 gross, valued at \$81,110, of which 1,131,524 gross, valued at \$81,090, were made in Connecticut. It appears from Table 7 that the manufacture of sewing machine needles is confined to Connecticut and Massachusetts, and the manufacture of the different varieties of pins almost confined to Connecticut and New York.

Table 8 gives the value of the needles imported for consumption for each year from 1891 to 1900, inclusive, as shown by the bulletins issued by the Bureau of Statistics of the United States Treasury Department for the respective years.

TABLE 8.—IMPORTS FOR CONSUMPTION, OF NEEDLES: 1891 TO 1900, INCLUSIVE.

| | 1900 | 1899 | 1898 | 1897 | 1896 | 1895 | 1894 | 1893 | 1892 | 1891 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Total value..... | \$418,004 | \$447,717 | \$406,420 | \$362,185 | \$366,258 | \$330,035 | \$308,087 | \$411,752 | \$383,727 | \$358,838 |
| For knitting or sewing machines, including latch needles: | | | | | | | | | | |
| Thousands..... | 2,166 | 1,482 | 1,887 | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| Value..... | \$13,201 | \$3,700 | \$12,229 | \$45,724 | \$50,179 | \$28,823 | \$14,900 | \$18,147 | \$24,563 | \$19,763 |
| Crochet, tape, and knitting needles, and all others not specially provided for, value..... | \$87,532 | \$31,208 | \$31,471 | \$5,298 | \$3,700 | \$10,317 | \$15,319 | \$23,054 | \$21,471 | \$15,553 |
| Hand sewing and darning, value..... | \$367,271 | \$407,814 | \$362,720 | \$311,163 | \$312,379 | \$290,895 | \$277,868 | \$370,551 | \$337,690 | \$323,517 |

¹ Quantity not shown.

² Includes value of crochet and knitting needles.

Table 8 is interesting in that it indicates the exceedingly large importation of the common hand sewing and darning needles, and crochet, tape, and hand knitting needles for each year from 1891 to 1900. In the case of knitting and sewing machine needles the imports for the year ending June 30, 1900, were valued at only \$13,201, whereas the products manufactured in this country in the year ending May 31, 1900, were

valued at \$1,027,949. In this item it is evident that the home manufacturer practically supplies the home trade. The importations for each year of the common hand sewing and darning needles, and crochet, tape, and hand knitting needles practically represent the value of such needles used each year, as it appears that none of these varieties are manufactured in the United States.

HISTORICAL AND DESCRIPTIVE.

PINS.

The familiar and very commonplace article known as a pin is not without a history and an ancestry as old as the oldest. When pins were first used is difficult to determine, but it is safe to assume that in some form they were used by our most remote ancestors. Nature gave man the pattern for a pin in the thorn, and the first pin used was, undoubtedly, this natural article, but later other materials were introduced for its construction. In the overhauling of ancient ruins, pins made of bone, ivory, bronze, copper, and iron have been found. The most prominent discoveries made in this line were in Egyptian and Scandinavian tombs and on sites of the ancient lake dwellings of central Europe. From the lacustrine stations in Switzerland alone more than 10,000 pins have been taken. These ancient pins are in various forms, and in cases where the ornamental head is used they are very curious and beautiful. They are longer than those now in use and differ from the modern pattern in that they taper gradually from the head to the point. Some were found in central Europe with double stems like the modern hair pin, and a few were found at Peschiera, Italy, fashioned like the modern safety-pin. Many of the single-stemmed pins varied in thickness, and others had heads formed of a loose ring in an eye at the blunt end.¹

In ancient and mediæval times pins were made of bronze, and this was the principal material used until metallurgy had advanced far enough to give a better material in brass. It is said that the early Anglo-Saxons and Britons used ribbons, loopholes, clasps, hooks and eyes, and skewers of wood, bone, brass, silver, or gold for their fastenings instead of pins. The brass-wire pin is supposed to be an invention of the French, although by some authorities it is credited to the Dutch. In England pins of iron wire were made during the fifteenth century, but the brass-wire pin was unknown until 1543, when it was brought from France by Catharine Howard.²

The invention of the process of wire drawing marked the beginning of the modern pin manufacture. The process originated in France and Germany, and for two centuries these countries monopolized all industries dependent upon it. The first man to manufacture brass pins in England was John Tilsby, who, in 1626, established a plant in Gloucestershire, where he met with remarkable success, and his make of pins became famous. By 1636 the industry was so well established that the pin makers of London formed a corporation, and the trade soon found its way to Bristol and Birmingham, where, in connection with other ironwork manufacture, the industry became localized. In those

cities pins were made for some time by hand labor. The construction of a single pin required from 14 to 18 different operators, and involved the following processes: Straightening and cutting the wire; cutting, printing, twisting the heads; cutting the heads; annealing the heads; stamping or shaping the heads; cleaning the pins; whitening or tinning the pins; washing, drying, and polishing; winnowing and pricking the papers to receive the pin. This method was improved upon by Timothy Harris, in 1797, who made the solid-headed brass pin by laying the blanks into a two-part mold in which prints representing the heads were cut. When the mold was closed an alloy of lead and antimony was poured in, and as soon as the pins were released the "gets" were cut off and the pins were cleansed by immersion in a solution of sulphuric acid and water, and then dipped into a solution of sulphate of copper and finished in the same way as other brass pins.¹

William Bundy a few years later had a method of heading which was the modern process in embryo. The wire was thickened by pressure into a collar on which the head rested to prevent its slipping down, and then the head was placed on the shank in a die, while another die, working in a fly press, descended and compressed the top of the wires, thus securing the attachment of the wire head to the shank.¹

In 1812 Bradbury and Weaver conceived the idea of heading "by means of an automatic machine." After the shanks were pointed and the heads prepared they were put into separate hoppers, where a mechanical device placed the shank and head into relation with each other. In this position the pins were pressed by screws against dies, which made the head and bound it to the shank, when they were withdrawn by hooks operated upon by parallels worked by the machine.¹

In 1817 Seth Hunt invented a machine to make the pin with head, shaft, and point from one piece, but his invention was not a success. In 1824 W. L. Wright, an American, a native of New Hampshire, invented the solid-headed pin-making machine, which entirely revolutionized the pin manufacture. He did not have his machine patented in America, but took it to England and put it into operation. He formed in London a company with a large capital, and built a good-sized factory in Lambeth. A plant was fitted up at great expense with 60 machines, but they were never put into successful operation, as they failed in pointing the pin. Although Wright remedied this defect by a supplemental machine, the company did not succeed, and suspended operations with a great loss to those interested in the enterprise. Fortunately, in the readjustment of the company's affairs the machinery fell into the hands of D. F. Taylor, who, by interesting capitalists in the enterprise, brought about the formation of a company known as D. F. Taylor & Co., which in 1833 put upon the mar-

¹ Monroe's Lake Dwellings of Europe.

² Bevan's British Manufacturing Industries, Vol. III, p. 87.

¹ Bevan's British Manufacturing Industries, Vol. III, p. 89-90.

ket the first machine-made solid-headed pins sold anywhere in the world. The company met with remarkable success, and machinery soon replaced the hand method in the leading English pin-making establishments.

In the early days of this country the manufacture of pins, especially at the times when commerce with England, France, or Germany was interrupted, was several times attempted, but the product was not equal to the imported article. During the Revolutionary War, when the importation of pins from England was entirely cut off and a scarcity of the article resulted, the manufacture was carried on to a limited extent in Connecticut and the Carolinas. Again, in the War of 1812 importations were suspended and pins grew so scarce that the prices asked for them were often as high as \$1 a package. At that time some pin makers came from England, bringing the necessary tools, and began the manufacture at the old States Prison at Greenwich, N. Y., employing convict labor. The enterprise was not successful, owing to a rapid decline in the prices of pins after the close of the war. The tools used in this manufacture passed into the hands of Richard Turnam, who made a contract for pauper labor, and began the manufacture in the almshouse at Bellevue, New York. The death of Mr. Turnam put an end to this enterprise, and these tools were never again used.

As early as 1812 the inventors of this country were using their energies to construct a machine for the manufacture of pins. The first machine made here, which was brought out by Moses L. Morse, of Boston, Mass., sometime during the war of 1812, proved too delicate and intricate to be used to much advantage and was soon abandoned. The man who did more to place the manufacture of pins by automatic machinery on a practical and successful basis in this country than any other one individual was Dr. J. I. Howe. In 1830 he began his labor in this direction, spending some of his time in Europe studying the methods employed there, and by the year 1832 he had patented in this country, France, and England, a machine designed to make pins similar to the English diamond pins, with heads formed of coils of small wire fastened upon the shank by pressure between dies. He brought the business to a successful issue in 1836, when the Howe Manufacturing Company was formed in New York and began operations at Birmingham, Conn. At first automatic spun-head machines were used, but in 1840 they were converted into solid-headed machines. These latter machines at first made from 40 to 50 pins per minute. They were later improved so that they made from 60 to 70 per minute.

About 1835 Samuel Slocum, an American, obtained a patent in England for a machine to make solid-headed pins. In 1838 he began with this machine the manufacture of pins in Poughkeepsie, N. Y. As he never had the machine patented here, it was operated secretly for a number of years. Until 1842 the industry made little progress because of discriminating tariffs. In this

year, however, a new tariff law went into effect which was more favorable to this industry than the previous tariff act, and the above-named companies did a very profitable business. Led by exaggerated ideas which became prevalent as to the extent of the business and the profit made in it, many persons in different parts of the country invented machinery for the construction of pins. Attempts in this direction met with varying success but the articles turned out were, with a few exceptions, inferior, and the market became overstocked. In consequence of this overproduction, by 1848 all parties engaged in pin making, except the two old companies at Poughkeepsie and Birmingham, suspended operation.¹ In the year 1850 there were four establishments engaged in this industry, and the success attending them led to further improvements in the machines. A Mr. Fowler and a Mr. Atwood perfected machines to make 160 to 170 pins a minute which, on account of their capacity, soon replaced the early machines.

Following the successful introduction of a machine for making the pins, the next important step was to invent a machine that would stick them on paper. Howe and Slocum gave their attention to this matter as early as 1840. Dr. Howe invented the device for crimping the paper, and this was followed by the distributor of Mr. Slocum. The two inventions were combined and effected a great increase in the number of pins that could be stuck on paper in a day. These devices were improved upon by Mr. De Grasse Fowler, who invented the "goose neck" or "runway." For many years the sticking machines consisted of a combination of these three devices, but more recently machines of various styles have come into use that will stick from 500 to 600 packages a day, far more than the early combined machine of Howe, Slocum, and Fowler.

The old process of pin manufacture by manual labor was very slow and tedious, since each pin passed through the hands of from 14 to 18 individuals. The modern pin is made in the United States by the improved Atwood or Fowler machines. The process of pin manufacture by modern machines may be briefly described as follows: Coils of wire are placed upon a reel, whence the wire is drawn automatically by a pair of pincers between fixed studs that straighten it. A pin length is then seized by a pair of lateral jaws, from which a portion of the wire is left projecting, when a snaphead die advances and partially shapes the head. The blank is then released and pushed forward about one-twentieth of an inch, when the head is given another squeeze by the same die. By this repetition of the motion the head is completed and the blank is cut off the wire in the length desired. About one-eighth of an inch of wire is required to make a pin head. If the attempt were made to upset this with a head in one motion the wire would be more likely to double up than to thicken as desired.

¹Report of Commissioner of Patents, 1850.

These headed blanks then drop into a receptacle and arrange themselves in the line of a slot formed by two inclined and bevel-edged bars. The opening between the bars is just large enough to permit the shank of the pin to fall through, so that the pins are suspended in a row along the slot. When the blanks reach the lower end of the inclined bar in their suspended position they are seized between two parts of the machine and passed along, rotating as they move, in front of a cylindrical cutter, with sharp grooves on its surface, that points the pins. They are then thrown from the machine properly shaped, and if they are brass pins they are cleaned by being boiled in weak, sour beer. After they are cleaned they are coated with tin. This is done by placing alternate layers of pins and grain tin in a copper can and adding water, along with some bitartrate of potash. Heat applied to this produces a solution of tin which is deposited on the surface of the pins. The pins are then taken from this solution and brightened by being shaken in a revolving barrel of bran or sawdust.¹ Lastly the operation of "papering" takes place. This process is performed now by an automatic papering machine something in the following manner: The pins to be stuck are placed in a hopper, in connection with which a steel plate is used, with longitudinal slits corresponding to the number of pins which form a row in the paper. The pins in the hopper are stirred up by a comb-like tool, the shanks drop through the slits in the steel plate, and the pins are suspended by their heads. Long narrow sheets of paper are presented by the operator to the action of the machine, by which two raised folds are crimped, and the row of pins collected in the slit steel plate is then, by being subjected to the same action, pressed through the two crimped folds. These operations are repeated until the requisite rows of pins are stuck in each paper.

NEEDLES.

Needle making was one of the first arts practiced by man, and no doubt dates back to the remote period when man first strove to shape clothing to his figure. Remains of civilized and uncivilized nations bear evidence of the use of needles made of various materials. Some excellent specimens made of fish bone, horse's bone, and bronze have been found in caves near Brunel, France, and on the sites of the ancient lake dwellings of central Europe. In Egyptian and Scandinavian tombs bronze needles, varying in length from 2½ to 8 inches, have been found. This material, which quite likely suggested itself for use in needle manufacture because it was an alloy easily worked, was for many centuries the material principally used, especially among the early European and western Asiatic peoples. Whether other materials than bone, ivory, and bronze were used by ancient nations for the construction of the needle we have no means of knowing. These early needles were clumsy affairs, and during the Dark Ages were superseded by steel needles.

The steel needle was introduced in Europe by the Moors at the time of the Saracen invasion, but it is not probable that these people were the inventors, since the Chinese claim to have used steel needles from time immemorial. Gradually the industry spread from Spain, the home of the Moorish artificers, to France and Germany, and in the year 1370 steel needles were made at Nuremberg, Germany, whose artisans at that time were more skilled in working metals than those of any other European nation.

Probably the first man to manufacture this article in England was a Spanish Moor, who, some time between 1543 and 1548, made and sold needles at Cheapside, England. He moved his shop a few years later to Whitechapel. There shortly after he died, and as he had never communicated to anyone the knowledge he was supposed to possess, the manufacture of steel needles in England ceased for a time with his death. It was next taken up in that country by Elias Crouse, a German, who, some time during the reign of Queen Elizabeth, taught Englishmen how to make "Spanish" needles. A few years later this manufacture was given an impetus by Mr. Humphreys, of Saxony, who brought to England twenty-two Saxon workmen skilled in drawing steel into the kind of wire essential to needle manufacture. The industry, however, did not attain much importance until 1650, when a Mr. Demar, with Mr. Christopher Greening, began the manufacture on a small scale at Long Crendon, in Buckinghamshire. From this time the industry gradually spread to neighboring towns and counties, where needle manufacture has been brought during the past two centuries to its present degree of perfection, and where the bulk of the common hand-sewing needles used in all countries are made.

In its primitive pattern the needle was an awl-shaped instrument, which merely perforated the materials meant to be fastened together along their edges, so that they could be laced together by hand. As the use of this needle involved two operations, it was soon displaced by a needle which had a circular depression near the blunt end for holding the thread, and thus did away with the lacing operation. Since this needle, though it did well enough for coarse work, was inadequate for finer work, the needle with the eye was introduced.

Since the introduction of the steel needle the model has remained the same and progress in the art of needle making has been confined to devices for perfecting the material used and the methods of construction. In the early days of needle manufacture, when the trade was practiced at home or in small shops, the materials and devices used were very crude. After the manufacture of the needle was started in plants provided with conveniences and facilities for its production, improvements were slowly introduced in performing the different operations.

The most notable improvements prior to 1870 may be summarized as follows: Drill-eyed needles were first made in 1826 and were followed two years later by the

¹Chamber's Encyclopedia, Vol. VIII, page 189.

burnishing machine, by means of which the eye secures its beautiful finish. In 1840 the process of hardening in oil succeeded the former method of hardening in water, in which a large percentage of the needles became crooked, so that their straightening involved considerable time and expense. The stamp to impress the print of the groove and the press with a punch to pierce the eye, though suggested as early as 1800, were not in general use until 1830, and by 1886 were superseded by an automatic machine. In 1839 a simple method was invented by a Mr. Morrall for polishing many thousands of needles simultaneously, and in 1869 a machine was brought out by a Mr. Lake for doing many of the operations previously performed by hand.¹ The more recent improvements have been made in devices for heating and ventilating, and for getting rid of the injurious dust which rises from the emery wheel in the grinding process.

The process of manufacturing the common hand-sewing needle, as carried on in Germany, France, and England, is exceedingly interesting; but as this particular branch of the industry is not carried on in the United States it could not properly be described in this connection. Needle manufacture is one of Europe's prominent industries, being extensively carried on in England, Germany, and France, where each year an immense quantity is produced, including every variety, size, and shape.

To what extent, if any, the making of hand-sewing needles was carried on in America during colonial times we have no means of knowing, but it is safe to assume that they were manufactured to some extent, for Bishop in his *History of American Manufactures*, Volume I, states that as early as 1666 Lynn artificers applied to the court of Plymouth Colony for the sum of £15 for the purchase of tools for wire drawing to make pins and needles; which sum being granted, the tools were bought and the manufacture began. He further states that Jeremiah Wilkinson, of Cumberland, R. I., made needles in that place in 1775 from wire drawn by himself; and that the colonists of the Carolinas at a convention at Newbern, on the 3d of April, 1775, encouraged the manufacture of pins and needles by offering a bounty to the person who should manufacture the first of these articles equal to those made in England.

Needle manufacture as an industry, however, was not put on a permanent basis in the United States until after 1852, when the peculiar kind of needles used in machinery was introduced. As the sewing machine is essentially an American production, and the most important feature of the invention of the machine was the needle constructed by Elias Howe for the making of the lock stitch, it was very natural that this part of the sewing machine should be manufactured in this country. It is

estimated that from 6 to 8 per cent of all the operative labor involved in the construction of the sewing machine is employed in making the needle. With the successful manufacture of the different varieties of sewing-machine needles, began the manufacture of needles for knitting machines. As the demand for sewing and knitting machines increased there was a corresponding demand for the needles used in these machines, and the industry developed rapidly.

The needles made are of various lengths and patterns to suit the requirements of the different sewing machines. Besides those differing generically, such as straight and curved, or specifically, such as long, short, round-pointed, and chisel-pointed, there are many peculiar patented needles for use in particular sewing machines. Among the endless varieties of sewing-machine needles the most prominent is the common needle used in the household sewing machine. This needle has the eye at the pointed end, with a long groove on one side and a short groove on the opposite side, and is used in connection with a shuttle or other device for carrying a second thread, which is passed through a loop of the thread in the needle, thus forming the double lock stitch. The purpose of the grooves is to protect the thread from wearing or tearing in the operation of the machine.

In addition to the common household sewing-machine needles there are needles for use in sewing leather, including many varieties to suit the various machines. Some of these needles, in distinction from the common sewing-machine needles, have a hook instead of an eye. The material to be sewed is perforated with an awl, and the thread is then pulled through by the hook. In most leather sewing machines, however, the needle itself perforates the material and pulls the thread through. In sewing cloth only the needle with a round point is used; but for sewing leather there are points of various shapes, known as twist, reverse twist, wedge, cross, chisel, reverse chisel, and diamond. A very interesting needle, used in the manufacture of boots and shoes, is that of the Goodyear welting machine. This needle is a segment of a circle in shape and puts welts upon boots and shoes with remarkable rapidity and accuracy.

The steel spring and latch needles used in making hosiery and in stockinet work are extensively manufactured in the United States. The former is constructed by reducing the working end on a taper to an approximate point, and then bending the reduced portion over upon itself so as to form an open loop, a groove having been previously made in the needle so as to come opposite the point. In the operation of the needle the point stands out at the proper time for the yarn to be taken, which is to be carried through to form the stitch. As the forward motion continues the point is depressed into the groove by coming in contact with mechanism arranged for the purpose, and thus the passage through the loop is secured with-

¹ Bevan's *British Manufacturing Industries*, Vol. III, page 102, and Johnson's *Universal Encyclopedia*, Vol. V, page 669.

out catching. The latch needle has, instead of the spring barb, a short rigid hook, which is formed by tapering the working end to an approximate point and bending it in combination with the latch. The latch is contained in a groove milled in the body of the needle and is pivoted upon a rivet which passes through the wall of the groove. As the latch, the walls between which it is riveted, and the diameter of the rivet are extremely delicate, each part being but one one-hundredth part of an inch thick, great care and skill must necessarily be exercised in manufacturing this needle. The purpose of the latch is to aid in forming and casting off the stitch by preventing the yarn from being caught under the hook except at the proper time.¹

When the sewing-machine needle was first made here the processes of its manufacture were similar to those employed in England in making the common hand-sewing needle, and required a great deal of manual labor. The reducing of the shank to the required size and putting in of the grooves on the sides of the needle was accomplished by stamping between dies. By this method the superabundant material was thrown out at each side as a fin, cut off by hand shears, and later removed by means of a die and punch in a press, after which the needles were rounded up and pointed by filing. Gradually these operations were replaced by rolling, grinding, turning, and milling, and finally machinery was invented to do the work.

In the course of the manufacture of the sewing-machine needle it passes through the following states: Blank, reduced blank, reduced and pointed blank, grooved, eye punched, hardened and tempered, hard burr dressed, brass brushed, eye polished, first inspection, hard straightened, finish pointed, and finished. There are two methods in use for the manufacture of the modern sewing-machine needle. In most respects these processes are similar, but they differ in the manner of forming the blade. In one method the blade is formed by cutting the blank down to its required size, and in the other method the wire is cut into short pieces about one-third the required length of the needle when finished, and then by a process known as cold-swaging these are brought to the proper length.

As the modern machinery used in the first process mentioned is largely of private designs, the manufacture can not be described in detail, but it may fairly be inferred from the following method used a few years ago. At that time the needle was made from the best quality of crucible steel wire, which was received in coils, and after being straightened by means of automatic machinery was fed into a machine devised to form the large end of the needle and cut off blanks of the required length. The blanks were then sent to machines, three in number, for roughing, dressing, and smoothing. The first two worked with coarse and fine emery wheels, respectively, and the third with an emery belt. Into

these machines the blanks were fed from a hopper onto a grooved endless traveling carrier, which exposed to the action of the emery wheel that portion of the blank which was to be reduced in diameter to form the shank of the needle. The portion not reduced was that designed to be placed in the end of the needle bar of the sewing machine. As the needles passed the emery wheel they were rotated by a pair of reciprocating plates, so that they were equally ground on all sides. After the process was completed by the emery belt in the third machine, the needles were passed on to another machine where the taper pointing was done. When taper pointed the blank was passed to a machine where the two grooves on the sides of the needle were made by two circular saws past which the blank was fed automatically. The saws were pressed in against the needles and then withdrawn at such times as would give the required depth and contour to the groove. The eye was then punched by a belt-driven punching machine, after which the needles were heated to a cherry red in a reverberatory furnace with a charcoal fire, taken out and immersed in whale oil. They were then placed in sheet-iron pans suspended from the arms of a revolving shaft, and tempered in an oven heated by the surplus heat of the furnace. Next, the needles were cleaned on an emery cloth, being held in bunches of about 20 between the finger and thumb and rotated while being pressed upon the cloth. They were then taken, with the grooves upward, by flat-jawed tongs carrying 70 at a time, and held against a scratch brush of brass wire, which revolved 8,000 times a minute, to polish the grooves. The brush of brass wire was soon replaced by a bristle brush, which finished the polishing of the grooves. While yet held in the clamps these needles were threaded in gangs on cotton thread, which was covered with oil and emery, and then drawn back and forth in various slanting positions so that the polishing powder would act on all parts of the eye. When removed from the thread the needles were cleaned by a revolving hair brush, and the eyes, points, and blades inspected. Imperfect ones were thrown aside and the good ones sent to the hand straightener, who rolled them on an anvil at the level of the eye of an operator, who detected any curvature and corrected it by a tap of a small hammer. The final operations were finish pointing, which was done on a fine emery wheel, and finish polishing, done by a revolving hair brush with crocus and alcohol.

In the second method of manufacture the wire is fed into a machine called the straightener and cutter, which straightens the wire and cuts the blanks into pieces about one-third the length required for the finished needle. The blanks are then placed in small iron cylinders rotated in such a manner as to keep the blanks in constant friction, and thus remove the scale and dirt. They are then ready for the cold-swaging machine. The blanks are placed in a hopper, from which they are taken automatically, one at a time, and their ends

¹The Universal Cyclopedia, Vol. XIII, pages 389 and 390.

are presented to the action of a set of revolving sectional steel dies. By the constant opening and shutting of these dies while in rotation the ends of the blanks are compressed and drawn out to form the blades. After swaging the blank is stamped in order to identify it. In the process of swaging there results a slight variation in the length of the needles, and they are trimmed to a uniform length by the clipping and straightening machine. The prominent feature of this machine is the arrangement of the screw-feed for simultaneously carrying the needles across, so that the ends of the shanks are aligned against a fence, and forward, so that the points are presented to a cutter which trims all to a uniform length. After passing the cut-

ter each needle is struck by a die that stamps upon its shank the descriptive number. The other processes involved in this method of needle manufacture are similar to those described in the first method.

Since the invention of these automatic machines for the different processes, the mechanism employed has been so combined as to effect a transfer of the blank from one operation to the next without the intervention of hand labor. In such combination of machinery there has been marked development during the past fifteen years, and the industry has fully kept pace with the progress of other wire-working processes.

Table 9 presents in detail the statistics relating to the manufacture of needles and pins, by states, 1900.

TABLE 9.—NEEDLES AND PINS: BY STATES, 1900.

| | United States. | Connecticut. | Massachusetts. | New Hampshire. | New York. | Pennsylvania. | All other states. ¹ |
|---|----------------|--------------|----------------|----------------|-----------|---------------|--------------------------------|
| Number of establishments..... | 43 | 13 | 6 | 5 | 8 | 4 | 7 |
| Character of organization: | | | | | | | |
| Individual..... | 19 | 3 | 3 | 1 | 5 | 2 | 6 |
| Firm and limited partnership..... | 9 | 3 | 2 | 1 | 1 | 2 | 1 |
| Incorporated company..... | 15 | 7 | 1 | 4 | 2 | 1 | 1 |
| Capital: | | | | | | | |
| Total..... | \$3,235,158 | \$2,250,021 | \$245,168 | \$209,254 | \$237,806 | \$15,065 | \$277,744 |
| Land..... | \$155,000 | \$48,200 | \$5,000 | \$14,000 | \$800 | \$250 | \$87,750 |
| Buildings..... | \$257,958 | \$151,200 | \$25,000 | \$31,000 | \$24,500 | \$1,150 | \$25,113 |
| Machinery, tools, and implements..... | \$671,798 | \$370,371 | \$47,599 | \$55,817 | \$92,500 | \$8,500 | \$37,211 |
| Cash and sundries..... | \$2,149,392 | \$1,680,250 | \$167,569 | \$108,637 | \$119,506 | \$5,765 | \$97,655 |
| Proprietors and firm members..... | 39 | 10 | 8 | 2 | 7 | 6 | 6 |
| Salaried officials, clerks, etc.: | | | | | | | |
| Total number..... | 101 | 62 | 8 | 9 | 15 | 1 | 6 |
| Total salaries..... | \$126,754 | \$87,841 | \$8,300 | \$8,999 | \$13,900 | \$720 | \$6,994 |
| Officers of corporations— | | | | | | | |
| Number..... | 16 | 9 | 1 | 2 | 3 | 1 | 1 |
| Salaries..... | \$38,680 | \$27,100 | \$1,400 | \$2,780 | \$5,000 | ..... | \$2,400 |
| General superintendents, managers, clerks, etc.— | | | | | | | |
| Total number..... | 85 | 53 | 7 | 7 | 12 | 1 | 5 |
| Total salaries..... | \$88,074 | \$60,741 | \$6,900 | \$6,219 | \$8,900 | \$720 | \$4,594 |
| Men— | | | | | | | |
| Number..... | 59 | 30 | 6 | 3 | 8 | 1 | 2 |
| Salaries..... | \$78,154 | \$55,105 | \$6,400 | \$5,039 | \$7,500 | \$720 | \$3,390 |
| Women— | | | | | | | |
| Number..... | 26 | 14 | 1 | 4 | 4 | ..... | 3 |
| Salaries..... | \$9,920 | \$5,636 | \$500 | \$1,180 | \$1,400 | ..... | \$1,204 |
| Wage-earners, including pieceworkers, and total wages: | | | | | | | |
| Greatest number employed at any one time during the year..... | 2,622 | 1,402 | 270 | 465 | 205 | 28 | 262 |
| Least number employed at any one time during the year..... | 2,095 | 1,097 | 255 | 338 | 173 | 12 | 220 |
| Average number..... | 2,353 | 1,288 | 282 | 408 | 190 | 18 | 237 |
| Wages..... | \$339,846 | \$533,298 | \$102,757 | \$145,020 | \$63,101 | \$7,976 | \$87,699 |
| Men, 16 years and over— | | | | | | | |
| Average number..... | 1,193 | 581 | 132 | 231 | 91 | 11 | 147 |
| Wages..... | \$611,391 | \$321,207 | \$71,109 | \$99,263 | \$41,741 | \$6,474 | \$71,537 |
| Women, 16 years and over— | | | | | | | |
| Average number..... | 1,019 | 566 | 99 | 177 | 88 | 2 | 57 |
| Wages..... | \$303,464 | \$195,828 | \$26,205 | \$45,757 | \$19,360 | \$572 | \$15,742 |
| Children, under 16 years— | | | | | | | |
| Average number..... | 141 | 91 | 31 | ..... | 11 | 5 | 3 |
| Wages..... | \$24,991 | \$16,258 | \$5,388 | ..... | \$2,000 | \$930 | \$420 |
| Average number of wage-earners, including pieceworkers, employed during each month: | | | | | | | |
| Men, 16 years and over— | | | | | | | |
| January..... | 1,205 | 577 | 133 | 243 | 90 | 11 | 151 |
| February..... | 1,204 | 583 | 132 | 240 | 90 | 9 | 150 |
| March..... | 1,213 | 593 | 132 | 239 | 90 | 9 | 150 |
| April..... | 1,225 | 602 | 133 | 234 | 92 | 16 | 148 |
| May..... | 1,216 | 600 | 132 | 234 | 93 | 16 | 136 |
| June..... | 1,182 | 587 | 133 | 214 | 93 | 17 | 133 |
| July..... | 1,123 | 539 | 133 | 209 | 93 | 9 | 135 |
| August..... | 1,162 | 567 | 130 | 228 | 88 | 8 | 141 |
| September..... | 1,173 | 572 | 130 | 225 | 88 | 10 | 148 |
| October..... | 1,181 | 570 | 130 | 231 | 85 | 11 | 154 |
| November..... | 1,207 | 585 | 132 | 230 | 85 | 11 | 155 |
| December..... | 1,225 | 595 | 130 | 242 | 92 | 11 | 155 |
| Women, 16 years and over— | | | | | | | |
| January..... | 1,025 | 567 | 95 | 183 | 89 | 2 | 89 |
| February..... | 1,044 | 580 | 95 | 189 | 89 | 2 | 89 |
| March..... | 1,055 | 590 | 93 | 192 | 89 | 2 | 89 |
| April..... | 1,087 | 623 | 100 | 183 | 91 | 2 | 88 |
| May..... | 1,074 | 612 | 100 | 181 | 93 | 2 | 86 |
| June..... | 988 | 563 | 100 | 150 | 93 | 2 | 80 |
| July..... | 950 | 527 | 99 | 149 | 93 | 2 | 80 |
| August..... | 969 | 530 | 101 | 165 | 85 | 2 | 86 |
| September..... | 988 | 538 | 101 | 170 | 85 | 2 | 87 |
| October..... | 1,003 | 548 | 100 | 184 | 80 | 2 | 80 |
| November..... | 1,023 | 564 | 102 | 186 | 80 | 2 | 89 |
| December..... | 1,027 | 551 | 104 | 192 | 89 | 2 | 89 |
| Children, under 16 years— | | | | | | | |
| January..... | 146 | 98 | 31 | ..... | 10 | 4 | 3 |
| February..... | 151 | 103 | 31 | ..... | 10 | 4 | 3 |
| March..... | 149 | 101 | 31 | ..... | 10 | 4 | 3 |
| April..... | 165 | 104 | 31 | ..... | 11 | 6 | 3 |
| May..... | 154 | 104 | 31 | ..... | 12 | 4 | 3 |
| June..... | 148 | 98 | 31 | ..... | 12 | 4 | 3 |

¹ Includes establishments distributed as follows: Illinois, 1; Maryland, 1; Michigan, 1; Missouri, 2; New Jersey, 1; Vermont, 1.

TABLE 9.—NEEDLES AND PINS: BY STATES, 1900—Continued.

| | United States. | Connecticut. | Massachu- setts. | New Hamp- shire. | New York. | Pennsyl- vania. | All other states. ¹ |
|---|----------------|--------------|---------------------|---------------------|-----------|--------------------|-----------------------------------|
| Average number of wage-earners, including pieceworkers, em- ployed during each month—Continued. | | | | | | | |
| Children, under 16 years—Continued. | | | | | | | |
| July..... | 127 | 77 | 31 | ..... | 12 | 4 | 3 |
| August..... | 124 | 75 | 31 | ..... | 10 | 5 | 3 |
| September..... | 123 | 74 | 31 | ..... | 10 | 5 | 3 |
| October..... | 139 | 81 | 31 | ..... | 19 | 5 | 3 |
| November..... | 138 | 89 | 31 | ..... | 10 | 5 | 3 |
| December..... | 138 | 88 | 31 | ..... | 11 | 5 | 3 |
| Miscellaneous expenses: | | | | | | | |
| Total..... | \$215,322 | \$177,503 | \$9,394 | \$5,825 | \$13,116 | \$781 | \$8,703 |
| Rent of works..... | \$84,709 | \$78,800 | \$1,025 | \$225 | \$8,460 | \$474 | \$1,225 |
| Taxes, not including internal revenue..... | \$14,178 | \$10,145 | \$1,679 | \$968 | \$53 | \$20 | \$1,313 |
| Rent of offices, interest, insurance, and all sundry ex- penses not hitherto included..... | \$115,641 | \$88,844 | \$6,690 | \$4,682 | \$9,603 | \$287 | \$6,085 |
| Contract work..... | \$794 | \$714 | ..... | ..... | ..... | ..... | \$80 |
| Materials used: | | | | | | | |
| Total cost..... | \$972,570 | \$708,323 | \$26,565 | \$27,925 | \$102,807 | \$2,029 | \$104,921 |
| Purchased in partially manufactured form..... | \$754,942 | \$539,635 | \$16,745 | \$19,281 | \$84,487 | \$1,330 | \$93,464 |
| Fuel..... | \$21,999 | \$11,404 | \$2,660 | \$2,867 | \$2,701 | \$270 | \$2,597 |
| Rent of power and heat..... | \$4,280 | \$1,725 | \$350 | \$76 | \$1,710 | \$150 | \$270 |
| Mill supplies..... | \$36,210 | \$25,036 | \$4,747 | \$2,282 | \$3,390 | \$112 | \$643 |
| All other materials..... | \$148,972 | \$126,267 | \$1,744 | \$2,641 | \$10,375 | \$167 | \$7,878 |
| Freight..... | \$6,167 | \$4,256 | \$319 | \$1,879 | \$144 | ..... | \$69 |
| Products: | | | | | | | |
| Needles and pins— | | | | | | | |
| Aggregate value..... | \$2,738,439 | \$1,761,806 | \$223,851 | \$261,822 | \$221,387 | \$22,100 | \$247,473 |
| Total value..... | \$1,926,008 | \$1,163,157 | \$222,141 | \$261,822 | \$171,803 | \$20,890 | \$96,200 |
| Needles— | | | | | | | |
| Total gross..... | 1,120,532 | 453,503 | 180,118 | 169,388 | 85,498 | 12,845 | 219,185 |
| Total value..... | \$1,027,949 | \$401,098 | \$222,141 | \$261,822 | \$90,208 | \$20,890 | \$91,200 |
| Knitting machine latch— | | | | | | | |
| Gross..... | 276,141 | 66,860 | 13,888 | 160,146 | 14,285 | 10,068 | 10,894 |
| Value..... | \$414,504 | \$103,088 | \$16,000 | \$259,816 | \$5,000 | \$18,800 | \$11,200 |
| Common household dry-thread sewing machine— | | | | | | | |
| Gross..... | 324,476 | 162,424 | 162,052 | ..... | ..... | ..... | ..... |
| Value..... | \$399,262 | \$212,508 | \$186,744 | ..... | ..... | ..... | ..... |
| Wax sewing machine— | | | | | | | |
| Gross..... | 212,649 | 208,476 | 4,173 | ..... | ..... | ..... | ..... |
| Value..... | \$99,533 | \$80,136 | \$19,397 | ..... | ..... | ..... | ..... |
| Knitting, spring— | | | | | | | |
| Gross..... | 307,266 | 15,743 | ..... | 9,242 | 71,213 | 2,777 | 208,291 |
| Value..... | \$114,660 | \$5,366 | ..... | \$2,006 | \$25,208 | \$2,080 | \$30,000 |
| Pins— | | | | | | | |
| Total gross..... | 50,167,817 | 42,279,857 | ..... | ..... | 7,864,151 | ..... | 23,809 |
| Total value..... | \$898,054 | \$751,469 | ..... | ..... | \$141,595 | ..... | \$5,000 |
| Common or toilet— | | | | | | | |
| Gross..... | 47,338,429 | 30,752,846 | ..... | ..... | 7,585,583 | ..... | ..... |
| Value..... | \$405,605 | \$378,210 | ..... | ..... | \$87,395 | ..... | ..... |
| Hair pins— | | | | | | | |
| Gross..... | 1,189,104 | 1,183,104 | ..... | ..... | 6,000 | ..... | ..... |
| Value..... | \$78,165 | \$75,455 | ..... | ..... | \$2,700 | ..... | ..... |
| Safety pins— | | | | | | | |
| Gross..... | 1,640,284 | 1,343,907 | ..... | ..... | 272,568 | ..... | 23,809 |
| Value..... | \$354,294 | \$297,794 | ..... | ..... | \$51,500 | ..... | \$5,000 |
| All other products..... | \$812,436 | \$608,649 | \$1,710 | ..... | \$49,584 | \$1,220 | \$151,273 |
| Comparison of products: | | | | | | | |
| Number of establishments reporting for both years..... | 40 | 12 | 5 | 5 | 8 | 4 | 6 |
| Value for census year..... | \$2,721,239 | \$1,750,306 | \$223,151 | \$261,822 | \$221,387 | \$22,100 | \$242,473 |
| Value for preceding business year..... | \$2,559,100 | \$1,685,209 | \$198,144 | \$225,363 | \$189,824 | \$20,300 | \$240,320 |
| Power: | | | | | | | |
| Number of establishments reporting..... | 40 | 12 | 6 | 5 | 8 | 4 | 5 |
| Total horsepower..... | 2,557 | 1,632 | 148 | 207 | 433 | 17 | 120 |
| Owned: | | | | | | | |
| Engines: | | | | | | | |
| Steam— | | | | | | | |
| Number..... | 27 | 14 | 2 | 4 | 8 | 1 | 3 |
| Horsepower..... | 1,242 | 802 | 89 | 95 | 139 | 6 | 111 |
| Gas or gasoline— | | | | | | | |
| Number..... | 3 | ..... | 1 | ..... | 1 | 1 | ..... |
| Horsepower..... | 21 | ..... | 15 | ..... | 2 | 4 | ..... |
| Water wheels— | | | | | | | |
| Number..... | 16 | 11 | ..... | 3 | 2 | ..... | ..... |
| Horsepower..... | 472 | 290 | ..... | 82 | 100 | ..... | ..... |
| Electric motors— | | | | | | | |
| Number..... | 17 | 7 | 1 | 1 | 8 | ..... | ..... |
| Horsepower..... | 672 | 525 | 30 | 25 | 92 | ..... | ..... |
| Rented: | | | | | | | |
| Total horsepower..... | 150 | 15 | 14 | 5 | 100 | 7 | 9 |
| Electric..... | 114 | ..... | 10 | 5 | 90 | ..... | 9 |
| Other kind..... | 36 | 15 | 4 | ..... | 10 | 7 | ..... |
| Horsepower furnished to other establishments..... | 12 | 12 | ..... | ..... | ..... | ..... | ..... |
| Establishments classified by number of persons employed, not including proprietors and firm members: | | | | | | | |
| Total number of establishments..... | 48 | 13 | 6 | 5 | 8 | 4 | 7 |
| No employees..... | | | | | | | |
| Under 5..... | 7 | 1 | 2 | ..... | 3 | 1 | ..... |
| 5 to 20..... | 17 | 4 | 2 | ..... | 3 | 3 | 5 |
| 21 to 50..... | 5 | 3 | 1 | ..... | ..... | ..... | ..... |
| 51 to 100..... | 7 | 2 | ..... | 3 | 1 | ..... | 1 |
| 101 to 250..... | 5 | 1 | 1 | 1 | 1 | ..... | 1 |
| 251 to 500..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... |
| 501 to 1,000..... | 1 | 1 | ..... | ..... | ..... | ..... | ..... |
| Over 1,000..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

¹ Includes establishments distributed as follows: Illinois, 1; Maryland, 1; Michigan, 1; Missouri, 2; New Jersey, 1; Vermont, 1.

Twelfth Census of the United States.

CENSUS BULLETIN.

No. 192.

WASHINGTON, D. C.

June 17, 1902.

AGRICULTURE.

KANSAS.

Hon. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture for the state of Kansas, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes, also, the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of Kansas, June 1, 1900, numbered 173,098, and had a value of \$643,652,770. Of this amount, \$111,465,160, or 17.3 per cent, represents the value of buildings, and \$532,187,610, or 82.7 per cent, the value of the land and improvements other than buildings. On the same date the value of farm implements and machinery was \$29,490,580, and that of live stock, \$190,956,936. These values, added to that of farms, give \$864,100,286, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on farms, are referred to in this bulletin as "animal products."

The total value of such products, together with the value of all crops, is termed "total value of farm products." This value for 1899 was \$209,895,542, of which amount \$96,372,849, or 45.9 per cent, represents the value of animal products, and \$113,522,693, or 54.1 per cent, the value of crops, including forest products cut or produced on farms. The total value of farm products for 1899 exceeds that for 1889 by \$114,825,462, or 120.8 per cent.

The "gross farm income" is obtained by deducting from the total value of farm products the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$48,741,250, leaving \$161,154,292 as the gross farm income. The ratio which this amount bears to "the total value of farm property" is referred to in this bulletin as the "percentage of gross income upon investment." For Kansas in 1899 it was 18.6 per cent.

As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

The statistics presented in this bulletin will be treated in greater detail in the report on agriculture in the United States. The present publication is designed to present a summarized advance statement for Kansas.

Very respectfully,

L. G. Powers.

Chief Statistician for Agriculture.

AGRICULTURE IN KANSAS.

GENERAL STATISTICS.

Kansas has a total land area of 81,700 square miles, or 52,288,000 acres, of which 41,662,970 acres, or 79.7 per cent, are included in farms.

The state forms a portion of the Great Plains that extend from the Rocky Mountains east to the Mississippi. Its surface slopes gently from the northwest toward the east and south, following the course of the rivers. Two principal streams drain the state—the Kansas, formed by the confluence of the Smoky Hill, Saline, Solomon, and Republican rivers in the north; and the Arkansas, with its tributaries, in the south. Between the river valleys are rolling prairies, and toward the east are wooded hills.

Throughout the state the soil has the property of retaining moisture to an unusual degree, and is productive without the aid of fertilization. It consists chiefly of the alluvium of the river bottoms, and the dark, rich prairie soil of the uplands. The tillage of the soil is confined almost wholly to the eastern and middle sections of the state, where there is sufficient rainfall. The western portion, on account of its lack of moisture, is not well adapted to general farming, but is admirably suited to pasturage, and especially to sheep raising.

NUMBER AND SIZE OF FARMS.

The following table gives, by decades since 1860, the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE 1.—FARMS AND FARM ACREAGE: 1860 TO 1900.

| YEAR. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | | Per cent of farm land improved. |
|-------|------------------|---------------------------|------------|-------------|----------|---------------------------------|
| | | Total. | Improved. | Unimproved. | Average. | |
| 1900 | 178,098 | 41,662,970 | 25,040,550 | 16,622,420 | 240.7 | 60.1 |
| 1890 | 186,617 | 30,214,456 | 22,303,301 | 7,911,155 | 181.8 | 73.8 |
| 1880 | 138,561 | 21,417,468 | 10,739,566 | 10,677,902 | 154.6 | 50.1 |
| 1870 | 38,202 | 5,656,379 | 1,971,003 | 3,685,376 | 148.1 | 34.8 |
| 1860 | 10,400 | 1,778,400 | 405,468 | 1,372,932 | 171.0 | 22.8 |

The number of farms reported June 1, 1900, is over sixteen times as great as the number reported in 1860,

and during the last decade there was an increase of 6,481, or 8.9 per cent. In the same period the total acreage of farm land has increased 37.9 per cent. Since 1860, the average size of farms has varied, but for the last two decades shows a material increase. Both improved and unimproved farm acreage have increased during the last ten years, but the former has gained only about a third as much as the latter.

FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year, beginning with 1860.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF FARM PRODUCTS: 1860 TO 1900.

| YEAR. | Total value of farm property. | Land, improvements, and buildings. | Implements and machinery. | Live stock. | Farm products. ¹ |
|-------------------|-------------------------------|------------------------------------|---------------------------|---------------|-----------------------------|
| 1900 | \$864,100,286 | \$643,652,770 | \$29,490,580 | \$190,956,936 | \$209,895,542 |
| 1890 | 706,664,141 | 559,726,046 | 18,869,790 | 128,068,305 | 95,070,039 |
| 1880 | 311,738,938 | 235,178,936 | 15,652,848 | 60,907,149 | 62,240,551 |
| 1870 ² | 117,558,537 | 90,327,040 | 4,053,312 | 23,178,185 | *27,630,631 |
| 1860 | 16,818,883 | 12,258,239 | 727,694 | 3,332,450 | ----- |

¹ For year preceding that designated.

² Values for 1870 were reported in depreciated currency. To reduce to specie basis of other years, they must be diminished one-fifth.

³ Includes betterments and additions to live stock.

The gain in the last decade in the total value of farm property was \$157,436,145, or 22.3 per cent. The increase in value of land, improvements, and buildings was \$88,926,724, or 15.0 per cent; in that of implements and machinery, \$10,620,790, or 56.3 per cent; and in that of live stock, \$62,888,631, or 49.1 per cent. The value of the farm products of 1899 was 120.8 per cent greater than the value reported for 1889. A portion of this increase, and of that shown for implements and machinery, is doubtless the result of a more detailed enumeration in 1900 than in previous census years.

COUNTY STATISTICS.

Table 3 gives an exhibit of general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

| COUNTIES. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | Value of products not fed to live stock. | EXPENDITURES. | |
|--------------|------------------|------------------|-----------------|------------|--|---------------|----------------------------|---------------|--|---------------|----------------|
| | Total. | With build-ings. | Total. | Improved. | Land and improve-ments (ex-cept build-ings). | Buildings. | Imple-ments and machinery. | Live stock. | | Labor. | Fertill-izers. |
| The State | 173,098 | 164,285 | 41,062,970 | 25,040,550 | \$582,187,610 | \$111,465,180 | \$29,490,530 | \$190,956,936 | \$161,154,292 | \$10,792,910 | \$268,360 |
| Allen | 1,961 | 1,869 | 807,258 | 239,452 | 5,374,240 | 1,032,290 | 235,370 | 1,462,468 | 1,411,651 | 66,760 | 2,420 |
| Anderson | 2,112 | 1,987 | 358,373 | 265,732 | 5,648,980 | 1,307,050 | 268,990 | 2,075,794 | 1,467,450 | 74,950 | 1,180 |
| Atholson | 1,930 | 1,855 | 257,486 | 217,598 | 8,497,230 | 1,666,070 | 315,900 | 1,568,582 | 1,769,663 | 125,010 | 17,830 |
| Barber | 954 | 903 | 677,741 | 179,211 | 2,693,890 | 539,300 | 179,110 | 2,884,402 | 1,190,323 | 129,240 | 910 |
| Barton | 1,745 | 1,652 | 548,900 | 388,249 | 6,799,510 | 1,288,030 | 426,260 | 1,499,856 | 1,750,013 | 198,650 | 1,850 |
| Bourbon | 2,535 | 2,408 | 382,151 | 281,343 | 5,934,330 | 1,352,710 | 203,280 | 1,781,012 | 1,566,384 | 93,130 | 2,760 |
| Brown | 2,313 | 2,205 | 341,841 | 304,021 | 13,425,820 | 2,536,500 | 526,320 | 2,316,082 | 2,151,539 | 212,650 | 3,400 |
| Butler | 3,167 | 3,048 | 871,901 | 538,464 | 10,831,640 | 2,032,370 | 521,200 | 5,483,886 | 3,497,650 | 237,130 | 7,370 |
| Chase | 1,033 | 960 | 451,862 | 129,338 | 5,127,960 | 753,900 | 202,470 | 3,851,977 | 1,214,444 | 120,160 | 40 |
| Chautauqua | 1,770 | 1,663 | 408,958 | 166,841 | 8,377,690 | 629,100 | 219,120 | 1,844,392 | 1,153,743 | 86,060 | 1,340 |
| Cherokee | 2,699 | 2,608 | 345,380 | 295,082 | 6,423,260 | 1,338,630 | 355,040 | 1,446,052 | 1,470,753 | 102,820 | 9,620 |
| Cheyenne | 507 | 465 | 230,026 | 79,806 | 527,160 | 147,140 | 55,830 | 687,343 | 215,539 | 9,070 | ----- |
| Clark | 222 | 207 | 611,590 | 57,820 | 1,075,130 | 145,750 | 49,240 | 2,029,023 | 491,623 | 34,560 | ----- |
| Clay | 2,267 | 2,165 | 411,309 | 299,252 | 6,845,420 | 1,587,120 | 427,790 | 2,228,182 | 2,351,093 | 139,490 | 6,830 |
| Cloud | 2,397 | 2,290 | 444,405 | 312,924 | 6,503,800 | 1,469,630 | 416,010 | 2,338,781 | 2,565,653 | 124,840 | 5,710 |
| Coffey | 2,591 | 2,375 | 402,653 | 251,071 | 6,370,560 | 1,486,240 | 351,330 | 2,519,713 | 2,031,451 | 109,190 | 5,330 |
| Comanche | 267 | 246 | 460,758 | 58,636 | 1,113,290 | 187,850 | 59,490 | 1,334,076 | 580,455 | 37,450 | ----- |
| Cowley | 3,252 | 3,121 | 707,239 | 546,612 | 10,163,520 | 2,084,820 | 678,690 | 3,833,173 | 3,019,555 | 198,800 | 6,210 |
| Crawford | 2,653 | 2,492 | 362,185 | 320,788 | 7,603,030 | 1,493,400 | 331,740 | 1,616,786 | 1,782,509 | 86,120 | 7,220 |
| Deatur | 1,593 | 1,523 | 539,384 | 239,533 | 2,947,860 | 641,480 | 266,520 | 1,467,985 | 1,257,191 | 60,000 | 1,400 |
| Dickinson | 2,521 | 2,478 | 531,398 | 464,614 | 8,399,940 | 2,267,960 | 586,360 | 2,864,876 | 2,983,445 | 195,970 | 3,950 |
| Doniphan | 1,860 | 1,803 | 227,580 | 195,784 | 8,327,490 | 1,434,760 | 280,130 | 1,413,260 | 1,677,111 | 130,210 | ----- |
| Douglas | 2,371 | 2,275 | 292,674 | 229,560 | 7,632,910 | 2,111,600 | 305,670 | 1,652,170 | 1,984,800 | 147,670 | 4,590 |
| Edwards | 627 | 596 | 365,759 | 131,525 | 1,803,240 | 369,350 | 156,920 | 983,942 | 862,108 | 61,470 | 110 |
| Elk | 1,717 | 1,630 | 408,825 | 226,531 | 4,072,590 | 885,590 | 271,700 | 2,435,586 | 1,694,662 | 102,520 | 5,860 |
| Ellis | 1,024 | 979 | 460,853 | 267,916 | 3,858,170 | 533,130 | 258,970 | 955,618 | 995,876 | 110,230 | 450 |
| Ellsworth | 1,279 | 1,223 | 371,816 | 215,065 | 6,017,510 | 1,166,150 | 333,500 | 1,990,940 | 1,556,279 | 177,960 | 9,810 |
| Finney | 468 | 448 | 586,779 | 72,274 | 1,314,510 | 297,670 | 83,220 | 1,464,687 | 420,133 | 68,430 | 1,040 |
| Ford | 589 | 561 | 513,282 | 116,219 | 1,437,720 | 313,730 | 117,210 | 1,383,571 | 477,450 | 70,270 | 8,010 |
| Franklin | 2,645 | 2,454 | 366,371 | 282,247 | 7,835,790 | 1,894,790 | 336,820 | 2,103,749 | 2,073,840 | 100,910 | 1,930 |
| Geary | 973 | 904 | 229,942 | 117,811 | 3,247,410 | 794,430 | 185,620 | 1,289,126 | 1,055,773 | 65,920 | 2,030 |
| Gove | 477 | 460 | 235,658 | 64,701 | 795,480 | 224,370 | 68,230 | 749,239 | 257,325 | 15,220 | 260 |
| Graham | 1,008 | 955 | 406,132 | 141,567 | 1,842,290 | 389,490 | 145,070 | 885,137 | 653,338 | 33,700 | 180 |
| Grant | 75 | 73 | 47,051 | 5,784 | 95,190 | 28,940 | 10,300 | 303,002 | 48,996 | 4,450 | ----- |
| Gray | 237 | 225 | 171,050 | 31,590 | 620,400 | 162,330 | 45,390 | 699,771 | 123,667 | 14,100 | 1,100 |
| Greeley | 79 | 77 | 18,083 | 4,778 | 37,640 | 23,910 | 10,200 | 151,679 | 47,212 | ----- | ----- |
| Greenwood | 2,332 | 2,220 | 666,256 | 338,876 | 7,687,770 | 1,457,820 | 860,060 | 5,298,976 | 2,836,337 | 194,680 | 1,400 |
| Hamilton | 227 | 186 | 81,987 | 18,824 | 818,330 | 83,010 | 20,350 | 521,852 | 224,302 | 14,250 | 400 |
| Harper | 1,615 | 1,446 | 498,466 | 335,133 | 4,083,440 | 853,520 | 383,090 | 1,810,517 | 1,431,887 | 125,910 | 1,890 |
| Harvey | 1,733 | 1,668 | 326,816 | 276,465 | 6,055,620 | 1,368,070 | 377,460 | 1,636,423 | 1,970,633 | 139,980 | 10,620 |
| Haskell | 86 | 85 | 60,000 | 9,695 | 154,410 | 45,590 | 11,840 | 144,024 | 33,167 | 1,190 | ----- |
| Hodgeman | 429 | 414 | 841,517 | 60,214 | 976,590 | 209,270 | 75,230 | 808,210 | 348,360 | 24,470 | 400 |
| Jackson | 2,342 | 2,197 | 347,413 | 237,824 | 8,440,200 | 1,670,350 | 310,470 | 2,278,051 | 2,184,393 | 137,990 | 3,310 |
| Jefferson | 2,529 | 2,397 | 349,415 | 274,760 | 8,516,590 | 1,776,880 | 319,030 | 2,102,959 | 2,148,299 | 137,050 | 2,930 |
| Jewell | 3,375 | 3,179 | 572,091 | 463,377 | 8,397,150 | 1,801,840 | 568,470 | 3,346,096 | 3,614,511 | 126,020 | 3,030 |
| Johnson | 2,307 | 2,223 | 293,310 | 252,098 | 11,878,890 | 2,073,190 | 871,580 | 1,817,830 | 2,217,856 | 213,140 | 2,080 |
| Kearny | 173 | 171 | 115,565 | 26,444 | 493,450 | 95,040 | 35,450 | 493,472 | 139,292 | 18,090 | ----- |
| Kingman | 1,681 | 1,640 | 632,239 | 382,530 | 4,262,400 | 864,390 | 310,070 | 2,124,460 | 1,472,807 | 71,270 | 1,240 |
| Kiowa | 344 | 323 | 412,051 | 68,314 | 1,300,645 | 1,022,513 | 65,040 | 1,022,513 | 307,601 | 33,180 | 2,820 |
| Labette | 2,858 | 2,746 | 419,416 | 356,910 | 6,443,170 | 1,778,490 | 462,720 | 1,702,568 | 1,368,007 | 111,840 | 1,920 |
| Lane | 290 | 277 | 170,461 | 60,909 | 544,475 | 108,180 | 32,620 | 388,566 | 128,321 | 14,870 | 80 |
| Leavenworth | 2,407 | 2,363 | 334,404 | 215,221 | 8,336,590 | 2,080,990 | 823,830 | 1,794,640 | 2,081,316 | 160,200 | 3,130 |
| Lincoln | 1,634 | 1,576 | 447,758 | 236,000 | 4,693,260 | 897,060 | 320,510 | 1,824,625 | 1,726,805 | 117,240 | 1,050 |
| Linn | 2,569 | 2,441 | 351,672 | 278,631 | 5,029,370 | 1,211,830 | 270,740 | 1,781,043 | 1,819,938 | 61,870 | ----- |
| Logan | 388 | 374 | 269,387 | 57,602 | 676,950 | 160,190 | 56,840 | 664,032 | 132,336 | 10,760 | 150 |
| Lyon | 2,853 | 2,749 | 538,768 | 366,827 | 8,865,130 | 1,939,460 | 414,840 | 4,033,201 | 3,036,009 | 178,590 | 3,510 |
| McPherson | 2,820 | 2,675 | 602,620 | 506,148 | 10,202,370 | 1,943,630 | 650,320 | 2,534,022 | 2,930,926 | 257,570 | 4,000 |
| Marion | 2,558 | 2,469 | 507,249 | 419,763 | 8,297,650 | 1,743,680 | 569,890 | 3,095,951 | 2,311,751 | 160,840 | 4,070 |
| Marshall | 3,313 | 3,117 | 573,139 | 468,771 | 13,403,020 | 2,744,970 | 619,420 | 3,463,887 | 3,794,627 | 225,790 | 930 |
| Meade | 271 | 262 | 335,190 | 80,843 | 978,745 | 148,960 | 42,990 | 988,213 | 310,564 | 25,370 | ----- |
| Miami | 2,669 | 2,545 | 370,438 | 312,825 | 8,470,900 | 1,799,870 | 356,750 | 2,203,875 | 2,380,605 | 121,350 | 2,310 |
| Mitchell | 1,974 | 1,904 | 458,060 | 374,757 | 6,001,750 | 1,445,010 | 449,210 | 2,082,720 | 2,416,443 | 167,300 | 710 |
| Montgomery | 2,655 | 2,531 | 390,380 | 271,718 | 6,172,550 | 1,540,590 | 406,810 | 1,576,976 | 1,831,077 | 91,370 | 2,320 |
| Morris | 1,775 | 1,632 | 473,533 | 367,564 | 6,229,790 | 1,259,510 | 282,480 | 3,252,372 | 1,823,165 | 115,880 | 1,380 |
| Morton | 75 | 62 | 104,894 | 7,616 | 237,810 | 43,750 | 15,790 | 501,169 | 83,233 | 20,360 | 100 |
| Nemaha | 2,962 | 2,736 | 457,998 | 383,913 | 12,603,440 | 2,364,000 | 531,170 | 3,229,387 | 3,415,933 | 128,040 | 3,180 |
| Nessho | 2,505 | 2,545 | 348,332 | 288,139 | 5,557,430 | 1,445,440 | 363,490 | 1,694,699 | 1,772,507 | 81,840 | 610 |
| Ness | 332 | 305 | 533,542 | 143,982 | 1,848,015 | 295,770 | 124,900 | 1,051,060 | 571,323 | 35,390 | 650 |
| Osage | 1,938 | 1,887 | 521,639 | 338,080 | 8,608,560 | 778,700 | 311,100 | 1,699,592 | 1,556,500 | 67,000 | 550 |
| Norton | 3,056 | 2,929 | 490,909 | 400,937 | 8,696,810 | 2,066,830 | 430,400 | 3,273,328 | 2,885,333 | 164,670 | 2,500 |
| Osborne | 1,889 | 1,813 | 562,614 | 335,429 | 4,566,190 | 1,110,930 | 374,920 | 2,275,612 | 1,914,682 | 109,970 | 420 |
| Ottawa | 1,725 | 1,634 | 436,495 | 250,720 | 5,960,170 | 1,048,020 | 313,510 | 2,225,461 | 1,977,845 | 122,370 | 2,680 |
| Pawnee | 2,770 | 2,709 | 385,321 | 229,682 | 2,418,740 | 507,930 | 133,350 | 782,431 | 483,422 | 60,930 | 50 |
| Phillips | 2,360 | 2,266 | 557,332 | 383,749 | 5,136,300 | 1,161,330 | 383,370 | 2,250,058 | 2,209,275 | 109,040 | 4,010 |
| Pottawatomie | 2,407 | 2,407 | 556,541 | 315,078 | 10,637,580 | 2,010,450 | 368,450 | 3,669,405 | 2,835,334 | 169,320 | 3,260 |
| Pratt | 1,199 | 1,076 | 402,339 | 269,021 | 2,023,210 | 477,670 | 193,950 | 1,158,753 | 824,390 | 62,590 | 730 |
| Rawlins | 985 | 980 | 512,979 | 173,188 | 1,638,370 | 368,330 | 153,570 | 922,775 | 635,144 | | |

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES—Continued.

| COUNTIES. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | EXPENDITURES. | | |
|--------------------------|------------------|------------------|-----------------|-----------|--|------------|----------------------------|-------------|--|---------|---------------|
| | Total. | With build-ings. | Total. | Improved. | Land and improve-ments (ex-cept build-ings). | Buildings. | Imple-ments and machinery. | Live stock. | Value of products not fed to live stock. | Labor. | Fertili-zers. |
| Riley | 1,882 | 1,759 | 389,619 | 239,503 | 6,370,900 | 1,498,770 | 290,680 | 2,626,658 | 2,019,924 | 123,580 | 280 |
| Rooks | 1,285 | 1,295 | 489,132 | 211,789 | 2,081,660 | 588,380 | 226,810 | 1,068,421 | 1,010,220 | 71,810 | 720 |
| Rush | 1,006 | 918 | 400,514 | 247,402 | 3,245,910 | 582,460 | 259,530 | 828,625 | 842,583 | 104,870 | 8,450 |
| Russell | 1,231 | 1,182 | 570,847 | 324,407 | 5,290,840 | 813,390 | 302,750 | 1,746,494 | 1,293,638 | 140,830 | 8,090 |
| Saline | 1,948 | 1,846 | 488,505 | 276,286 | 6,908,290 | 1,420,210 | 474,930 | 2,097,814 | 1,968,369 | 180,890 | 7,900 |
| Scott | 189 | 186 | 104,928 | 29,588 | 192,450 | 77,690 | 27,550 | 448,555 | 81,969 | 9,600 | 509 |
| Sedgwick | 3,554 | 3,364 | 613,946 | 514,660 | 12,590,490 | 2,589,410 | 696,520 | 3,186,878 | 3,826,310 | 269,130 | 21,020 |
| Seward | 142 | 82 | 122,344 | 12,715 | 218,310 | 52,070 | 15,460 | 476,299 | 107,683 | 18,880 | 1,060 |
| Shawnee | 2,572 | 2,476 | 353,945 | 299,775 | 9,884,330 | 2,166,780 | 398,970 | 2,825,617 | 2,571,219 | 204,580 | 410 |
| Sheridan | 778 | 743 | 486,650 | 144,643 | 1,858,570 | 338,900 | 144,920 | 880,006 | 533,230 | 44,420 | 630 |
| Sherman | 628 | 503 | 221,182 | 89,493 | 443,700 | 150,250 | 69,200 | 580,217 | 204,106 | 8,680 | 10 |
| Smith | 2,894 | 2,687 | 561,558 | 410,688 | 5,281,430 | 1,387,500 | 449,240 | 2,576,798 | 2,474,273 | 99,060 | 690 |
| Stafford | 1,522 | 1,457 | 457,611 | 306,441 | 3,878,590 | 799,040 | 300,520 | 1,421,908 | 1,483,686 | 108,970 | 8,950 |
| Stanton | 73 | 70 | 36,680 | 6,320 | 113,920 | 36,080 | 9,760 | 216,849 | 41,677 | 2,720 | ----- |
| Stevens | 123 | 120 | 54,761 | 10,990 | 185,090 | 49,900 | 21,950 | 813,847 | 71,805 | 6,760 | ----- |
| Sumner | 3,568 | 3,238 | 743,920 | 606,975 | 11,003,980 | 2,082,390 | 738,600 | 2,713,436 | 3,071,255 | 246,090 | 1,510 |
| Thomas | 711 | 686 | 320,116 | 157,161 | 952,160 | 166,900 | 131,610 | 785,109 | 441,699 | 39,250 | 370 |
| Trego | 549 | 514 | 373,117 | 99,637 | 1,809,390 | 326,860 | 108,730 | 902,170 | 364,070 | 47,290 | 910 |
| Wabunsee | 2,050 | 1,968 | 541,646 | 328,079 | 7,821,330 | 1,607,800 | 337,740 | 4,300,415 | 2,747,719 | 176,370 | 1,237 |
| Wallace | 226 | 222 | 196,843 | 20,484 | 524,210 | 109,150 | 27,840 | 552,272 | 203,357 | 10,350 | ----- |
| Washington | 3,384 | 3,204 | 563,147 | 438,177 | 11,255,490 | 2,475,000 | 590,630 | 3,486,424 | 3,596,273 | 178,880 | 4,680 |
| Wichita | 262 | 258 | 114,056 | 38,608 | 246,340 | 77,800 | 34,580 | 251,694 | 74,153 | 1,850 | 30 |
| Wilson | 2,252 | 2,170 | 353,047 | 245,689 | 4,928,880 | 1,151,510 | 309,150 | 1,841,861 | 1,740,198 | 73,840 | 1,520 |
| Woodson | 1,395 | 1,354 | 283,287 | 197,575 | 3,931,610 | 788,570 | 195,190 | 1,372,137 | 935,655 | 64,130 | 3,860 |
| Wyandotte | 1,428 | 1,387 | 80,431 | 61,354 | 7,378,260 | 1,182,670 | 162,640 | 578,907 | 1,087,724 | 158,950 | 1,230 |
| Kickapoo ¹ | 78 | 72 | 10,954 | 8,683 | 207,110 | 12,750 | 8,150 | 29,878 | 47,060 | 3,280 | ----- |
| Potawatomi ¹ | 78 | 73 | 12,700 | 9,896 | 269,750 | 46,400 | 11,670 | 108,549 | 50,496 | 2,880 | 140 |
| Sac and Fox ¹ | 67 | 65 | 8,340 | 6,405 | 315,560 | 25,500 | 10,280 | 81,979 | 67,894 | 5,580 | ----- |

¹Indian reservation.

Nearly two-thirds of the counties show increases in the number of farms in the last decade, those showing decreases being located in the western part of the state, where large areas are used for grazing purposes.

Except 6 western counties, all report a larger area in farm land in 1900 than in 1890. The decrease in improved acreage reported by many of the counties is doubtless due to the use of a more strict definition of the term "improved" used by the Twelfth, than by any preceding census. The average size of farms is, as a rule, largest in the southern counties, and smallest in the counties on the eastern border of the state. For the state the average size of farms is 240.7 acres, ranging from 56.4 acres in Wyandotte county to 2,754.9 acres in Clark county.

The average value of farms for the state is \$3,718. Increased farm values are reported in nearly all of the central and eastern counties. A few counties, containing a large number of hay and grain and live-stock farms, report decreases in the value of implements and machinery, though large increases are almost everywhere shown. The increase in the value of live stock has been more general than that for any other item of farm property. Anderson and Sumner counties alone report decreases.

FARM TENURE.

Table 4 gives a comparative exhibit of farm tenure for 1880, 1890, and 1900. Tenants are divided into two groups: "Cash tenants," who pay a rental in cash or in a

stated amount of farm produce, and "share tenants," who pay as rental a stated share of the products.

In Table 5, the tenure of farms for 1900 is given by race of farmer, the farms operated by owners being subdivided into four groups designated as "owners," "part owners," "owners and tenants," and "managers." These groups comprise, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1880 TO 1900.

| YEAR. | Total number of farms. | NUMBER OF FARMS OPERATED BY— | | | PER CENT OF FARMS OPERATED BY— | | |
|-------|------------------------|------------------------------|---------------|----------------|--------------------------------|---------------|----------------|
| | | Owners. ¹ | Cash tenants. | Share tenants. | Owners. ¹ | Cash tenants. | Share tenants. |
| 1880 | 173,098 | 112,172 | 17,741 | 48,185 | 64.8 | 10.3 | 24.9 |
| 1890 | 166,617 | 119,576 | 10,101 | 50,940 | 71.8 | 6.0 | 22.2 |
| 1890 | 198,561 | 115,910 | 4,438 | 18,213 | 58.7 | 8.2 | 13.1 |

¹Including "part owners," "owners and tenants," and "managers."

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

| PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES. | | | | | | | |
|---|------------------------|---------|--------------|---------------------|-----------|---------------|----------------|
| RACE. | Total number of farms. | Owners. | Part owners. | Owners and tenants. | Managers. | Cash tenants. | Share tenants. |
| The State..... | 173,098 | 74,447 | 33,434 | 2,562 | 1,729 | 17,741 | 43,185 |
| White..... | 171,232 | 73,712 | 33,063 | 2,549 | 1,712 | 17,512 | 42,684 |
| Colored ¹ | 1,866 | 735 | 371 | 13 | 17 | 229 | 501 |

| PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES. | | | | | | | |
|---|-------|------|------|-----|-----|------|------|
| The State..... | 100.0 | 43.0 | 19.3 | 1.5 | 1.0 | 10.3 | 24.9 |
| White..... | 100.0 | 43.1 | 19.3 | 1.5 | 1.0 | 10.2 | 24.9 |
| Colored ¹ | 100.0 | 39.4 | 19.9 | 0.7 | 0.9 | 12.3 | 26.8 |

¹Comprising 1 Chinese, 83 Indians, and 1,782 negroes.

Between 1890 and 1900 the number of farms operated by owners decreased 7,404, or 6.2 per cent; cash tenants increased 7,640, or 75.6 per cent; and share tenants, 6,245, or 16.9 per cent, the greater relative increase of cash tenants indicating a growing sentiment on the part of both landlord and tenant in favor of the cash-payment system. The greatest relative numbers of owners are in the western half of the state, where settlements have been most recently made—the share-tenant system being most in favor in the east central division, and the cash tenants predominating in the eastern division where the land is more valuable and the settlements have been longest established.

No previous census reported the number of farms operated by "part owners," "owners and tenants," or "managers," but it is believed that the number of farms conducted by the last-named class is constantly increasing.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

| RACE OF FARMER, AND TENURE. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------------|------------------|---------------------------|------------|------------------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 173,098 | 240.7 | 41,662,970 | 100.0 | \$864,100,286 | 100.0 |
| White farmers..... | 171,232 | 242.2 | 41,476,323 | 99.6 | 859,909,840 | 99.5 |
| Negro farmers..... | 1,782 | 97.4 | 173,614 | 0.4 | 3,757,904 | 0.4 |
| Indian farmers ¹ | 84 | 195.2 | 13,033 | (²) | 432,542 | 0.1 |
| Owners..... | 74,447 | 194.7 | 14,497,826 | 84.8 | 368,788,174 | 42.7 |
| Part owners..... | 33,434 | 414.6 | 13,862,445 | 33.3 | 210,604,039 | 24.4 |
| Owners and tenants..... | 2,562 | 305.1 | 781,586 | 1.9 | 17,185,991 | 2.0 |
| Managers..... | 1,729 | 1,427.0 | 2,467,841 | 5.9 | 34,863,924 | 4.0 |
| Cash tenants..... | 17,741 | 164.5 | 2,918,430 | 7.0 | 74,404,215 | 8.6 |
| Share tenants..... | 43,185 | 165.2 | 7,135,342 | 17.1 | 165,248,943 | 18.3 |

¹Including 1 Chinese.

²Less than one-tenth of 1 per cent.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

| RACE OF FARMER, AND TENURE. | AVERAGE VALUES PER FARM OF— | | | | Gross income (products of 1899 not fed to live stock). | Per cent of gross income on total investment in farm property. |
|-----------------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State..... | \$3,075 | \$644 | \$170 | \$1,103 | \$931 | 18.6 |
| White farmers..... | 3,091 | 648 | 172 | 1,111 | 937 | 18.7 |
| Negro farmers..... | 1,473 | 248 | 71 | 316 | 396 | 13.8 |
| Indian farmers ¹ | 3,384 | 613 | 126 | 1,026 | 688 | 13.4 |
| Owners..... | 2,978 | 708 | 173 | 1,035 | 884 | 17.3 |
| Part owners..... | 3,753 | 701 | 223 | 1,622 | 1,284 | 20.4 |
| Owners and tenants..... | 4,212 | 934 | 220 | 1,342 | 1,209 | 18.0 |
| Managers..... | 10,297 | 1,540 | 281 | 8,049 | 5,260 | 26.1 |
| Cash tenants..... | 2,731 | 446 | 123 | 894 | 722 | 17.2 |
| Share tenants..... | 2,499 | 414 | 137 | 614 | 686 | 17.4 |

¹Including 1 Chinese.

The average value of land is highest for Indian farmers—who are few in number, however—but for the other kinds of farm property and products, the average values are highest for white farmers. The highest per cent of gross farm income is for farms of colored farmers. This is not due to superior management but to the low value of the farm land of the negroes, which is used as a base in the computation.

The farms of managers, though few in number, have the largest average value of land and buildings, the highest average values of farm property and products, and the highest rate of gross income. In all these respects the farms of tenants stand lowest.

FARMS CLASSIFIED BY AREA.

Tables 8 and 9 present the principal statistics for farms classified by area.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

| AREA. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|---------------------------|------------------|---------------------------|------------|------------------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 173,098 | 240.7 | 41,662,970 | 100.0 | \$864,100,286 | 100.0 |
| Under 3 acres..... | 690 | 2.2 | 1,552 | (¹) | 1,462,724 | 0.2 |
| 3 to 9 acres..... | 2,903 | 6.9 | 20,204 | (¹) | 4,763,422 | 0.6 |
| 10 to 19 acres..... | 3,403 | 13.9 | 47,310 | 0.1 | 5,285,298 | 0.6 |
| 20 to 49 acres..... | 12,269 | 35.6 | 437,177 | 1.0 | 21,750,187 | 2.5 |
| 50 to 99 acres..... | 32,263 | 76.9 | 2,467,724 | 6.0 | 82,111,697 | 9.5 |
| 100 to 174 acres..... | 32,103 | 147.9 | 8,638,256 | 20.7 | 226,739,572 | 26.1 |
| 175 to 259 acres..... | 53,421 | 213.5 | 4,952,753 | 11.9 | 127,008,255 | 14.7 |
| 260 to 499 acres..... | 25,132 | 342.7 | 9,854,430 | 23.7 | 201,743,555 | 23.3 |
| 500 to 999 acres..... | 3,535 | 877.6 | 6,027,503 | 14.5 | 97,807,711 | 11.3 |
| 1,000 acres and over..... | 3,559 | 2,589.5 | 9,216,056 | 22.1 | 96,427,360 | 11.2 |

¹Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

| AREA. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property |
|----------------------|---|------------|---------------------------|-------------|--|---|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State | \$3,075 | \$644 | \$170 | \$1,103 | \$981 | 18.6 |
| Under 3 acres | 441 | 552 | 46 | 1,081 | 458 | 21.6 |
| 3 to 9 acres | 901 | 511 | 49 | 177 | 223 | 13.6 |
| 10 to 19 acres | 789 | 479 | 59 | 224 | 286 | 18.5 |
| 20 to 49 acres | 1,064 | 362 | 78 | 274 | 381 | 21.5 |
| 50 to 99 acres | 1,620 | 416 | 104 | 418 | 492 | 19.2 |
| 100 to 174 acres | 2,458 | 556 | 150 | 700 | 705 | 18.2 |
| 175 to 259 acres | 3,621 | 751 | 201 | 1,081 | 1,016 | 18.1 |
| 260 to 499 acres | 4,522 | 867 | 253 | 1,517 | 1,259 | 17.6 |
| 500 to 999 acres | 6,618 | 1,150 | 328 | 2,900 | 1,929 | 17.5 |
| 1,000 acres and over | 13,915 | 1,685 | 440 | 11,053 | 6,151 | 22.7 |

The medium-sized farms, containing from 100 to 174 acres each, constitute over one-third of the total number of farms, and comprise more than one-fourth the value of all farm property. Those from 260 to 499 acres in extent report nearly one-fourth of the total area—a larger proportion than any other group.

For farms containing less than 10 acres each, the average values given in Table 9 are relatively high, as this class includes most of the florists' establishments in the state, and a number of city dairies. The income from these industries depends less upon the acreage of land used than upon the amount of capital invested and the expenditures for such items as labor and fertilizers.

The average gross incomes per acre for the various groups are as follows: Farms under 3 acres, \$203.67; 3 to 9 acres, \$32.06; 10 to 19 acres, \$20.64; 20 to 49 acres, \$10.71; 50 to 99 acres, \$6.40; 100 to 174 acres, \$4.76; 175 to 259 acres, \$4.65; 260 to 499 acres, \$3.60; 500 to 999 acres, \$2.85; 1,000 acres and over, \$2.38.

FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

Tables 10 and 11 present the leading features of the statistics relating to farms classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop, and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is classified as a "hay and grain" farm. If vegetables are the leading crop, constituting 40 per cent of the value of products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive their principal income from any one class of products. Farms with no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

| PRINCIPAL SOURCE OF INCOME. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|------------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State | 173,098 | 240.7 | 41,662,970 | 100.0 | \$864,100,286 | 100.0 |
| Hay and grain | 75,807 | 201.1 | 15,248,849 | 36.6 | 323,295,923 | 38.0 |
| Vegetables | 2,249 | 57.3 | 123,731 | 0.3 | 8,107,354 | 0.9 |
| Fruits | 2,956 | 67.7 | 64,721 | 0.2 | 3,835,447 | 0.5 |
| Live stock | 79,308 | 301.8 | 23,936,240 | 57.5 | 474,916,126 | 54.9 |
| Dairy produce | 5,381 | 132.1 | 779,713 | 2.3 | 19,373,814 | 2.2 |
| Tobacco | 5 | 24.0 | 120 | (1) | 4,815 | (1) |
| Cotton | 7 | 26.0 | 182 | (1) | 7,270 | (1) |
| Sugar | 99 | 167.1 | 16,538 | (1) | 397,843 | 0.1 |
| Flowers and plants | 65 | 2.6 | 171 | (1) | 238,570 | (1) |
| Nursery products | 79 | 107.8 | 8,515 | (1) | 643,735 | 0.1 |
| Miscellaneous | 9,142 | 140.0 | 1,279,640 | 3.1 | 28,849,359 | 3.3 |

¹ Less than one-tenth of 1 per cent.

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

| PRINCIPAL SOURCE OF INCOME. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State | \$3,075 | \$644 | \$170 | \$1,103 | \$981 | 18.6 |
| Hay and grain | 2,980 | 536 | 170 | 645 | 761 | 17.6 |
| Vegetables | 2,789 | 526 | 94 | 246 | 656 | 18.2 |
| Fruits | 2,731 | 841 | 116 | 324 | 686 | 17.1 |
| Live stock | 3,369 | 768 | 138 | 1,651 | 1,188 | 19.9 |
| Dairy produce | 2,104 | 554 | 120 | 322 | 484 | 12.9 |
| Tobacco | 624 | 216 | 12 | 111 | 1,442 | 149.7 |
| Cotton | 659 | 200 | 59 | 121 | 301 | 23.0 |
| Sugar | 2,275 | 565 | 210 | 969 | 859 | 22.1 |
| Flowers and plants | 1,618 | 1,950 | 60 | 42 | 1,148 | 81.3 |
| Nursery products | 5,997 | 1,724 | 198 | 230 | 5,632 | 69.1 |
| Miscellaneous | 1,985 | 514 | 117 | 540 | 454 | 14.4 |

For the several classes of farms the average values per acre of products not fed to live stock are as follows: For farms deriving their principal income from flowers and plants, \$436.53; tobacco, \$60.08; nursery products, \$52.25; cotton, \$11.59; vegetables, \$11.44; fruits, \$10.18; sugar, \$5.32; live stock, \$3.94; hay and grain, \$3.78; miscellaneous products, \$3.25; and dairy products, \$2.38. The wide variations shown in the averages and percentages of gross income are largely due to the fact that in computing gross income no deduction was made for expenditures. For florists' establishments, nurseries, and market gardens the average expenditure for such items as labor and fertilizers represents a greater percentage of the gross income than in the case of "hay and grain," "live-stock," or "miscellaneous" farms. Were it possible to present the average net incomes, the variations shown would be comparatively slight.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by the reported value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|--|------------------|---------------------------|------------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 173,098 | 240.7 | 41,662,970 | 100.0 | \$864,100,236 | 100.0 |
| \$0..... | 1,574 | 385.7 | 607,072 | 1.5 | 7,265,000 | 0.8 |
| \$1 to \$49..... | 2,125 | 178.1 | 378,415 | 0.9 | 4,037,350 | 0.5 |
| \$50 to \$99..... | 4,154 | 184.8 | 557,935 | 1.3 | 7,795,220 | 0.9 |
| \$100 to \$249..... | 18,614 | 129.9 | 2,417,882 | 5.8 | 37,619,140 | 4.4 |
| \$250 to \$499..... | 37,505 | 162.1 | 5,703,690 | 13.7 | 103,799,600 | 12.0 |
| \$500 to \$999..... | 58,495 | 196.8 | 11,511,857 | 27.6 | 243,588,954 | 28.2 |
| \$1,000 to \$2,499..... | 42,185 | 301.6 | 12,724,059 | 30.6 | 301,167,062 | 34.8 |
| \$2,500 and over..... | 8,446 | 919.1 | 7,762,560 | 18.6 | 153,827,960 | 18.4 |

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | AVERAGE VALUES PER FARM OF— | | | | Gross income (products of 1899 not fed to live stock). | Per cent of gross income on total investment in farm property. |
|--|---|------------|-------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | | |
| | Land and improvements (except buildings). | Buildings. | Implementments and machinery. | Live stock. | | |
| The State..... | \$3,075 | \$644 | \$170 | \$1,103 | \$981 | 18.6 |
| \$0..... | 2,169 | 188 | 62 | 2,197 | | |
| \$1 to \$49..... | 1,094 | 222 | 58 | 526 | 43 | 2.3 |
| \$50 to \$99..... | 1,069 | 279 | 63 | 466 | 69 | 3.6 |
| \$100 to \$249..... | 1,205 | 317 | 77 | 422 | 171 | 3.5 |
| \$250 to \$499..... | 1,704 | 408 | 109 | 552 | 362 | 13.1 |
| \$500 to \$999..... | 2,624 | 582 | 161 | 797 | 676 | 16.2 |
| \$1,000 to \$2,499..... | 4,537 | 929 | 249 | 1,424 | 1,356 | 19.0 |
| \$2,500 and over..... | 10,741 | 1,816 | 422 | 5,826 | 5,599 | 29.8 |

The absence of income in the first group is due, in part, to the fact that the enumerators could not always secure complete reports for farms where changes in ownership or tenancy had occurred shortly prior to the date of enumeration. The persons in charge of such farms, on June 1, 1900, could not always give definite information concerning the products of the preceding year. The same statement is also true of some of the farms with reported incomes of less than \$100. To this extent the reports fail to give a complete statement of farm income in 1899. Other farms with small reported incomes are doubtless the suburban or summer homes of city merchants and professional men, who derive their principal income from other than agricultural pursuits.

LIVE STOCK.

At the request of the various live-stock associations of

the country, a new classification of domestic animals was adopted for the census of 1900. The age grouping for neat cattle was determined by their present and prospective relations to the dairy industry and the supply of meat products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

| LIVE STOCK. | Age in years. | ON FARMS. | | | NOT ON FARMS. |
|---|--------------------|------------|--------------|----------------|---------------|
| | | Number. | Value. | Average value. | |
| Cattle..... | Under 1..... | 923,462 | \$10,630,929 | \$11.51 | 8,168 |
| Steers..... | 1 and under 2..... | 560,377 | 12,833,686 | 22.90 | 2,567 |
| Steers..... | 2 and under 3..... | 530,461 | 17,466,124 | 32.93 | 3,745 |
| Steers..... | 3 and over..... | 430,633 | 17,450,632 | 40.52 | 4,266 |
| Bulls..... | 1 and over..... | 62,499 | 3,089,345 | 49.45 | 424 |
| Heifers..... | 1 and under 2..... | 447,295 | 9,112,985 | 20.37 | 3,071 |
| Cows kept for milk..... | 2 and over..... | 676,456 | 22,191,123 | 32.80 | 37,740 |
| Cows and heifers not kept for milk..... | 2 and over..... | 859,925 | 24,866,027 | 28.92 | 1,583 |
| Colts..... | Under 1..... | 72,539 | 1,465,610 | 20.20 | 1,991 |
| Horses..... | 1 and under 2..... | 78,447 | 2,462,308 | 31.39 | 1,530 |
| Horses..... | 2 and over..... | 828,709 | 39,830,326 | 48.06 | 89,495 |
| Mule colts..... | Under 1..... | 18,809 | 518,591 | 27.57 | 252 |
| Mules..... | 1 and under 2..... | 18,330 | 751,271 | 40.99 | 229 |
| Mules..... | 2 and over..... | 81,565 | 5,238,054 | 64.22 | 3,544 |
| Asses and burros..... | All ages..... | 3,787 | 428,176 | 113.06 | 613 |
| Lambs..... | Under 1..... | 82,106 | 167,196 | 2.04 | 768 |
| Sheep (ewes)..... | 1 and over..... | 183,825 | 491,198 | 3.67 | 587 |
| Sheep (rams and wethers)..... | 1 and over..... | 46,082 | 175,433 | 3.81 | 677 |
| Swine..... | All ages..... | 3,594,859 | 17,076,004 | 4.75 | 73,170 |
| Goats..... | All ages..... | 18,288 | 71,290 | 3.90 | 611 |
| Fowls: ¹ | | | | | |
| Chickens ² | | 11,966,843 | | | |
| Turkeys..... | | 275,330 | | | |
| Geese..... | | 97,768 | | | |
| Ducks..... | | 216,244 | | | |
| Bees (swarms of)..... | | 88,594 | 277,967 | 3.14 | |
| Unclassified..... | | | 4,721 | | |
| Value of all live stock..... | | | 190,956,936 | | |

¹ The number reported is of fowls over 3 months old. The value is of all, old and young.

² Including Guinea fowls.

The value of all live stock on farms, June 1, 1900, was \$190,956,936, of which 50.0 per cent represents the value of neat cattle other than dairy cows; 22.9 per cent, the value of horses; 11.6 per cent, that of dairy cows; 8.9 per cent, that of swine; 2.3 per cent, that of poultry; and 4.3 per cent, the value of all other live stock.

No reports were secured of the value of live stock not on farms, but it is probable that such animals have higher average values than those on farms. Allowing the same averages, however, the total value of domestic animals not on farms is \$6,872,122, or but 3.6 per cent of the total value of farm live stock. Exclusive of poultry and bees not on farms, the total value of live stock in the state is approximately \$197,829,000.

CHANGES IN LIVE STOCK ON FARMS.

The following table shows the changes since 1860 in the numbers of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS: 1860 TO 1900.

| YEAR. | Dairy cows. | Other neat cattle. | Horses. | Mules and asses. | Sheep. ¹ | Swine. |
|-------|-------------|--------------------|---------|------------------|---------------------|-----------|
| 1900 | 676,456 | 3,814,622 | 979,095 | 122,491 | 179,907 | 3,594,859 |
| 1890 | 741,786 | 2,446,247 | 930,305 | 95,937 | 401,192 | 4,022,933 |
| 1880 | 418,333 | 1,032,724 | 430,907 | 64,869 | 499,071 | 1,767,938 |
| 1870 | 123,440 | 250,527 | 117,786 | 11,786 | 109,088 | 206,587 |
| 1860 | 26,560 | 64,903 | 20,314 | 1,496 | 17,569 | 138,224 |

¹ Lambs not included.

The decade of greatest development for Kansas was that between 1880 and 1890, when large increases in the number and value of live stock also occurred. From 1890 to 1900, the growth was more gradual, but for all classes, except sheep, swine, and dairy cows, the last decade shows increases in the number of animals reported.

More than twenty-three times as many dairy cows were reported in 1900 as in 1860, but the table shows a decrease of 8.8 per cent for the last decade. This decrease is probably more apparent than real, as the term "dairy cows" was more strictly construed in 1900 than in any previous census year, being confined to "cows kept for milk" exclusively. Many of the 859,925 cows and heifers not kept for milk were doubtless milch cows, dry at the time of enumeration, or were milked at some time during the year. The increase in the production of milk indicates that more cows were used in dairying in 1900 than in 1890. The number of "other neat cattle" reported in 1900 was more than fifty-eight times that in 1860, the gain since 1890 being 55.9 per cent.

There were over forty-eight times as many horses reported in 1900 as in 1860, the gain of the last decade being 5.3 per cent.

The per cent of increase in numbers of mules and asses has been greater than that for horses, over eighty-one times as many being reported in 1900 as forty years before, while the increase since 1890 was 27.7 per cent. The total number of mules and asses in 1900 was about one-eighth as great as the number of horses.

Since 1880 the sheep raising industry has declined, although over ten times as many sheep were reported in 1900 as in 1860. The decrease in the last decade was 55.2 per cent. Many counties which led in sheep raising in 1890 report large numbers of cattle and but few sheep in 1900. There were over twenty-six times as many swine reported in 1900 as in 1860, but the last decade showed a decrease of 10.6 per cent, due in part to an epidemic of hog cholera in 1899 and 1900.

In comparing the poultry report for 1900 (see Table 14) with that of 1890 it should be borne in mind that in 1900 the enumerators were instructed to report no fowls under three months old, while no such limitation was made in 1890. This fact explains to a great extent the apparent decreases in the numbers of all fowls. An increase of 71.9 per cent in dozens of eggs produced indicates that more fowls were kept in 1900 than in 1890. Compared with the figures for 1890, the present census shows

decreases in the numbers of fowls as follows: Ducks, 55.4 per cent; turkeys, 48.1 per cent; chickens, 24.5 per cent; and geese, 17.1 per cent.

ANIMAL PRODUCTS.

Table 16 is a summarized exhibit of the products of the animal industry.

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS IN 1899.

| PRODUCTS. | Unit of measure. | Quantity. | Value. |
|----------------------|------------------|---------------|-------------|
| Wool | Pounds | 1,599,374 | \$247,895 |
| Mohair and goat hair | Pounds | 4,066 | 1,077 |
| Milk | Gallons | 1,244,909,123 | 11,782,902 |
| Butter | Pounds | 41,640,772 | 7,237,111 |
| Cheese | Pounds | 291,445 | 6,491,183 |
| Eggs | Dozens | 73,190,590 | 151,873 |
| Poultry | | | 19,236 |
| Honey | Pounds | 1,187,569 | 64,596,534 |
| Wax | Pounds | 19,236 | 5,864,274 |
| Animals sold | | | |
| Animals slaughtered | | | |
| Total | | | \$6,372,849 |

¹ Comprises all milk produced, whether sold, consumed, or made into butter or cheese.

² Comprises the value of milk sold and consumed, and of butter and cheese made.

The value of animal products in 1899 was \$6,372,849. Of this amount, 73.1 per cent represents the value of animals sold and animals slaughtered on farms; 14.3 per cent, that of poultry raised and eggs produced; 12.2 per cent, that of dairy produce; and 0.4 per cent, that of all other products.

DAIRY PRODUCE.

Improved facilities for making and shipping dairy produce have led to a rapid development of dairying in Kansas. The production of milk in 1899 exceeded that in 1889 by 43,801,024 gallons, or 21.5 per cent, but on account of the transfer of the butter and cheese making industries from the farm to the creamery and cheese factory, the quantities of butter and cheese made on farms in 1899 were, respectively, 9.7 per cent and 61.6 per cent less than in 1889. The quantity of milk sold was not separately reported in 1890, but in 1899 it was over thirty-five times as great as in 1879.

Of the \$11,782,902 given in Table 16 as the value of all dairy produce in 1899, \$5,846,240, or 49.6 per cent, represents the value of such produce consumed on farms, and \$5,936,662, or 50.4 per cent, the amount realized from sales. Of the latter amount, \$3,028,892 was derived from the sale of 47,939,088 gallons of milk; \$167,813, from 335,377 gallons of cream; \$2,716,948, from 20,463,158 pounds of butter; and \$23,009, from 227,431 pounds of cheese.

POULTRY AND EGGS.

The total value of the products of the poultry industry in 1899 was \$13,728,294, of which amount, 52.7 per cent represents the value of eggs produced, and 47.3 per cent, the value of fowls raised. Over thirty million dozens more eggs were produced in 1899 than in 1889, the rate of increase being 71.9 per cent.

WOOL.

The production of wool has decreased steadily since 1880, the rate for the last decade being 29.0 per cent. In the last decade the average weight per fleece decreased from 7.3 pounds to 6.9 pounds.

HONEY AND WAX.

The quantity of honey produced in 1899 was 1,187,569 pounds, a gain of 33.3 per cent since 1889. The quantity of wax reported in 1900 was more than twice that reported ten years before.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

| CLASSES. | HORSES. | | | DAIRY COWS. | | |
|----------------------------|------------------|---------|-------------------|------------------|---------|-------------------|
| | Farms reporting. | Number. | Average per farm. | Farms reporting. | Number. | Average per farm. |
| Total | 164,106 | 979,695 | 6.0 | 149,902 | 676,456 | 4.5 |
| White farmers | 162,459 | 973,399 | 6.0 | 148,763 | 673,379 | 4.5 |
| Colored farmers | 1,647 | 6,296 | 3.8 | 1,139 | 3,077 | 2.7 |
| Owners ¹ | 105,634 | 655,385 | 6.2 | 100,344 | 493,442 | 4.9 |
| Managers | 1,468 | 18,014 | 12.3 | 1,230 | 6,623 | 5.4 |
| Cash tenants | 16,583 | 96,323 | 5.8 | 14,416 | 58,611 | 4.1 |
| Share tenants | 40,421 | 208,973 | 5.2 | 33,912 | 117,780 | 3.5 |
| Under 20 acres | 5,450 | 12,087 | 2.2 | 4,404 | 9,186 | 2.1 |
| 20 to 99 acres | 40,602 | 142,719 | 3.5 | 31,232 | 98,066 | 2.9 |
| 100 to 174 acres | 55,951 | 311,745 | 5.6 | 52,136 | 211,406 | 4.1 |
| 175 to 259 acres | 22,261 | 145,828 | 6.6 | 21,270 | 114,103 | 5.4 |
| 260 acres and over | 39,842 | 367,816 | 9.2 | 37,860 | 243,695 | 6.4 |
| Hay and grain | 70,447 | 387,181 | 5.5 | 60,785 | 223,297 | 3.7 |
| Vegetable | 1,770 | 6,034 | 3.4 | 1,289 | 2,508 | 1.9 |
| Fruit | 815 | 2,738 | 3.4 | 647 | 1,553 | 2.4 |
| Live stock | 77,478 | 519,265 | 6.7 | 74,361 | 381,796 | 5.1 |
| Dairy | 5,074 | 26,308 | 5.2 | 5,381 | 40,944 | 7.6 |
| Sugar | 94 | 566 | 6.0 | 85 | 324 | 3.8 |
| Miscellaneous ² | 8,428 | 37,608 | 4.5 | 7,404 | 26,034 | 3.5 |

¹Including "part owners" and "owners and tenants."
²Including florists' establishments, nurseries, 6 cotton farms, and 3 tobacco farms.

CROPS.

The following table gives the statistics of the principal crops of 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

| CROPS. | Acres. | Unit of measure. | Quantity. | Value. |
|--------------------------|------------|------------------|-------------|--------------|
| Corn | 8,266,018 | Bushels | 229,937,430 | \$58,079,738 |
| Wheat | 3,803,318 | Bushels | 38,778,460 | 19,132,455 |
| Oats | 900,353 | Bushels | 21,469,980 | 4,915,896 |
| Barley | 119,158 | Bushels | 1,474,150 | 383,709 |
| Rye | 80,964 | Bushels | 807,260 | 316,013 |
| Buckwheat | 1,923 | Bushels | 15,203 | 9,022 |
| Kafir corn | 154,706 | Bushels | 3,063,781 | 785,276 |
| Flaxseed | 192,167 | Bushels | 1,417,770 | 1,262,487 |
| Clover seed | | Bushels | 36,865 | 141,583 |
| Grass seed | | Bushels | 244,523 | 151,014 |
| Hay and forage | 4,337,342 | Tons | 7,235,136 | 18,490,287 |
| Cotton | 153 | Pounds | 35,200 | 2,279 |
| Cotton seed | | Tons | 35 | 245 |
| Tobacco | 80 | Pounds | 45,960 | 4,804 |
| Broom corn | 34,333 | Pounds | 11,813,310 | 458,481 |
| Peanuts | 225 | Bushels | 4,516 | 4,306 |
| Dry beans | 318 | Bushels | 7,284 | 9,485 |
| Castor beans | 3,338 | Bushels | 18,108 | 17,391 |
| Dry peas | 151 | Bushels | 2,006 | 2,308 |
| Potatoes | 85,318 | Bushels | 8,091,745 | 2,485,800 |
| Sweet potatoes | 4,570 | Bushels | 474,810 | 224,049 |
| Onions | 864 | Bushels | 143,832 | 89,261 |
| Miscellaneous vegetables | 53,302 | | | 2,351,044 |
| Maple sirup | | Gallons | 45 | 60 |
| Sorghum cane | 20,689 | Tons | 131,207 | 73,019 |
| Sorghum sirup | | Gallons | 735,787 | 206,010 |
| Small fruits | 5,824 | | | 406,464 |
| Grapes | 28,232 | Centals | 157,860 | 296,640 |
| Orchard fruits | 308,179 | Bushels | | 41,728,659 |
| Figs | | Pounds | 50 | 1 |
| Nuts | | | | 6,097 |
| Forest products | | | | 837,997 |
| Flowers and plants | 75 | | | 79,765 |
| Seeds | 812 | | | 44,431 |
| Nursery products | 3,449 | | | 447,053 |
| Miscellaneous | 7,330 | | | 70,557 |
| Total | 18,394,271 | | | 113,522,693 |

¹Sold as cane.

²Estimated from number of vines or trees.

³Including value of raisins, wine, etc.

⁴Including value of cider, vinegar, etc.

Of the total value of crops, cereals, including Kafir corn, contributed 73.7 per cent; hay and forage, 16.3 per cent; vegetables, including sweet potatoes and onions, 2.3 per cent; potatoes, 2.2 per cent; fruits and nuts, 2.2 per cent; flaxseed, 1.1 per cent; and all other products, 2.2 per cent.

The average values per acre of the various crops are as follows: Flowers and plants, \$1,064; nursery products, \$130; onions, \$103; small fruits, \$70; sweet potatoes, \$49; miscellaneous vegetables, \$44; potatoes, \$29; flaxseed, \$7; cereals, \$6; orchard fruits, \$6; and hay and forage, \$4. The crops yielding the highest average returns per acre were grown upon very highly improved land. Their production required a relatively great amount of labor and large expenditures for fertilizers.

CEREALS.

The following table is an exhibit of the changes in cereal production since 1859.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS:
1859 TO 1899.

PART 1.—ACREAGE.

| YEAR. ¹ | Barley. | Buck- wheat. | Corn. | Oats. | Rye. | Wheat. |
|--------------------|---------|-----------------|-----------|-----------|---------|-----------|
| 1899 | 119,158 | 1,923 | 3,266,018 | 900,358 | 80,964 | 3,803,818 |
| 1889 | 7,201 | 3,907 | 7,314,765 | 1,403,326 | 199,140 | 1,532,035 |
| 1879 | 23,993 | 2,458 | 3,417,817 | 435,859 | 34,621 | 1,861,402 |

¹No statistics of acreage were secured prior to 1879.

PART 2.—BUSHELS PRODUCED.

| | | | | | | |
|------|-----------|--------|-------------|------------|-----------|------------|
| 1899 | 1,474,150 | 15,203 | 229,937,430 | 24,469,980 | 807,260 | 33,778,450 |
| 1889 | 165,715 | 67,115 | 259,574,568 | 44,629,034 | 2,917,386 | 30,399,871 |
| 1879 | 300,273 | 24,421 | 105,729,325 | 8,180,385 | 413,181 | 17,324,141 |
| 1869 | 98,405 | 27,826 | 17,025,325 | 4,097,325 | 85,207 | 2,391,198 |
| 1859 | 4,716 | 41,575 | 6,150,727 | 83,325 | 3,833 | 194,173 |

Each census year since 1859, except the last, shows a marked increase in the production of cereals. Between 1879 and 1889 the acreage in cereals increased 83.1 per cent, and in the last decade 24.6 per cent. The area devoted to the production of barley in 1899 was nearly seventeen times as great as in 1889; wheat increased 140.3 per cent; corn, 13.0 per cent. Buckwheat, oats, and rye, show decreases of 72.2, 38.5, and 59.3 per cent, respectively.

Of the total acreage under cereals in 1899, corn occupied 62.8 per cent; wheat, 28.9 per cent; oats, 6.8 per cent; and barley, rye, and buckwheat, 1.5 per cent. The late spring of 1899 caused a different distribution of the areas in the various cereals from that prevailing in other seasons. Ordinarily, there would have been a greater area planted in wheat and oats, and less in barley.

In 1900, 151,996 farmers, or 87.8 per cent of all in the state, reported corn. Every county was represented, and more than one-third reported over 100,000 acres each. Nearly one-sixth of the land of the state was planted in corn, or an average of 5.6 acres to each inhabitant. Wheat was reported from all the counties except Grant. More than one-fourth of the acreage in barley was in the adjoining counties of Ness, Barton, Pawnee, and Rush. Rye and buckwheat are of minor importance.

HAY AND FORAGE.

In 1900, 137,083 farmers, or 79.2 per cent of the total number, reported hay and forage crops, of which, exclusive of cornstalks and corn strippings, an average yield of 1.6 tons per acre was obtained. The acreage in hay and forage in 1899 was 16.5 per cent greater than it was ten years before.

In 1899 the acreages and yields of the various kinds of hay and forage were as follows: Wild, salt, or prairie grasses, 2,165,174 acres and 2,291,173 tons; millet and Hungarian grasses, 349,906 acres and 670,770 tons; alfalfa or lucern, 267,376 acres and 601,624 tons; clover, 160,395 acres and 214,199 tons; other tame and cultivated grasses, 258,108 acres and 337,536 tons; grains cut green for hay, 94,936 acres and 223,048 tons; forage crops, 1,041,447 acres and 2,728,321 tons; and cornstalks and corn strippings, 107,087 acres and 163,465 tons.

In Table 18 the production of cornstalks and corn strippings is included under "hay and forage," but the acreage is included under "corn," as the forage secured was only an incidental product of the corn crop.

FLAX.

Flax was grown in 1899 by 10,322 farmers, or 6.0 per cent of the total number in the state. Compared with 1889, the area devoted to this crop shows an increase from 114,069 acres to 192,167 acres, and the production of seed, an increase from 994,127 bushels to 1,417,770 bushels. The average yield per acre was 8.7 bushels in 1889, and 7.4 in 1899. The average area per farm was 18.6 acres, and the average value of the crop, \$122. Almost the entire crop is grown in the eastern portion of the state, 14 of the extreme eastern and southeastern counties reporting 84.6 per cent of the total acreage. The leading counties are Allen, Miami, Bourbon, Linn, Anderson, and Neosho.

BROOM CORN.

In 1899, 34,383 acres, reported by 1,487 farmers, produced 11,813,310 pounds of broom corn, valued at \$458,481. This is a gain in production of 9.3 per cent since 1890. McPherson, Reno, and Rice counties produced 5,947,450 pounds, or 50.3 per cent of the total yield, and Allen, Stafford, Sheridan, and Pratt rank next in the order named.

ORCHARD FRUITS.

The changes in orchard fruits since 1890 are shown in the following table.

TABLE 20.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

| FRUITS. | NUMBER OF TREES. | | BUSHELS OF FRUIT. | |
|------------------|------------------|-----------|-------------------|-----------|
| | 1900. | 1890. | 1899. | 1889. |
| Apples | 11,848,070 | 6,063,343 | 3,214,407 | 3,713,019 |
| Apricots | 169,266 | 18,795 | 4,236 | 252 |
| Cherries | 1,109,673 | 1,087,890 | 60,511 | 101,000 |
| Peaches | 5,098,064 | 4,376,311 | 137,489 | 1,793,781 |
| Pears | 327,781 | 80,510 | 21,978 | 13,391 |
| Plums and prunes | 852,702 | 410,426 | 57,520 | 13,123 |

Of the farmers of the state 56,002, or 32.4 per cent, reported orchard fruits in 1900. The value of orchard products was not ascertained by the census of 1890, but in 1879 the total value of such products was \$358,860, and in 1899 it was \$1,728,659, almost five times as great as twenty years before.

The most noteworthy change between 1890 and 1900 is an increase of 95.4 per cent in the number of apple trees. This fruit is grown in every county except Greeley, and of the counties reporting apples, Linn is the only one which did not report an increase in the number of trees. The leading apple-growing counties are Leavenworth, Shawnee, Doniphan, and Reno.

In 1890, 48.4 per cent of all fruit trees in the state were apple trees, and 38.9 per cent, peach trees. In 1900, 60.6 per cent of all fruit trees were apple trees; 26.0 per cent, peach trees; 5.7 per cent, cherry trees; and 7.7 per cent, plum and prune, pear, apricot, and unclassified fruit trees.

The unclassified trees numbered 158,139, and yielded 17,545 bushels of fruit.

The value of orchard products, given in Table 18, includes the value of 15,598 barrels of cider, 7,931 barrels of vinegar, and 205,820 pounds of dried and evaporated fruits. The five southeastern counties of Chautauqua, Wilson, Cowley, Butler, and Harvey, report over one-third of the dried and evaporated fruits produced on farms. The quantity of fruit produced in any given year is determined largely by the nature of the season. Comparisons between the crops of 1889 and 1899 have little significance, because in the latter year there was an almost complete failure of peaches, and unusually small yields of other fruits.

VEGETABLES.

The total area used in the cultivation of vegetables, including potatoes, sweet potatoes, and onions, in 1899 was 144,054 acres. Of this amount, 59.2 per cent was devoted to potatoes, 37.0 per cent to miscellaneous vegetables, 3.2 per cent to sweet potatoes, and 0.6 per cent to onions.

Potatoes were reported by 56.5 per cent of the total number of farmers in the state, and show an average yield per acre of 94.8 bushels. Although grown throughout the state, the soil in the northeastern portion is best adapted to their cultivation, Wyandotte, Doniphan, Douglas, Johnson, Jefferson, Leavenworth, and Shawnee counties reporting 30.3 per cent of the total acreage and 37.4 per cent of the total production. For the state as a whole an average of 0.9 of an acre per farm reporting potatoes was devoted to this crop, but in the counties given above the average was 2.5 acres per farm. Compared with the census of 1890, the returns received by the present census show a decrease of 24.3 per cent in the acreage devoted to potatoes. This is doubtless due to the very late spring of 1899, and to the heavy rains that prevailed at that time. Ground that otherwise would have been used in the cultivation of potatoes was devoted to cultivation of crops that require a shorter season.

The average acreage per farm devoted to miscellaneous vegetables by the 93,336 farmers reporting them was 0.6 of an acre. Vegetables grown on 17,997 acres were reported in detail, but for 35,305 acres, or 66.2 per cent of the total, no detailed reports were received. The acreages devoted to the more important vegetables reported in detail were as follows: 6,142, to watermelons; 4,626, to sweet corn; 2,579, to tomatoes; 2,510, to cabbages; 1,032, to muskmelons; 481, to cucumbers; and 609 to other vegetables.

SMALL FRUITS.

The total area used in the cultivation of small fruits in 1899 was 5,824 acres, distributed among 12,955 farms. The growing of berries was confined chiefly to the eastern part of the state, particularly to Wyandotte, Cherokee, Doniphan, Douglas, Leavenworth, Labette, and Johnson counties. Of the total area 39.5 per cent was devoted to strawberries, the production of which was 3,321,650 quarts, and 35.1 per cent to blackberries and dewberries, with a production of 1,857,514 quarts. The acreages and pro-

duction of the other berries were as follows: Raspberries and Logan berries, 957 acres and 820,330 quarts; gooseberries, 212 acres and 269,860 quarts; currants, 134 acres and 130,210 quarts; cranberries, 1 acre and 36 bushels; and other small fruits, 172 acres and 171,320 quarts.

The total value of all small fruits was \$406,464, an average of \$31.38 per farm, and \$69.79 per acre devoted to their cultivation.

TOBACCO.

According to the census of 1860, Kansas produced in 1859, 20,349 pounds of tobacco. The census of 1870 showed a gain over this of 12,892 pounds, or 63.4 per cent, the increase in the subsequent decade being 158,428 pounds. Since 1880 the tobacco crop has noticeably declined, a decrease of 129,586 pounds, or 67.6 per cent, being shown between 1880 and 1890.

The present census shows that in 1899 tobacco was grown in Kansas by 207 farmers, who obtained from 80 acres a yield of 45,960 pounds, valued at \$4,804. This is a decrease in area since 1889 of 43 acres, or 35.0 per cent, and in production of 16,123 pounds, or 26.0 per cent. The average area in tobacco was less than two-fifths of an acre for each farm reporting, and the average yield per acre was 575 pounds.

The tobacco crop of 1899 was distributed through 42 counties of the state, but the four counties of Miami, Ellis, Rush, and Franklin furnished 48.8 per cent of the total acreage and 58.6 per cent of the entire production of the state.

CASTOR BEANS.

In 1899 castor beans were grown by 228 farmers, who devoted to their cultivation 3,338 acres, securing a product of 18,108 bushels, an average of 5.4 bushels per acre. Of the total acreage, 93.9 per cent was reported by the extreme southeastern counties of Neosho, Crawford, Labette, Bourbon, and Wilson, ranking in the order named.

SORGHUM CANE.

The present census shows that in 1899 sorghum cane was raised by 5,727 farmers on 20,689 acres, an average of 3.6 acres for each farm reporting. From this area they sold 31,207 tons of cane for \$73,019, and from the remaining product manufactured 735,787 gallons of sirup, valued at \$206,010. This was a decrease in acreage since 1889 of 62.9 per cent. The total value of the sorghum-cane products for 1899 was \$279,029, an average of \$48.72 for each farm reporting. The average yield per acre, not including the product of the 31,207 tons of cane sold, was 35.6 gallons. The average value per gallon was 28 cents.

The crop was distributed over 95 counties of the state, the largest area, 1,840 acres, being reported from Cowley county.

FLORICULTURE.

The area devoted to the cultivation of flowers and ornamental plants in 1899 was 75 acres, and the value of the products sold therefrom was \$79,765. These flowers and

plants were grown by 121 farmers and florists, of whom 65 made commercial floriculture their principal business.

These 65 proprietors reported greenhouses with a glass surface of 272,426 square feet. The capital invested in land, buildings, implements, and live stock was \$238,570, of which \$126,750 represents the value of buildings. Their sales of flowers and plants amounted to \$71,541, and other products sold were worth \$3,105, making an average value of \$1,148 for each farm reporting. Their expenditure for labor was \$16,270, and that for fertilizers, \$510. The average gross income per acre was \$436.53.

In addition to the 65 principal florists' establishments, 352 farms and market gardens made use of glass in the propagation of flowers, plants, or vegetables. They had an area of land under glass of 345,920 square feet, making, with the 204,320 square feet belonging to the florists' establishments, a total of 550,240 square feet.

NURSERIES.

The total value of the nursery stock sold in 1899 was \$447,053, reported by the operators of 181 farms and nurseries. Of this number 79 derived their principal income from the nursery business. They had 8,515 acres of land, valued at \$473,755; buildings, valued at \$136,170; implements and machinery, valued at \$15,640; and live

stock, valued at \$18,170. Their total gross income was \$444,897, of which \$424,701 was derived from the sale of trees, shrubs, and vines, and \$20,196 from the sale of other farm products. The average gross income per acre was \$52.25, and for each farm reporting, exclusive of products fed to live stock, \$5,632.

LABOR AND FERTILIZERS.

The total expenditure for labor on farms in 1899, including the value of board furnished, was \$10,792,910, an average of \$62 per farm. The average was highest on the most intensively cultivated farms, being \$1,291 for nurseries, \$250 for florists' establishments, \$100 for fruit farms, \$89 for vegetable farms, \$80 for sugar farms, \$75 for live-stock farms, \$52 for hay and grain farms, and \$38 for dairy farms. "Managers" expended on an average, \$417; "owners," \$61; "cash tenants," \$42; and "share tenants," \$35. White farmers expended \$63 per farm, and colored farmers, \$26.

Fertilizers purchased in 1899 cost \$268,360, over ten times the amount spent in 1889, and an average of \$2 per farm. The average expenditure was \$8 for nurseries and florists' establishments, \$3 for fruit farms, \$2 for vegetable, hay and grain, and live-stock farms, and \$1 for dairy farms.

INDIAN RESERVATIONS.

Kickapoo, Potawatomi, and Sac and Fox are the only reservations in Kansas still intact. The farm products of the Iowa Indians, whose lands have been entirely allotted, were reported with the Sac and Fox reservation. These tracts are situated in the heart of the corn belt and contain much rich agricultural land.

The Kansas Indians have made considerable progress in civilized life, agriculture and stock raising being their principal occupations. With excellent land, and plenty of horses, wagons, and agricultural implements, they have every inducement to become good farmers, but in this respect they are making little advancement as a class. The system of allowing Indians to lease their lands is accountable, in a great measure, for their lack of industry in agriculture. Their incomes from annuity payments, and the lease of a whole or a part of their land, enable many of them to live in idleness most of the time, and they are retrograding, acquiring habits of indolence and dissipation. Some of them, however, have tilled the soil industriously, and are steadily increasing their acreage under cultivation.

KICKAPOO RESERVATION.

Kickapoo reservation is located in the extreme northeastern part of Kansas, in Brown county, and contains an area of 32 square miles, more than one-half of which is allotted. Practically all of the land is suitable for either agriculture or grazing, although it is not as fertile as that of the Sac and Fox.

The Kickapoo (Algonquin) in Kansas constitute but a branch of that tribe; the remainder, called the Mexican Kickapoo on account of their withdrawal into Mexico during the Civil War, are now allotted in Oklahoma. The population of the reserve is 566, of which about one-half are Indians. A few were opposed to allotment and have not yet begun to fence or improve their land. The others are industrious and are making good progress towards citizenship, except in the matter of tilling the soil, for they prefer to rent their land rather than work it themselves.

Corn and wild hay are the principal crops of the Kickapoo, but some of their white tenants raise wheat and oats in addition. A few Indians had potatoes and other vegetables but gardens were not generally reported. Only 23 of the 73 farms on the reserve were operated by Indians, the others being operated by white and black tenants. The majority of the Indian farmers cultivate from 20 to 80 acres. Their live stock consists of a few work horses, mules, and cattle.

POTAWATOMI RESERVATION.

Potawatomi reservation is situated in Jackson county, in the northeastern part of Kansas, and contains an area of 121 square miles. The larger part of the tract is allotted. One-half consists of creek bottoms and sloping hillsides, with a rich soil suitable for cultivation, while the remainder is adapted only to grazing, the native prairie grasses affording excellent feed. The population of the reserve is 1,011, of which about three-fifths are Indians.

They are quite civilized and well to do, but since the practice of leasing their lands was inaugurated, very few of them are industrious.

The principal crops of the Potawatomi are corn and hay; most of the latter is made from native prairie grasses, while a few raise alfalfa and other tame grasses. Only a small number reported gardens, while some have orchards of apple trees. The leasing system seems to be even more prevalent here than on other Kansas reserves, only 9 of the 63 farms being operated by Indians. The area cultivated by the majority of Indian farmers ranged from 50 to 150 acres; two, however, had improved areas of 360 and 550 acres respectively.

The Potawatomi are well supplied with good horses, cattle, dairy cows, swine, and chickens; a few have herds of range cattle and derive an income from the sale of live stock; the largest sale reported for 1899 was \$3,500.

SAC AND FOX RESERVATION.

The reserve of the Sac and Fox of the Missouri is located in Brown county, in the extreme northeastern part of Kansas and extends into Nebraska. The total area is 12 square miles, of which the greater part is allotted. The former Iowa reservation, now completely allotted, adjoins that of the Sac and Fox, and the agricultural statistics of the two have been consolidated. These two tracts com-

prise a fine body of very productive agricultural land, situated in the midst of the corn belt.

The total population on the two reservations is 449, of which only about three-fourths are Indians. They carry on agriculture ordinarily, but the majority have leased their lands and are content to live on the income derived therefrom together with annuity payments. Most of them are well equipped with implements and farm machinery, while many have comfortable homes and are well to do.

But 18 of the 67 farms on these two reserves are operated by Indians, showing the extent to which the leasing system prevails. The majority of the Indian farmers cultivate from 40 to 100 acres, while two cultivate 135 and 160 acres, respectively. Corn is the principal crop raised by these Indians, although a few have wheat and oats. The larger number have small vegetable gardens in connection with their farms, as well as orchards of apple, plum, and cherry trees; some also raise grapes. Their hay crop consists of both wild and tame grasses.

All the farmers possess good American horses, while most of them have a small number of cattle, in addition to swine and chickens. Nearly all the Indian farmers reported small sales of live stock, and six also reported milk and butter.

IRRIGATION STATISTICS.

In many important agricultural conditions, the western part of Kansas differs materially from the eastern. The divergence is marked in the elevation, soil, and rainfall. That portion lying west of the one-hundredth meridian, and some parts extending east of it, belongs to the semi-arid region, where irrigation is necessary for the successful cultivation of most crops. Had these facts been appreciated earlier, much of the distress and many of the failures which have occurred in the development of the western part of the state, would have been obviated.

The history of irrigation in Kansas has been marked by a number of disastrous failures. Most of them resulted from a lack of knowledge of the climatic oscillation in the subhumid regions, and from a fever of speculation in western mortgages. During a cycle of wet years agriculture was extended far into the Plains region. The movement westward was greatly facilitated by companies which were formed to place loans and to take mortgages on real estate, the funds being obtained from the East. As long as the rainfall continued abundant, the profits of these loan agencies were great and the competition became so keen that ordinary prudence was thrown aside. When a series of dry years came, and no crops were made season after season, the land owners abandoned their farms, leaving whole counties practically deserted. The loan companies foreclosed their mortgages and became possessors of large tracts of land which were comparatively valueless.

These ditches and canals have never given adequate returns upon the large investments, owing to the fact that

no study had been made of the volume of water in the streams, or of any of the important conditions relating to the diversion of water from them. In order to make their property marketable, the corporations organized new companies, sold stock, and in the southwestern part of the state constructed some of the largest irrigation canals in the United States.

The water supply for most of these ditches was taken from the Arkansas River, but after a few years of drought it proved wholly inadequate for the purpose, and hundreds of miles of ditches had to be abandoned. The principal irrigated areas are along this river, where the conditions are somewhat similar to those along the Platte River in Nebraska. Its broad, shallow channel is dry for a considerable part of the year, but water is seeping beneath the surface of the valley lands as well as under the stream bed. The ditches that are operated at the present time can receive water only in times of flood, and are utilized largely in the cultivation of forage crops.

The reclamation of large areas of fertile and productive land depends upon the adoption and application of successful methods of utilizing the ground waters, which are found throughout western Kansas at varying depths. A partial solution of this problem has been found in the use of windmills and by building small storage reservoirs. The wind, which in the West has heretofore been regarded as an annoyance and a mischief maker, is harnessed and becomes a factor in promoting progress and development. Irrigation from windmills is no longer an experiment, and

to-day many farmers are depending for their living on the products of orchard and garden tracts irrigated by this means. In 1899 there were reported 599 farms irrigating 1,909 acres from wells. This acreage was mostly in gardens and orchards. The average cost of installing these plants is estimated at \$50 an acre.

Table A gives certain statistics relating to irrigation from streams and wells in 1899, with cost of construction of irrigation systems.

TABLE A.—IRRIGATION FROM STREAMS AND WELLS, IN 1899, WITH COST OF CONSTRUCTION OF IRRIGATION SYSTEMS.

| COUNTIES. | IRRIGATION FROM STREAMS. | | | IRRIGATION FROM WELLS. | | Cost of construction of irrigation systems. |
|--------------------|--------------------------|--------------------|--|------------------------|------------------|---|
| | Number of ditches. | Acreage irrigated. | Total length in miles of main ditches. | Number of wells. | Acres irrigated. | |
| The State | 107 | 21,711 | 824 | 599 | 1,909 | \$529,755 |
| Cheyenne | 6 | 568 | 69 | 4 | 13 | 106,220 |
| Clark | 4 | 1,120 | 14 | 6 | 9 | 14,315 |
| Finney | 4 | 8,482 | 60 | 77 | 457 | 102,225 |
| Gray | 3 | 495 | 8 | 1 | 1 | 1,950 |
| Hamilton | 11 | 1,877 | 14 | 7 | 37 | 9,050 |
| Kearny | 10 | 7,000 | 104 | 19 | 71 | 213,500 |
| Meade | 3 | 652 | 10 | 9 | 272 | 15,500 |
| Reno | 4 | 345 | 8 | 12 | 53 | 3,575 |
| Wallace | 14 | 458 | 17 | 10 | 21 | 5,900 |
| All other counties | 48 | 719 | 20 | 454 | 975 | 57,520 |

CHANGES BETWEEN 1889 AND 1899.

The following table shows the changes during the last decade in the number of irrigators and in the acreage irri-

gated for the state, and for a few of the chief irrigating counties.

TABLE B.—NUMBER OF IRRIGATORS AND ACREAGE IRRIGATED IN 1899 AND 1889, WITH PERCENTAGES OF INCREASE.

| COUNTIES. | NUMBER OF IRRIGATORS. | | | ACRES IRRIGATED. | | |
|---------------------|-----------------------|------|-----------------------|------------------|--------|-----------------------|
| | 1899 | 1889 | Per cent of increase. | 1899 | 1889 | Per cent of increase. |
| The State | 929 | 519 | 79.0 | 23,620 | 20,818 | 13.5 |
| Clark | 14 | 2 | 600.0 | 1,129 | 550 | 105.3 |
| Finney ¹ | 182 | 162 | 12.3 | 8,939 | 9,151 | ² 2.3 |
| Gray | 20 | 4 | 400.0 | 496 | 265 | 86.5 |
| Hamilton | 39 | 8 | 387.5 | 1,914 | 1,130 | 69.4 |
| Kearny | 88 | 91 | ² 3.3 | 7,071 | 5,218 | 35.5 |
| All others | 586 | 252 | 132.5 | 4,071 | 4,503 | ² 9.5 |

¹Including Garfield county, annexed in 1893.

²Decrease.

In 1889 there were 519 irrigators in the state, and in 1899, 929, an increase of 79.0 per cent. The total area irrigated in 1889 was 20,818 acres, and in 1899, 23,620 acres, an increase of 13.5 per cent. There has been a large increase in the number of irrigators, but not a corresponding increase in the number of acres irrigated. This is explained by the large increase in the number of farms which irrigate small areas by means of windmills and of water pumped from streams, and by a shortage of water for the ditches operated in 1899. The total value of irrigated products was \$226,453; hay and forage, \$154,257; cereals, \$10,109; vegetables, \$45,662; orchard fruits, \$11,315; small fruits, \$2,974; and other crops, \$2,136.

CENSUS BULLETIN.

No. 193.

WASHINGTON, D. C.

June 17, 1902.

AGRICULTURE.

NEBRASKA.

Hon. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture for the state of Nebraska, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes also the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of Nebraska, June 1, 1900, numbered 121,525, and were valued at \$577,660,020. Of this amount \$91,054,120, or 15.8 per cent, represents the value of buildings, and \$486,605,900, or 84.2 per cent, the value of land and improvements other than buildings. On the same date the value of farm implements and machinery was \$24,940,450, and that of live stock, \$145,349,587. These values, added to that of farms, give \$747,950,057, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on

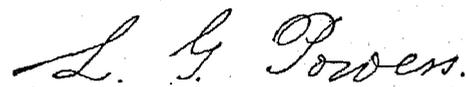
farms, are referred to in this bulletin as "animal products." The total value of such products, together with the value of all crops, is termed "total value of farm products." This value for 1899 was \$162,696,386, of which amount \$70,227,060, or 43.2 per cent, represents the value of animal products, and \$92,469,326, or 56.8 per cent, the value of crops, including forest products cut or produced on farms. The total value of farm products for 1899 exceeds that reported for 1889 by \$95,858,769, or 143.4 per cent.

The "gross farm income" is obtained by deducting from the total value of farm products the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was \$38,025,530, leaving \$124,670,856 as the gross farm income. The percentage which this latter amount is of the "total value of farm property" is termed the "percentage of gross income upon investment." For Nebraska in 1899 it was 16.7 per cent.

As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

The statistics presented in this bulletin will be treated in greater detail in the report on agriculture in the United States. The present publication is designed to present a summarized advance statement for Nebraska.

Very respectfully,



Chief Statistician for Agriculture.

AGRICULTURE IN NEBRASKA.

GENERAL STATISTICS.

Nebraska has a total land area of 76,840 square miles, or 49,177,600 acres, of which 29,911,779 acres, or 60.8 per cent, are included in farms.

The surface of Nebraska is a high, gently rolling prairie, which breaks into a few hills in the extreme west. The general slope of the state is toward the southeast, where the elevation above the waters of the Gulf of Mexico is about nine hundred feet. From this portion of the state the ascent is very gradual, both to the north, along the Missouri, and to the west to the foothills of the Rocky Mountains. The elevation of the entire western boundary of the state is about four thousand feet. The highest point, which is Scotts Bluff, is located a little south of where the North Platte River enters the state, and has an elevation of 6,000 feet.

The soil, which is very fertile, mellow, and easily tilled, consists of fine sand, mixed with clay and vegetable mold of considerable depth and unusual richness. In the three tiers of counties along the Missouri River, which forms a boundary for nearly five hundred miles, the glacial drift is found to some extent.

Nebraska is preeminently an agricultural state. The fertility of the soil is greatest in the eastern and west-central sections of the state, while the Bad Lands, located in the northwestern part, and traversed by the forks of the Cheyenne and White rivers, are not entirely barren. Since the soil throughout the state contains all the elements essential to agriculture, it requires comparatively little fertilizing.

NUMBER AND SIZE OF FARMS.

Table 1 gives, by decades since 1860, the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE 1.—FARMS AND FARM ACREAGE: 1860 TO 1900.

| YEAR. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | | Per cent of farm land improved. |
|-----------|------------------|---------------------------|------------|-------------|----------|---------------------------------|
| | | Total. | Improved. | Unimproved. | Average. | |
| 1860..... | 121,525 | 29,911,779 | 18,482,595 | 11,479,184 | 246.1 | 61.6 |
| 1870..... | 118,008 | 21,598,444 | 15,247,705 | 6,345,739 | 190.1 | 70.6 |
| 1880..... | 63,387 | 9,944,820 | 5,504,702 | 4,440,118 | 156.9 | 55.3 |
| 1890..... | 12,801 | 2,079,781 | 647,031 | 1,426,750 | 168.6 | 31.2 |
| 1900..... | 2,789 | 681,214 | 118,789 | 512,425 | 226.3 | 18.8 |

The number and area of farms has increased rapidly since 1860, the rates of increase since 1890 being 7.0 per

cent and 38.5 per cent, respectively. The establishment of extensive live-stock ranches in the western part of the state, and the cultivation of large corn-producing areas throughout the state have effected a substantial increase in the average size of farms since 1880. The development of the aforesaid industries has been so rapid that the division of farm holdings in the eastern half of the state, where the farms are more intensively cultivated, has not been sufficient to counteract the effect of the expansive movement in the western section. In the last decade this increase in the average size of farms was most marked. The acreage of improved farm land has increased each decade until the last, when, probably owing to a more strict definition of the term "improved" by the Twelfth Census than heretofore, a slight decrease is shown.

FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year, beginning with 1860.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF FARM PRODUCTS: 1860 TO 1900.

| YEAR. | Total value of farm property. | Land, improvements, and buildings. | Implements and machinery. | Live stock. | Farm products. ¹ |
|-------------------------|-------------------------------|------------------------------------|---------------------------|---------------|-----------------------------|
| 1900..... | \$747,950,057 | \$577,660,020 | \$24,940,450 | \$145,349,587 | \$162,696,386 |
| 1890..... | 511,799,810 | 402,858,913 | 16,468,977 | 92,971,920 | 66,837,617 |
| 1880..... | 147,193,723 | 105,332,541 | 7,820,917 | 33,440,265 | 31,708,914 |
| 1870 ² | 38,343,087 | 30,242,186 | 1,549,716 | 6,551,185 | 8,004,742 |
| 1860..... | 5,212,761 | 3,878,326 | 205,664 | 1,128,771 | ----- |

¹ For the year preceding that designated.

² Values for 1870 were reported in depreciated currency. To reduce to specie basis of other years they must be diminished one-fifth.

³ Includes betterments and additions to live stock.

Each decade since 1860 shows gains in the values of all forms of farm property. For the decade ending in 1900 the increases in values are as follows: All farm property, 46.1 per cent; farms, 43.6 per cent; implements and machinery, 51.4 per cent; live stock, 56.3 per cent. The value of farm products for 1899 was more than twice as great as that reported for 1889, but a part of this gain, and of that shown in implements and machinery, is doubtless due to a more detailed enumeration in 1900 than heretofore.

COUNTY STATISTICS.

Table 3 gives a statement of general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

| COUNTIES. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | Value of products not fed to live stock. | EXPENDITURES. | |
|--------------|------------------|-------------------|-----------------|------------|---|--------------|-----------------------------|---------------|--|---------------|----------------|
| | Total. | With build- ings. | Total. | Improved. | Land and improve- ments (ex- cept build- ings). | Buildings. | Imple- ments and machinery. | Live stock. | | Labor. | Fertill- zers. |
| The State | 121,525 | 114,587 | 29,911,779 | 18,482,595 | \$486,605,900 | \$91,054,120 | \$24,940,450 | \$145,349,587 | \$121,670,856 | \$7,399,160 | \$158,080 |
| Adams | 1,949 | 1,811 | 843,181 | 305,465 | 7,710,610 | 1,621,690 | 455,660 | 1,430,111 | 1,962,761 | 77,320 | 4,170 |
| Antelope | 1,745 | 1,677 | 470,885 | 819,855 | 5,949,450 | 1,235,550 | 398,350 | 2,052,604 | 1,739,742 | 77,440 | 5,720 |
| Banner | 226 | 224 | 205,797 | 18,359 | 944,530 | 127,780 | 34,620 | 688,055 | 184,086 | 7,140 | — |
| Blaine | 131 | 128 | 57,540 | 15,178 | 173,820 | 37,200 | 18,000 | 847,571 | 71,687 | 10,610 | 1,030 |
| Boone | 1,624 | 1,552 | 394,148 | 292,933 | 7,144,710 | 1,222,480 | 378,250 | 1,939,599 | 2,019,872 | 91,790 | 430 |
| Boxbutte | 484 | 479 | 866,888 | 50,358 | 784,560 | 129,640 | 60,170 | 1,068,817 | 889,796 | 26,110 | — |
| Boyd | 1,289 | 1,272 | 240,887 | 140,021 | 2,124,730 | 394,810 | 181,500 | 944,106 | 695,215 | 12,070 | — |
| Brown | 513 | 486 | 205,736 | 83,516 | 753,300 | 208,220 | 69,240 | 775,392 | 298,140 | 14,100 | 530 |
| Buffalo | 2,249 | 2,249 | 614,329 | 407,138 | 8,225,010 | 1,730,890 | 505,990 | 2,543,903 | 2,146,266 | 136,210 | 5,260 |
| Burt | 1,601 | 1,523 | 292,733 | 277,404 | 8,747,490 | 1,499,980 | 406,360 | 2,156,835 | 2,202,646 | 175,560 | 5,050 |
| Butler | 2,098 | 1,967 | 366,507 | 319,439 | 10,957,240 | 1,764,210 | 484,790 | 2,059,740 | 2,691,187 | 181,290 | 5,770 |
| Cass | 2,310 | 2,151 | 335,540 | 284,427 | 12,753,960 | 2,408,900 | 431,980 | 1,914,733 | 2,649,487 | 137,510 | — |
| Cedar | 1,731 | 1,654 | 410,625 | 307,023 | 8,450,520 | 1,559,100 | 469,170 | 2,370,010 | 1,906,046 | 108,050 | 2,860 |
| Chase | 484 | 467 | 209,627 | 189,377 | 886,110 | 189,300 | 55,060 | 858,362 | 817,028 | 27,680 | 20 |
| Cherry | 1,082 | 1,039 | 717,635 | 230,321 | 2,860,240 | 438,750 | 157,210 | 4,667,692 | 1,231,264 | 148,120 | 10,860 |
| Cheyenne | 712 | 698 | 412,834 | 87,684 | 1,366,790 | 391,950 | 105,250 | 1,006,002 | 416,052 | 54,850 | 1,910 |
| Clay | 2,087 | 1,946 | 359,604 | 305,064 | 8,902,570 | 1,636,730 | 498,210 | 1,534,253 | 1,969,807 | 38,880 | 640 |
| Colfax | 1,451 | 1,387 | 252,865 | 220,288 | 7,428,190 | 1,266,680 | 282,230 | 1,589,178 | 1,661,094 | 39,310 | 440 |
| Cuming | 1,857 | 1,779 | 364,065 | 332,802 | 11,276,540 | 2,123,340 | 708,900 | 2,620,943 | 2,281,966 | 135,820 | 8,320 |
| Custer | 3,366 | 3,161 | 1,251,757 | 634,538 | 8,008,330 | 1,396,250 | 618,180 | 3,850,009 | 2,403,040 | 146,250 | 500 |
| Dakota | 743 | 701 | 152,077 | 99,439 | 3,960,550 | 807,670 | 199,730 | 992,777 | 1,008,983 | 78,570 | 5,140 |
| Dawes | 693 | 678 | 491,768 | 81,041 | 1,056,640 | 234,460 | 79,280 | 1,150,355 | 423,325 | 27,020 | 110 |
| Dawson | 1,728 | 1,670 | 551,598 | 323,940 | 6,121,910 | 1,154,500 | 404,940 | 1,949,520 | 1,524,586 | 98,820 | 660 |
| Deuel | 510 | 499 | 400,731 | 76,586 | 1,605,470 | 281,880 | 92,510 | 2,568,165 | 572,021 | 64,440 | — |
| Dixon | 1,408 | 1,357 | 286,066 | 207,610 | 6,154,510 | 1,167,930 | 373,590 | 1,795,685 | 1,514,431 | 67,140 | 940 |
| Dodge | 1,390 | 1,743 | 828,830 | 291,866 | 12,645,530 | 2,385,870 | 488,700 | 2,462,559 | 2,866,362 | 496,610 | 2,330 |
| Douglas | 1,000 | 1,738 | 197,744 | 175,836 | 10,851,230 | 1,978,630 | 363,630 | 1,498,889 | 2,151,141 | 191,880 | 1,390 |
| Dundy | 472 | 449 | 254,463 | 90,041 | 853,000 | 1,149,900 | 57,590 | 1,754,155 | 294,002 | 16,560 | — |
| Fillmore | 2,155 | 2,022 | 365,862 | 308,820 | 8,789,500 | 1,617,610 | 431,820 | 1,499,681 | 2,035,866 | 94,130 | 8,430 |
| Franklin | 1,383 | 1,308 | 330,618 | 200,628 | 4,344,380 | 820,210 | 259,390 | 1,509,458 | 1,241,855 | 31,990 | — |
| Frontier | 1,574 | 1,480 | 554,708 | 267,925 | 3,236,420 | 679,680 | 277,000 | 1,451,819 | 1,141,584 | 47,900 | 1,090 |
| Furnas | 1,870 | 1,764 | 493,550 | 290,596 | 4,574,280 | 945,190 | 302,590 | 1,741,202 | 1,573,723 | 62,730 | 800 |
| Gage | 3,394 | 3,005 | 539,749 | 464,837 | 15,673,350 | 2,846,420 | 640,280 | 2,774,662 | 3,992,923 | 201,200 | 8,550 |
| Garfield | 869 | 869 | 106,470 | 48,591 | 595,300 | 110,240 | 45,890 | 500,377 | 142,346 | 8,620 | — |
| Gosper | 1,013 | 949 | 280,586 | 22,938 | 2,817,870 | 614,690 | 187,620 | 951,881 | 878,325 | 99,970 | 90 |
| Grant | 110 | 101 | 118,884 | 56,962 | 642,560 | 79,460 | 29,390 | 1,546,309 | 300,055 | 40,830 | — |
| Greeley | 864 | 833 | 267,597 | 184,445 | 2,450,100 | 543,070 | 170,690 | 1,049,777 | 819,906 | 81,060 | 2,050 |
| Hall | 1,617 | 1,537 | 322,088 | 259,450 | 6,171,710 | 1,367,830 | 309,930 | 1,551,165 | 1,397,522 | 119,490 | 120 |
| Hamilton | 2,049 | 1,936 | 841,119 | 305,779 | 8,137,780 | 1,765,580 | 436,020 | 1,948,844 | 2,202,001 | 96,040 | 1,200 |
| Harlan | 1,401 | 1,336 | 341,604 | 213,114 | 4,487,200 | 846,180 | 358,870 | 1,468,190 | 1,239,940 | 41,950 | 150 |
| Hayes | 567 | 545 | 286,556 | 85,648 | 788,090 | 184,680 | 82,940 | 704,090 | 878,153 | 17,710 | 1,580 |
| Hitchcock | 757 | 733 | 319,340 | 188,105 | 1,240,510 | 261,680 | 101,360 | 608,599 | 383,008 | 14,280 | — |
| Holt | 1,876 | 1,802 | 732,155 | 393,609 | 4,261,800 | 1,050,580 | 355,910 | 3,221,299 | 1,627,914 | 71,010 | 850 |
| Hooker | 51 | 46 | 31,442 | 7,587 | 74,340 | 8,320 | 5,820 | 438,462 | 82,200 | 9,450 | — |
| Howard | 1,486 | 1,440 | 341,120 | 198,822 | 4,478,040 | 1,017,410 | 306,610 | 1,527,665 | 1,358,076 | 78,060 | 210 |
| Jefferson | 2,081 | 1,898 | 350,254 | 278,445 | 8,198,030 | 1,650,130 | 421,220 | 2,093,078 | 2,311,682 | 118,570 | 3,380 |
| Johnson | 1,594 | 1,427 | 229,692 | 198,718 | 7,276,290 | 1,233,660 | 280,840 | 1,819,252 | 1,716,487 | 78,190 | 2,540 |
| Kearney | 1,509 | 1,484 | 312,301 | 266,017 | 5,873,320 | 1,241,660 | 844,230 | 1,328,958 | 1,438,827 | 75,690 | 120 |
| Keith | 303 | 298 | 402,626 | 74,399 | 1,259,730 | 119,810 | 45,960 | 1,195,742 | 260,626 | 25,350 | — |
| Keyapaha | 599 | 575 | 230,344 | 62,066 | 925,110 | 197,650 | 86,310 | 890,806 | 369,413 | 8,470 | 400 |
| Kimball | 112 | 107 | 157,894 | 8,388 | 263,760 | 99,390 | 18,340 | 703,225 | 251,771 | 19,600 | — |
| Knox | 2,141 | 2,046 | 545,176 | 313,706 | 7,639,950 | 1,403,190 | 441,760 | 2,436,916 | 1,844,463 | 100,230 | 1,420 |
| Lancaster | 3,585 | 3,242 | 514,419 | 445,114 | 17,442,020 | 2,776,060 | 614,070 | 8,584,819 | 8,584,819 | 193,140 | 9,790 |
| Lincoln | 1,458 | 1,426 | 601,993 | 227,349 | 3,253,980 | 693,960 | 228,200 | 1,929,551 | 922,402 | 95,100 | 1,770 |
| Logan | 184 | 180 | 102,865 | 36,408 | 515,600 | 58,390 | 40,460 | 372,623 | 190,438 | 14,490 | — |
| Loup | 259 | 254 | 86,424 | 35,181 | 554,570 | 89,410 | 47,390 | 387,844 | 186,601 | 10,200 | 10 |
| McPherson | 127 | 114 | 86,768 | 17,749 | 311,180 | 30,190 | 14,610 | 721,205 | 160,308 | 17,830 | — |
| Madison | 1,703 | 1,604 | 360,679 | 280,031 | 7,718,780 | 1,308,880 | 355,230 | 1,896,317 | 2,086,840 | 104,400 | 2,020 |
| Merrick | 1,201 | 1,201 | 290,881 | 266,205 | 5,260,980 | 1,056,590 | 287,480 | 2,076,290 | 1,885,637 | 80,220 | 7,340 |
| Nance | 1,142 | 1,048 | 270,625 | 196,008 | 5,339,590 | 840,710 | 233,340 | 2,069,292 | 1,838,838 | 124,930 | 470 |
| Nemaha | 1,738 | 1,624 | 237,075 | 214,686 | 9,278,830 | 1,478,850 | 349,650 | 1,410,863 | 1,946,519 | 119,080 | 110 |
| Nuckolls | 1,773 | 1,616 | 357,401 | 275,825 | 6,997,000 | 1,231,120 | 349,230 | 2,000,027 | 1,629,108 | 82,860 | 1,090 |
| Otoe | 2,424 | 2,282 | 377,995 | 337,995 | 13,969,550 | 2,460,640 | 509,610 | 2,163,140 | 2,907,205 | 180,510 | 7,190 |
| Pawnee | 1,649 | 1,531 | 205,479 | 187,476 | 5,429,880 | 1,328,560 | 306,720 | 1,691,721 | 1,679,641 | 68,890 | 1,620 |
| Perkins | 335 | 326 | 114,082 | 35,882 | 155,150 | 171,480 | 38,400 | 605,610 | 225,407 | 6,690 | — |
| Phelps | 1,452 | 1,379 | 336,481 | 261,182 | 5,671,330 | 1,292,620 | 393,820 | 1,532,199 | 1,264,827 | 72,400 | 750 |
| Pierce | 1,215 | 1,135 | 293,336 | 226,099 | 5,394,910 | 1,058,080 | 258,290 | 1,738,174 | 1,440,227 | 87,850 | — |
| Platte | 2,124 | 2,026 | 411,015 | 329,853 | 11,366,170 | 2,057,340 | 524,130 | 2,432,568 | 2,742,338 | 141,660 | 670 |
| Polk | 1,699 | 1,560 | 276,189 | 249,924 | 6,682,790 | 1,426,920 | 338,070 | 1,712,885 | 1,851,894 | 99,300 | 910 |
| Redwillow | 1,237 | 1,177 | 393,560 | 271,339 | 8,124,890 | 639,620 | 223,460 | 1,208,402 | 934,154 | 49,710 | 1,100 |
| Richardson | 2,415 | 2,264 | 333,329 | 291,888 | 12,390,780 | 2,238,300 | 438,460 | 2,483,498 | 2,556,787 | 183,450 | 2,960 |
| Rock | 475 | 458 | 237,187 | 115,737 | 1,182,200 | 265,810 | 73,670 | 885,006 | 298,284 | 82,020 | — |
| Saline | 2,229 | 2,206 | 361,891 | 296,823 | 10,307,880 | 1,894,610 | 479,260 | 1,767,389 | 2,300,837 | 103,210 | 190 |
| Sarpy | 1,075 | 1,030 | 141,190 | 123,682 | 5,778,000 | 923,820 | 205,360 | 959,494 | 1,241,890 | 185,620 | 1,830 |
| Saunders | 3,141 | 2,978 | 473,364 | 415,690 | 15,414,640 | 2,711,590 | 682,800 | 3,301,576 | 3,801,576 | 207,810 | 5,960 |
| Scotts Bluff | 421 | 404 | 174,082 | 39,490 | 992,730 | 189,780 | 88,970 | 921,352 | 835,681 | 80,180 | 160 |
| Seward | 2,285 | 2,165 | 359,565 | 315,418 | 9,958,610 | 1,879,950 | 466,420 | 1,937,302 | 2,454,486 | 182,270 | 5,480 |
| Sheridan | 955 | 921 | 717,242 | 186,021</ | | | | | | | |

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES—Continued.

| COUNTIES. | NUMBER OF FARMS. | | ACRES IN FARMS. | | VALUES OF FARM PROPERTY. | | | | Value of products not fed to live stock. | EXPENDITURES. | |
|------------|------------------|------------------|-----------------|-----------|--|-------------|----------------------------|-------------|--|---------------|----------------|
| | Total. | With build-ings. | Total. | Improved. | Land and improve-ments (ex-cept build-ings). | Buildings. | Imple-ments and machinery. | Live stock. | | Labor. | Fertill-izers. |
| Stanton | 1,123 | 1,029 | 270,602 | 211,841 | \$6,010,190 | \$1,036,800 | \$273,520 | \$1,593,812 | \$1,680,179 | \$99,700 | \$1,029 |
| Thayer | 2,033 | 1,847 | 853,684 | 294,879 | 8,018,410 | 1,467,660 | 370,660 | 1,680,695 | 1,835,718 | 74,700 | 160 |
| Thomas | 74 | 69 | 45,874 | 17,022 | 123,390 | 27,010 | 12,320 | 369,523 | 51,037 | 11,010 | |
| Thurston | 855 | 758 | 214,251 | 132,526 | 4,988,620 | 340,750 | 178,500 | 1,320,393 | 975,747 | 48,550 | 1,490 |
| Valley | 1,085 | 1,045 | 311,273 | 174,060 | 3,144,120 | 564,970 | 191,480 | 934,150 | 844,823 | 49,440 | |
| Washington | 1,572 | 1,519 | 239,763 | 198,994 | 8,586,990 | 1,819,400 | 441,000 | 1,719,531 | 1,941,513 | 159,820 | 1,750 |
| Wayne | 1,401 | 1,303 | 270,449 | 233,048 | 7,423,740 | 1,153,280 | 354,450 | 1,960,656 | 1,858,666 | 101,690 | 1,090 |
| Webster | 1,731 | 1,612 | 348,235 | 272,744 | 6,421,870 | 1,164,220 | 348,630 | 1,778,040 | 1,639,639 | 70,270 | 160 |
| Wheeler | 299 | 262 | 193,570 | 52,449 | 711,500 | 141,740 | 52,550 | 746,599 | 228,030 | 13,000 | |
| York | 2,240 | 2,118 | 372,307 | 324,771 | 9,936,500 | 1,987,000 | 505,640 | 1,851,347 | 2,345,737 | 114,400 | 1,450 |

Nearly two-thirds of the counties report increases in the number of farms in the last decade, notwithstanding the frequent and severe droughts which occurred between 1890 and 1900, causing the abandonment of many farms in the central and western counties.

The total farm acreage increased in every county except Saline, Cass, and Perkins. The decrease in improved acreage reported in some of the counties is probably due to the fact, already mentioned, that the term "improved" was more strictly defined by the Twelfth than by any previous census. The average size of farms for the state is 246.1 acres. In the western counties, owing to the number of live-stock farms, many of which are more than 1,000 acres in extent, the average size of farms is greater than in the eastern counties where general farming prevails.

The average value of farms for the state is \$4,753. In eleven counties in the northern part of the state, the value has more than doubled since 1890. Although decreased farm values are reported by a few western counties, increases in the value of implements and machinery are reported by nearly all counties. The average value of the implements and machinery was \$205 per farm. In the northern counties which showed the largest increases in farm values, the gain in the value of live stock was also large. In more than one-sixth of the counties this value doubled, and, in the remainder, except in a few southern counties which reported slight decreases, it increased noticeably.

The average expenditure for labor in 1899, which was \$61 for the state, varied greatly in the different counties. For fertilizers, the average expenditure per farm increased from \$0.17 in 1889 to \$1.26 in 1899. Most counties reported large increased expenditures.

FARM TENURE.

Table 4 gives a comparative exhibit of farm tenure for 1880, 1890, and 1900. Tenants are divided into two groups: "Cash tenants," who pay a rental in cash or a stated amount of labor or farm produce, and "share tenants," who pay as rental a stated share of the products.

In Table 5 the tenure of farms in 1900 is given by race of farmer. "Farms operated by owners" are subdivided into four groups designated as "owners," "part owners,"

"owners and tenants," and "managers." These groups comprise, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other or others owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1880 TO 1900.

| YEAR. | Total number of farms. | NUMBER OF FARMS OPERATED BY— | | | PER CENT OF FARMS OPERATED BY— | | |
|-------|------------------------|------------------------------|---------------|----------------|--------------------------------|---------------|----------------|
| | | Owners. ¹ | Cash tenants. | Share tenants. | Owners. ¹ | Cash tenants. | Share tenants. |
| 1900 | 121,525 | 76,715 | 11,599 | 33,211 | 63.1 | 9.6 | 27.3 |
| 1890 | 113,608 | 85,525 | 8,942 | 19,141 | 75.3 | 7.9 | 16.8 |
| 1880 | 68,887 | 51,963 | 1,948 | 9,476 | 82.0 | 3.1 | 14.9 |

¹ Including "part owners," "owners and tenants," and "managers."

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

| RACE. | Total number of farms. | Owners. | Part owners. | Owners and tenants. | Man-agers. | Cash tenants. | Share tenants. |
|-----------|------------------------|---------|--------------|---------------------|------------|---------------|----------------|
| The State | 121,525 | 51,911 | 22,518 | 1,154 | 1,132 | 11,599 | 33,211 |
| White | 121,196 | 51,654 | 22,501 | 1,153 | 1,128 | 11,535 | 33,175 |
| Colored | 329 | 257 | 17 | 1 | 4 | 14 | 36 |
| Chinese | 2 | 1 | | | | 1 | |
| Indian | 249 | 225 | 3 | | | 3 | 17 |
| Negro | 78 | 30 | 14 | 1 | 4 | 10 | 19 |

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

| The State | 100.0 | 42.7 | 18.5 | 1.0 | 0.9 | 9.6 | 27.3 |
|-----------|-------|------|------|-----|-----|-----|------|
| White | 100.0 | 42.6 | 18.6 | 0.9 | 0.9 | 9.6 | 27.4 |
| Colored | 100.0 | 78.1 | 5.2 | 0.8 | 1.2 | 4.3 | 10.0 |

In the last decade, when the total number of farms increased 7.0 per cent, the number operated by owners decreased 10.3 per cent, while that operated by tenants of either class increased noticeably. Corresponding relative

losses and gains are shown in the percentages of the total number of farms operated by owners, cash tenants, and share tenants, respectively.

Of the total number of farms in 1900, 99.7 per cent were operated by white farmers, and 0.3 per cent by colored farmers. The percentage of farms operated by owners is relatively greater for colored than for white farmers, owing to the fact that the Indians, who constitute more than two-thirds of the "colored" class, possess land allotted them by the Government.

No previous census has reported the number of farms operated by "part owners," "owners and tenants," or "managers," but it is believed that the number of farms conducted by the last-named class is constantly increasing.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

| RACE OF FARMER, AND TENURE. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------------|------------------|---------------------------|------------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State ----- | 121,525 | 246.1 | 29,911,779 | 100.0 | \$747,950,057 | 100.0 |
| White farmers ----- | 121,196 | 246.4 | 29,865,094 | 99.8 | 747,010,547 | 99.9 |
| Negro farmers ----- | 78 | 193.2 | 15,087 | 0.1 | 278,081 | (2) |
| Indian farmers ¹ ----- | 251 | 126.3 | 81,708 | 0.1 | 661,429 | 0.1 |
| Owners ----- | 51,911 | 219.9 | 11,417,248 | 38.2 | 317,183,817 | 42.4 |
| Part owners ----- | 22,518 | 384.4 | 8,656,029 | 28.9 | 162,191,190 | 21.7 |
| Owners and tenants ----- | 1,154 | 330.5 | 381,408 | 1.3 | 8,301,130 | 1.1 |
| Managers ----- | 1,132 | 1,194.9 | 1,352,589 | 4.5 | 27,538,970 | 3.7 |
| Cash tenants ----- | 11,599 | 181.8 | 2,108,673 | 7.1 | 66,628,920 | 8.9 |
| Share tenants ----- | 83,211 | 180.5 | 5,995,832 | 20.0 | 166,106,080 | 22.2 |

¹Including 2 Chinese.

²Less than one-tenth of 1 per cent.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

| RACE OF FARMER, AND TENURE. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State ----- | \$4,004 | \$750 | \$205 | \$1,196 | \$1,026 | 16.7 |
| White farmers ----- | 4,009 | 751 | 206 | 1,198 | 1,028 | 16.7 |
| Negro farmers ----- | 2,239 | 324 | 123 | 879 | 546 | 15.3 |
| Indian farmers ¹ ----- | 2,068 | 255 | 108 | 210 | 149 | 5.6 |
| Owners ----- | 3,839 | 915 | 199 | 1,157 | 992 | 16.2 |
| Part owners ----- | 4,428 | 773 | 254 | 1,748 | 1,237 | 17.2 |
| Owners and tenants ----- | 4,636 | 945 | 265 | 1,347 | 1,201 | 16.7 |
| Managers ----- | 12,029 | 1,977 | 360 | 9,356 | 6,188 | 25.4 |
| Cash tenants ----- | 4,056 | 556 | 183 | 949 | 886 | 15.4 |
| Share tenants ----- | 3,642 | 492 | 182 | 686 | 788 | 16.0 |

¹Including 2 Chinese.

More than 60 per cent of the farms in the state are operated by owners and part owners, about three-fifths of the total farm acreage and of the total value of farm property being accredited to these two classes. However, the average size, the average values of all forms of farm property, and the per cent of gross income are greater for farms operated by managers than for any other group. These conditions are due, in part, to the fact that many of these farms are large stock farms, while others are adjuncts to public institutions.

Among the colored farmers the Indians outnumber the negroes, but the average acreage, and the average value of farm property, as well as the per cent of gross income, are greater for the latter.

FARMS CLASSIFIED BY AREA.

Tables 8 and 9 present the principal statistics for farms classified by area.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

| AREA. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|----------------------------|------------------|---------------------------|------------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State ----- | 121,525 | 246.1 | 29,911,779 | 100.0 | \$747,950,057 | 100.0 |
| Under 3 acres ----- | 530 | 2.4 | 1,293 | (1) | 1,088,320 | 0.1 |
| 3 to 9 acres ----- | 1,342 | 6.7 | 8,999 | (1) | 2,154,840 | 0.3 |
| 10 to 19 acres ----- | 1,635 | 12.8 | 20,911 | 0.1 | 2,955,599 | 0.4 |
| 20 to 49 acres ----- | 5,243 | 35.2 | 184,424 | 0.6 | 11,804,230 | 1.5 |
| 50 to 99 acres ----- | 17,979 | 76.0 | 1,367,012 | 4.6 | 57,283,490 | 7.7 |
| 100 to 174 acres ----- | 46,109 | 151.3 | 6,978,190 | 23.3 | 221,902,527 | 30.1 |
| 175 to 259 acres ----- | 17,855 | 216.1 | 3,858,463 | 12.9 | 124,068,650 | 17.2 |
| 260 to 499 acres ----- | 22,416 | 357.2 | 8,006,863 | 26.8 | 189,058,210 | 25.3 |
| 500 to 999 acres ----- | 6,052 | 685.9 | 4,150,909 | 13.9 | 69,880,260 | 9.3 |
| 1,000 acres and over ----- | 2,364 | 2,256.6 | 5,334,715 | 17.8 | 60,747,440 | 8.1 |

¹Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

| AREA. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|----------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State ----- | \$4,004 | \$750 | \$205 | \$1,196 | \$1,026 | 16.7 |
| Under 3 acres ----- | 432 | 524 | 47 | 1,051 | 442 | 21.5 |
| 3 to 9 acres ----- | 677 | 639 | 61 | 229 | 308 | 19.2 |
| 10 to 19 acres ----- | 843 | 635 | 65 | 265 | 281 | 15.6 |
| 20 to 49 acres ----- | 1,249 | 490 | 86 | 331 | 395 | 18.3 |
| 50 to 99 acres ----- | 2,129 | 481 | 129 | 447 | 542 | 17.0 |
| 100 to 174 acres ----- | 3,285 | 636 | 192 | 765 | 806 | 16.5 |
| 175 to 259 acres ----- | 4,978 | 912 | 259 | 1,080 | 1,164 | 16.1 |
| 260 to 499 acres ----- | 5,629 | 969 | 245 | 1,591 | 1,560 | 16.2 |
| 500 to 999 acres ----- | 7,018 | 1,081 | 335 | 3,031 | 1,801 | 15.7 |
| 1,000 acres and over ----- | 12,812 | 1,600 | 404 | 10,881 | 5,194 | 20.2 |

The relative frequency of quarter-section holdings is evident from the fact that the group of farms containing 100 to 174 acres each comprised more than one-third of all those in the state, and represented nearly one-fourth of the total acreage and one-third of the total value of all farm property in the state.

With few exceptions the average values of all forms of farm property increase with the size of the farms. The relatively high average value of live stock, and the high average gross income for farms under 3 acres are due to the fact that this class comprises for the most part dairy and truck farms supplying city markets, and includes 25 of the 38 florists' establishments in the state. For these industries the incomes depend less upon the acreage used than upon the amount invested in buildings, implements, and live stock, and the amount expended for labor and fertilizers.

The average gross incomes per acre for the various groups classified by area, are as follows: Farms under 3 acres, \$181.33; 3 to 9 acres, \$45.97; 10 to 19 acres, \$21.99; 20 to 49 acres, \$11.24; 50 to 99 acres, \$7.13; 100 to 174 acres, \$5.32; 175 to 259 acres, \$5.39; 260 to 499 acres, \$5.83; 500 to 999 acres, \$2.63; 1,000 acres and over, \$2.80.

FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 10 and 11 the farms are classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is designated a "hay and grain" farm. If vegetables are the leading crop, constituting 40 per cent of the value of the products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive 40 per cent of their income from any one class of farm products. Farms reporting no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

| PRINCIPAL SOURCE OF INCOME. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|-----------------------------|------------------|---------------------------|------------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 121,525 | 246.1 | 29,911,779 | 100.0 | \$747,950,057 | 100.0 |
| Hay and grain..... | 59,509 | 192.9 | 11,477,161 | 38.4 | 350,640,840 | 46.9 |
| Vegetables..... | 978 | 90.6 | 88,648 | 0.3 | 2,844,230 | 0.4 |
| Fruits..... | 285 | 46.6 | 13,281 | (1) | 1,022,060 | 0.1 |
| Live stock..... | 53,895 | 317.8 | 17,128,839 | 57.3 | 367,390,827 | 49.1 |
| Dairy produce..... | 2,883 | 216.8 | 614,328 | 2.1 | 11,567,430 | 1.6 |
| Sugar..... | 101 | 122.2 | 12,339 | (1) | 514,300 | 0.1 |
| Flowers and plants..... | 38 | 6.3 | 241 | (1) | 248,805 | (1) |
| Nursery products..... | 44 | 90.3 | 3,975 | (1) | 802,910 | (1) |
| Miscellaneous..... | 3,842 | 149.1 | 672,967 | 1.9 | 13,418,655 | 1.8 |

¹ Less than one-tenth of 1 per cent.

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

| PRINCIPAL SOURCE OF INCOME. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|-----------------------------|---|------------|---------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implements and machinery. | Live stock. | | |
| The State..... | \$4,004 | \$750 | \$205 | \$1,196 | \$1,026 | 16.7 |
| Hay and grain..... | 4,219 | 658 | 199 | 816 | 891 | 15.1 |
| Vegetables..... | 1,908 | 499 | 110 | 391 | 610 | 21.0 |
| Fruits..... | 2,341 | 860 | 85 | 810 | 487 | 13.6 |
| Live stock..... | 4,030 | 873 | 225 | 1,689 | 1,254 | 18.4 |
| Dairy produce..... | 2,852 | 567 | 180 | 1,034 | 499 | 10.8 |
| Sugar..... | 3,671 | 640 | 152 | 629 | 1,008 | 19.8 |
| Flowers and plants..... | 3,061 | 3,194 | 222 | 71 | 3,349 | 51.2 |
| Nursery products..... | 4,993 | 1,518 | 161 | 212 | 6,528 | 80.3 |
| Miscellaneous..... | 2,183 | 590 | 125 | 595 | 427 | 12.2 |

For the several classes of farms the average values per acre of all products not fed to live stock are as follows: Farms whose operators derive their principal income from flowers and plants, \$528.13; nursery products, \$61.20; fruits, \$10.46; sugar, \$8.25; vegetables, \$6.73; hay and grain, \$4.62; live stock, \$3.95; miscellaneous, \$2.87; dairy, \$2.03. In computing these averages the total acreage is used, and not the acreage devoted to the crop from which the principal income is derived. The wide variations in the averages and percentages of gross income are due largely to the fact that no deductions from the gross income are made for expenditures. For florists' establishments and nurseries, the average expenditure for such items as labor and fertilizers represents a far greater percentage of the gross income than in the case of "live-stock" and "miscellaneous" farms. If it were possible to present the average net income, the variations shown would be comparatively slight.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by the reported gross income, or value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | Number of farms. | NUMBER OF ACRES IN FARMS. | | | VALUE OF FARM PROPERTY. | |
|--|------------------|---------------------------|------------|-----------|-------------------------|-----------|
| | | Average. | Total. | Per cent. | Total. | Per cent. |
| The State..... | 121,525 | 246.1 | 29,911,779 | 100.0 | \$747,950,057 | 100.0 |
| \$0..... | 1,245 | 301.9 | 375,907 | 1.3 | 6,327,030 | 0.8 |
| \$1 to \$49..... | 1,238 | 162.1 | 200,688 | 0.7 | 2,587,710 | 0.4 |
| \$50 to \$99..... | 2,359 | 153.5 | 362,055 | 1.2 | 4,725,770 | 0.6 |
| \$100 to \$249..... | 9,287 | 165.8 | 1,539,639 | 5.1 | 22,114,230 | 3.0 |
| \$250 to \$499..... | 20,558 | 176.4 | 3,807,294 | 12.1 | 64,288,625 | 8.6 |
| \$500 to \$999..... | 41,507 | 200.2 | 8,307,789 | 27.8 | 199,238,010 | 26.6 |
| \$1,000 to \$2,499..... | 33,998 | 274.4 | 10,690,253 | 35.8 | 324,570,832 | 43.4 |
| \$2,500 and over..... | 6,333 | 757.8 | 4,799,154 | 16.0 | 121,037,820 | 16.0 |

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

| VALUE OF PRODUCTS NOT FED TO LIVE STOCK. | AVERAGE VALUES PER FARM OF— | | | | | Per cent of gross income on total investment in farm property. |
|--|---|------------|--------------------------------|-------------|--|--|
| | Farm property, June 1, 1900. | | | | Gross income (products of 1899 not fed to live stock). | |
| | Land and improvements (except buildings). | Buildings. | Implementations and machinery. | Live stock. | | |
| The State | \$4,004 | \$750 | \$205 | \$1,196 | \$1,035 | 18.7 |
| \$0 | 2,568 | 187 | 61 | 2,266 | 37 | 1.4 |
| \$1 to \$49 | 1,134 | 268 | 64 | 629 | 66 | 3.3 |
| \$50 to \$99 | 1,108 | 279 | 67 | 549 | 70 | 7.1 |
| \$100 to \$249 | 1,373 | 336 | 91 | 581 | 170 | 14.3 |
| \$250 to \$499 | 1,971 | 421 | 123 | 612 | 268 | 14.3 |
| \$500 to \$999 | 5,182 | 618 | 180 | 822 | 1,396 | 16.8 |
| \$1,000 to \$2,499 | 5,612 | 1,027 | 278 | 1,406 | 1,396 | 16.8 |
| \$2,500 and over | 11,373 | 1,946 | 468 | 5,299 | 5,104 | 26.1 |

In view of the fact that about half the farms reporting no income for 1899 were owned farms between 100 and 175 acres in size, it is probable that this class included many homesteads taken up too late for cultivation that year. Some were live-stock farms on which the stock ranged during the entire year, and the crops of others were failures on account of drought or other unusual conditions. There were some farms, also, from which no reports of the products could be secured, as the persons in charge, June 1, 1900, did not operate them in 1899 and could give no information concerning the products of that year. To this extent the reports fall short of giving a complete statement of farm products in 1899.

LIVE STOCK.

At the request of the various live-stock associations of the country, a new classification of domestic animals was adopted for the Twelfth Census. The age grouping for neat cattle was determined by their present and prospective relations to the dairy industry and the supply of meat products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

| LIVE STOCK. | Age in years. | ON FARMS. | | | NOT ON FARMS. Number. |
|-------------------------------------|---------------|-----------|-------------|----------------|--------------------------|
| | | Number. | Value. | Average value. | |
| Calves | Under 1 | 754,500 | \$8,757,661 | \$11.61 | 5,027 |
| Steers | 1 and under 2 | 401,153 | 9,303,685 | 23.19 | 1,683 |
| Steers | 2 and under 3 | 317,360 | 10,991,720 | 34.63 | 1,068 |
| Steers | 3 and over | 119,599 | 5,690,337 | 47.58 | 4,349 |
| Bulls | 1 and over | 51,791 | 2,567,433 | 49.57 | 422 |
| Heifers | 1 and under 2 | 345,275 | 7,413,317 | 21.47 | 2,000 |
| Cows kept for milk | 2 and over | 512,544 | 17,192,120 | 33.54 | 26,512 |
| Cows and heifers not kept for milk. | 2 and over | 674,025 | 20,552,720 | 30.49 | 1,868 |
| Colts | Under 1 | 66,776 | 1,284,984 | 19.24 | 1,517 |
| Horses | 1 and under 2 | 73,082 | 2,310,583 | 31.70 | 1,271 |
| Horses | 2 and over | 655,460 | 33,061,792 | 50.44 | 65,333 |
| Mule colts | Under 1 | 6,201 | 182,875 | 29.49 | 398 |
| Mules | 1 and under 2 | 6,671 | 239,356 | 35.89 | 160 |
| Mules | 2 and over | 42,252 | 2,695,229 | 63.79 | 2,242 |
| Asses and burros | All ages | 732 | 116,756 | 159.59 | 508 |
| Lambs | Under 1 | 175,323 | 330,358 | 1.88 | 185 |
| Sheep (ewes) | 1 and over | 279,073 | 1,102,871 | 3.95 | 5,401 |
| Sheep (rams and wethers) | 1 and over | 56,877 | 245,269 | 4.31 | 492 |
| Swine | All ages | 4,128,000 | 18,660,932 | 4.52 | 93,094 |
| Goats | All ages | 2,399 | 9,126 | 3.80 | 384 |
| Fowls: | | | | | |
| Chickens ² | | 7,417,837 | | | |
| Turkeys | | 113,892 | | | |
| Geese | | 74,007 | | | |
| Ducks | | 201,503 | | | |
| Bees (swarms of) | | 52,143 | 199,563 | 3.83 | |
| Unclassified | | | 5,465 | | |
| Value of all live stock. | | | 145,349,587 | | |

¹The number reported is of fowls over 3 months old. The value is of all, old and young.

²Including Guinea fowls.

The value of all live stock on farms, June 1, 1900, was \$145,349,587. Of this amount, 44.9 per cent represents the value of neat cattle other than dairy cows; 25.2 per cent, that of horses; 12.9 per cent, that of swine; 11.8 per cent, that of dairy cows; 2.2 per cent, that of mules; 1.6 per cent, that of poultry; 1.2 per cent, that of sheep; and 0.2 per cent, that of all other live stock.

At the time of the enumeration the prices of all neat cattle were high owing to the great demand for beef cattle then prevalent. Nearly 70.0 per cent of the value of animal products in 1899 was received from the sale of live animals.

No reports were secured of the value of live stock not on farms, but it is probable that such animals have higher average values than those on farms. If the same averages are allowed, the value of all live stock not on farms would be \$5,420,843, and the total value of live stock in the

state, exclusive of poultry and bees not on farms, is approximately \$150,770,430.

The number of horses two years old and over, kept in towns and cities, is more than one-tenth of the number used in agricultural operations. Nearly one-half the total number of domestic animals in the state are swine, the average number per farm being 35.

CHANGES IN LIVE STOCK ON FARMS.

The following table shows the changes since 1860 in the numbers of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS: 1860 TO 1900.

| YEAR. | Dairy cows. | Other neat cattle. | Horses. | Mules and asses. | Sheep. ¹ | Swine. |
|-------|-------------|--------------------|---------|------------------|---------------------|-----------|
| 1900 | 512,544 | 2,668,699 | 795,318 | 55,856 | 385,950 | 4,128,000 |
| 1890 | 505,045 | 1,637,552 | 626,789 | 46,512 | 209,243 | 3,815,647 |
| 1880 | 161,187 | 597,363 | 204,364 | 19,999 | 199,453 | 1,241,724 |
| 1870 | 28,940 | 50,988 | 30,511 | 2,632 | 22,725 | 59,449 |
| 1860 | 6,995 | 30,202 | 4,449 | 469 | 2,355 | 25,369 |

¹Lambs not included.

Table 15 shows an uninterrupted progress in the live-stock industry for the forty years succeeding 1860. Increases from decade to decade are indicated in the numbers of every class. From 1890 to 1900 the numbers of domestic animals increased as follows: Neat cattle, other than dairy cows, 62.7 per cent; sheep, 60.6 per cent; horses, 26.9 per cent; mules and asses, 20.1 per cent; swine, 8.2 per cent; and dairy cows, 1.5 per cent. The small percentage of increase in the number of dairy cows is probably due to a difference between the methods of enumeration employed in 1890 and 1900. In the latter year, doubtless, many milch cows dry at the time of enumeration, and cows milked at some time during the year, though not "kept for milk" primarily, were included in the group "cows and heifers not kept for milk," while in 1890 the term "dairy cows" was less restricted. The very large percentage of increase in the number of "other neat cattle" is probably due in part to the fact that 754,500 calves are included in this class, while it is uncertain whether calves were reported under this head in 1890.

In comparing the poultry report of 1900 (see Table 14) with that of 1890, it should be borne in mind that in 1900 the enumerators were instructed to report no fowls under three months old, while in 1890 no such limitation was made. This fact explains to a great extent the apparently small increases of 6.0 per cent and 0.3 per cent, respectively, in the numbers of chickens and geese, and the decreases of 45.6 per cent and 26.7 per cent, respectively, in the numbers of turkeys and ducks. The fact that nearly twice as many eggs were reported in 1900 as in 1890 tends to confirm the statement that these decreases were only apparent.

ANIMAL PRODUCTS.

Table 16 is a summarized statement of the animal products of agriculture.

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS, IN 1899.

| PRODUCTS. | Unit of measure. | Quantity. | Value. |
|----------------------|------------------|--------------------------|-------------|
| Wool | Pounds | 2,788,839 | \$426,311 |
| Mohair and goat hair | Pounds | 5,801 | 1,725 |
| Milk | Gallons | ¹ 190,477,911 | \$8,595,408 |
| Butter | Pounds | 34,518,659 | |
| Cheese | Pounds | 264,480 | 4,668,002 |
| Eggs | Dozens | 41,132,140 | |
| Poultry | | | 3,499,614 |
| Honey | Pounds | 866,200 | 105,676 |
| Wax | Pounds | 16,090 | |
| Animals sold | | | 49,022,401 |
| Animals slaughtered | | | 4,568,457 |
| Total | | | 70,227,060 |

¹ Comprises all milk produced, whether sold, consumed, or made into butter or cheese.

² Comprises the value of milk sold and consumed, and of butter and cheese made.

The value of the animal products of the state in 1899 was \$70,227,060, or 48.2 per cent of the value of all farm products, and 56.3 per cent of the gross farm income. Of the total value, 69.8 per cent represents the value of animals sold; 6.4 per cent, that of animals slaughtered on farms; 12.2 per cent, that of dairy products; 10.8 per cent, that of poultry and eggs; 0.6 per cent, that of wool, mohair, and goat hair; and 0.2 per cent, that of honey and wax.

ANIMALS SOLD AND ANIMALS SLAUGHTERED.

The value of animals sold and animals slaughtered on farms in 1899 was \$53,530,861, or 42.9 per cent of the gross farm income. Of all farmers reporting live stock, 94,486, or 79.4 per cent, report sales of live animals, the average receipts per farm being \$518.83. Animals slaughtered are reported by 93,874 farmers, or 78.9 per cent of all those reporting live stock. The average value per farm was \$48.03. In obtaining these reports, the enumerators were instructed to secure from each farmer a statement of the amount received from sales in 1899, less the amount paid for animals purchased during the year.

DAIRY PRODUCTS.

Of the \$8,595,408 given in Table 16 as the value of dairy products, \$4,137,009, or 48.1 per cent, represents the value of such products consumed on farms, and \$4,458,399, or 51.9 per cent, the amount realized from sales. Of the latter amount, \$2,393,089 was received from the sale of 18,236,897 pounds of butter; \$1,664,741, from 23,492,560 gallons of milk; \$379,188, from 885,056 gallons of cream; and \$21,381, from 214,873 pounds of cheese.

In 1899, 45,709,648 gallons more milk were produced than in 1889, a gain of 31.6 per cent. In the same time the amount of butter produced on farms increased 24.1 per cent, while that of cheese produced on farms decreased 48.0 per cent. Lancaster county leads in the production of milk and butter, Douglas in sales of milk, and Holt in sales of cream; Platte and Pierce counties produce nearly one-third of the cheese made on farms in the state.

POULTRY AND EGGS.

Lancaster, Saline, Saunders, Gage, and Otoe counties each reported more than a million dozen eggs produced in 1899, while the production for the state was 41,182,140 dozens, an increase of 76.5 per cent over that of 1889. Of the \$7,567,046 given as the value of poultry products, 53.8 per cent represents the value of eggs, and 46.2 per cent, that of poultry raised in 1899.

WOOL.

The production of wool for 1899 was more than double that of any previous census year, and more than three times as great as in 1889. The largest quantities reported were from Hall, Kimball, Sheridan, and Dawes counties. The average weight of fleeces in 1889 was 6.7 pounds, and in 1899, 6.8 pounds.

HONEY AND WAX.

In 1900, 12,130 farmers reported bees. The production of honey for 1899 was 866,200 pounds, 16.1 per cent more than that of 1889, and that of wax was more than twice the quantity reported ten years before.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

| CLASSES. | HORSES. | | | DAIRY COWS. | | |
|----------------------------------|------------------|---------|-------------------|------------------|---------|-------------------|
| | Farms reporting. | Number. | Average per farm. | Farms reporting. | Number. | Average per farm. |
| Total..... | 116,129 | 795,818 | 6.8 | 105,918 | 512,544 | 4.8 |
| White farmers..... | 115,811 | 793,346 | 6.9 | 105,821 | 512,292 | 4.8 |
| Colored farmers..... | 318 | 1,972 | 6.2 | 92 | 252 | 2.7 |
| Owners ¹ | 72,725 | 544,202 | 7.5 | 68,854 | 369,673 | 5.4 |
| Managers..... | 1,026 | 18,564 | 18.1 | 819 | 4,256 | 5.2 |
| Cash tenants..... | 10,952 | 68,611 | 5.8 | 9,620 | 42,436 | 4.4 |
| Share tenants..... | 31,426 | 168,941 | 5.4 | 26,620 | 96,179 | 3.6 |
| Under 20 acres..... | 2,641 | 7,046 | 2.7 | 2,288 | 5,618 | 2.5 |
| 20 to 99 acres..... | 20,818 | 77,498 | 3.7 | 17,060 | 50,993 | 3.0 |
| 100 to 174 acres..... | 45,026 | 238,357 | 5.3 | 40,822 | 170,350 | 4.2 |
| 175 to 259 acres..... | 17,465 | 121,128 | 6.9 | 16,814 | 89,213 | 5.3 |
| 260 acres and over..... | 30,179 | 351,289 | 11.6 | 28,929 | 196,370 | 6.8 |
| Hay and grain..... | 56,042 | 322,956 | 5.8 | 48,992 | 197,843 | 4.0 |
| Vegetable..... | 845 | 3,173 | 3.8 | 567 | 1,411 | 2.5 |
| Fruit..... | 176 | 521 | 3.0 | 134 | 313 | 2.4 |
| Live stock..... | 52,705 | 485,357 | 8.3 | 50,401 | 277,869 | 5.5 |
| Dairy..... | 2,675 | 15,563 | 5.8 | 2,833 | 23,611 | 8.3 |
| Miscellaneous ² | 3,686 | 17,748 | 4.8 | 2,986 | 11,492 | 3.8 |

¹Including "part owners" and "owners and tenants."
²Including florists' establishments and nurseries.

CROPS.

The following table gives the statistics of the principal crops of 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

| CROPS. | Acres. | Unit of measure. | Quantity. | Value. |
|-------------------------------|------------|------------------|-------------|--------------|
| Corn..... | 7,335,187 | Bushels..... | 210,974,740 | \$51,251,213 |
| Wheat..... | 2,588,949 | Bushels..... | 24,924,520 | 11,877,347 |
| Oats..... | 1,924,827 | Bushels..... | 58,007,140 | 11,333,393 |
| Barley..... | 92,098 | Bushels..... | 2,034,910 | 545,482 |
| Rye..... | 178,920 | Bushels..... | 1,301,820 | 712,759 |
| Buckwheat..... | 980 | Bushels..... | 8,629 | 6,109 |
| Flaxseed..... | 7,662 | Bushels..... | 54,394 | 58,793 |
| Kafir corn..... | 742 | Bushels..... | 13,607 | 5,189 |
| Clover seed..... | | Bushels..... | 8,156 | 37,332 |
| Grass seed..... | | Bushels..... | 41,816 | 32,450 |
| Hay and forage..... | 2,823,662 | Tons..... | 3,517,495 | 11,230,901 |
| Chicory..... | 124 | Pounds..... | 1,314,000 | 4,057 |
| Tobacco..... | 14 | Pounds..... | 5,765 | 610 |
| Hemp..... | 638 | Pounds..... | 305,400 | 10,752 |
| Hops..... | | Pounds..... | 50 | 4 |
| Broom corn..... | 6,627 | Pounds..... | 2,733,290 | 106,252 |
| Peanuts..... | 11 | Bushels..... | 221 | 256 |
| Dry beans..... | 887 | Bushels..... | 7,669 | 12,805 |
| Dry pease..... | 126 | Bushels..... | 1,586 | 2,041 |
| Potatoes..... | 79,901 | Bushels..... | 7,817,438 | 1,734,666 |
| Sweet potatoes..... | 551 | Bushels..... | 48,224 | 27,933 |
| Onions..... | 488 | Bushels..... | 84,628 | 55,159 |
| Miscellaneous vegetables..... | 34,044 | | | 1,883,470 |
| Sorghum cane..... | 4,778 | Tons..... | 12,802 | 41,824 |
| Sorghum sirup..... | | Gallons..... | 92,413 | 32,993 |
| Sugar beets..... | 8,662 | Tons..... | 62,470 | 222,258 |
| Small fruits..... | 1,171 | | | 98,159 |
| Grapes..... | 12,766 | Centals..... | 31,710 | \$74,707 |
| Orchard fruits..... | 104,486 | Bushels..... | | \$684,751 |
| Nuts..... | | | | 1,595 |
| Forest products..... | | | | 412,746 |
| Flowers and plants..... | 86 | | | 142,636 |
| Seeds..... | 2,278 | | | 77,495 |
| Nursery products..... | 1,594 | | | 234,033 |
| Miscellaneous..... | 1,719 | | | 23,206 |
| Total..... | 15,153,956 | | | \$92,469,326 |

¹Estimated from number of vines or trees.
²Including value of raisins, wine, etc.
³Including value of cider, vinegar, etc.

The total number of acres devoted to crops in 1899 was 15,153,956 and the total value \$92,469,326. Of these items, the major portion was contributed by cereals, and hay and forage. Of the total acreage, 79.7 per cent was devoted to cereals, including Kafir corn, and 18.6 per cent to hay and forage. Of the total value, 81.9 per cent is the value of cereals, including Kafir corn, and 12.1 per cent that of hay and forage. The percentages of the total value furnished by the remaining crops are as follows: Vegetables, including potatoes, sweet potatoes, and onions, 3.5 per cent; fruits, nuts, and forest products, 1.4 per cent; and all other products, 1.1 per cent.

The average values per acre of the various crops were as follows: Flowers and plants, \$1,658.56; onions, \$118.03; small fruits, \$83.82; vegetables, including sweet potatoes, \$40.80; potatoes, \$21.71; cereals, including Kafir corn, \$6.27; and hay and forage, \$3.98. The crops yielding the highest returns per acre were grown upon very highly improved land. Their production, therefore, required a relatively great amount of labor and large expenditures for fertilizers.

CEREALS.

Table 19 is an exhibit of the changes in cereal production since 1859.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS:
1859 TO 1899.
PART 1.—ACREAGE.

| YEAR. ¹ | Barley. | Buck-wheat. | Corn. | Oats. | Rye. | Wheat. |
|--------------------|---------|-------------|-----------|-----------|---------|-----------|
| 1899 ----- | 92,098 | 980 | 7,895,187 | 1,924,827 | 178,920 | 2,538,949 |
| 1889 ----- | 82,590 | 15,358 | 5,480,279 | 1,503,515 | 81,372 | 798,855 |
| 1879 ----- | 115,201 | 1,666 | 1,690,660 | 250,457 | 31,297 | 1,469,865 |

¹No statistics of acreage were secured prior to 1879.

PART 2.—BUSHELS PRODUCED.

| YEAR. | Barley. | Buck-wheat. | Corn. | Oats. | Rye. | Wheat. |
|------------|-----------|-------------|-------------|------------|-----------|------------|
| 1899 ----- | 2,034,910 | 8,629 | 210,974,740 | 58,007,140 | 1,901,820 | 24,924,520 |
| 1889 ----- | 1,822,111 | 120,000 | 15,895,996 | 43,843,040 | 1,085,083 | 10,571,059 |
| 1879 ----- | 1,744,088 | 17,562 | 65,460,135 | 6,553,875 | 424,348 | 13,847,007 |
| 1869 ----- | 216,481 | 3,471 | 4,730,710 | 1,477,562 | 13,532 | 2,125,068 |
| 1859 ----- | 1,108 | 12,224 | 1,482,080 | 74,502 | 2,495 | 147,887 |

The middle of the last century marked the opening of great areas of land in the West, well adapted to the cultivation of cereals, and since that time there has been a steady increase in their production.

The total area devoted to cereals has increased from 3,502,146 acres in 1879 to 12,070,961 acres in 1899. The acreage in corn in 1899 was over four times as great as that in 1879. During the same period the area under wheat increased 72.7 per cent, and that under oats became nearly eight times as large as in 1879. The acreage devoted to rye was over five times as large in 1899 as in 1879, but, in the same time, that of barley decreased 20.1 per cent.

As shown in the second part of the table, larger crops of corn, wheat, oats, rye, and barley were grown in 1899 than during any previous year, while the largest yield of buckwheat was in 1889.

Corn, oats, and rye were most extensively raised in the eastern part of the state. In the production of corn, which was reported in 1899 in every county, Gage and Saunders counties led with more than 8,000,000 bushels each. The crop of oats, which in 1899 was an important crop in nearly every county, amounted in Seward, Gage, Butler, Platte, and York counties to 2,000,000 bushels each. Rye was also raised in most of the counties, the largest returns coming from Merrick, Boone, and York counties, respectively. Of barley, which was generally cultivated, especially in the northeast section of the state, York county reported the greatest production. Wheat was produced, with few exceptions, throughout the state. Clay and Adams counties gave the largest yields, each reporting more than 1,000,000 bushels for 1899.

Kafir corn was reported in 1900 by 125 farmers, who had a total of 742 acres, with a yield of 13,607 bushels.

HAY AND FORAGE.

In 1900, 84,849 farmers, or 69.8 per cent of the total number, reported hay and forage crops. Exclusive of cornstalks, an average yield of 1.2 tons per acre was obtained. The total area in hay and forage for 1899 was 2,823,652

acres, or 14.7 per cent greater than ten years before. Of this acreage, 79.6 per cent, or 2,248,927 acres, produced 2,416,468 tons of wild, salt, and prairie grasses. The acreages and yields of the various other kinds of hay and forage were as follows: Millet and Hungarian grasses, 191,847 acres and 357,356 tons; alfalfa or lucern, 115,142 acres and 275,334 tons; clover, 42,447 acres and 72,747 tons; other tame and cultivated grasses, 92,895 acres and 143,109 tons; grains cut green for hay, 42,066 acres and 54,269 tons; crops grown for forage, 90,828 acres and 183,097 tons; and cornstalks, 15,143 acres and 15,115 tons.

In Table 18 the production of cornstalks is included under "hay and forage," but the acreage is included under "corn," as the forage secured was only an incidental product of the land devoted to the corn crop.

BROOM CORN.

In 1899 the cultivation of broom corn was reported by 270 farmers, who used 6,627 acres in the production of 2,733,290 pounds of broom corn, valued at \$100,252. This output shows a decrease of 3,781,473 pounds, or 58.0 per cent, since 1890. More than one-half of the total product of the state in 1899 was grown in the three counties of Cass, Polk, and Saunders.

FLAX.

Flax was grown in 1899 by 245 farmers, the area employed being 7,652 acres, and the yield 54,394 bushels of seed, valued at \$53,793. Large decreases are shown for the past ten years, the acreage of 1899 being only about one-twentieth of that reported in 1889, while the production is but one-twenty-fifth as great. The average yield per acre dropped from 8.5 bushels of seed in 1889 to 7.1 bushels in 1899. The average area per farm reporting in 1899 was 31.2 acres, and the average value of crops, \$220.

Of the total acreage, about three-fourths lies in the extreme northeastern counties of Dixon, Cedar, Burt, Thurston, Wayne, and Knox, ranking in the order named.

ORCHARD FRUITS.

The changes in orchard fruits since 1890 are shown in the following table.

TABLE 20.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

| FRUITS. | NUMBER OF TREES. | | BUSHEL OF FRUIT. | |
|------------------------|------------------|-----------|------------------|-----------|
| | 1900. | 1890. | 1899. | 1889. |
| Apples ----- | 3,877,329 | 1,283,367 | 1,343,497 | 1,172,935 |
| Apricots ----- | 27,831 | 3,250 | 333 | 223 |
| Cherries ----- | 607,017 | 175,914 | 54,047 | 18,601 |
| Peaches ----- | 1,055,959 | 144,701 | 8,753 | 13,741 |
| Pears ----- | 55,047 | 6,313 | 979 | 1,114 |
| Plums and prunes ----- | 542,450 | 227,129 | 42,314 | 15,828 |

Most of the fruit trees in Nebraska are grown in the southeastern portion of the state below the Platte River. In the last decade there has been a gain of 4,399,414 in the total number of fruit trees, which increased from 1,840,704 to 6,240,118 in that time. About three-fifths of this gain represents the increase in apple trees, the number of which in 1900 was more than three times as great.

as that of ten years before. Otoe, Richardson, and Cass counties reported the largest number of these trees.

The number of peach trees has increased more than six-fold during the decade, forming 7.9 per cent of the total number of orchard trees in 1890, and 16.9 per cent in 1900. The largest numbers were grown in Gage and Nemaha counties. Since 1890 cherry trees have increased in number nearly two and a half times, plum and prune trees have more than doubled, and pear and apricot trees each have gained approximately eightfold.

In addition to the number of trees given in Table 20, unclassified fruit trees to the number of 71,485 were reported, with a yield of 6,130 bushels of fruit.

The total value of the orchard products in 1899 was \$684,751, which includes the value of 5,212 barrels of cider, 2,163 barrels of vinegar, and 30,240 pounds of dried and evaporated fruits.

Since the quantity of fruit produced in any year is determined largely by the nature of the season, comparisons between the crops of the different years have little significance.

SMALL FRUITS.

The total area used in the cultivation of small fruits in 1899 was 1,171 acres, distributed among 7,690 farms. The value of the fruit grown was \$98,159, an average of \$12.76 per farm. The acreages and production of the various berries were as follows: Strawberries, 369 acres and 408,350 quarts; raspberries and Logan berries, 230 acres and 232,580 quarts; gooseberries, 192 acres and 189,680 quarts; blackberries and dewberries, 152 acres and 157,880 quarts; currants, 161 acres and 162,880 quarts; and all other berries, 67 acres and 60,260 quarts.

VEGETABLES.

The value of all vegetables grown in the state in 1899, including potatoes, sweet potatoes, and onions, was \$3,201,228. Of this amount 54.2 per cent represents the value of Irish potatoes. This important crop was reported by 80,607 farmers, or 66.3 per cent of the total number in the state. In addition to the land devoted to potatoes and onions 34,044 acres were used in the growing of miscellaneous vegetables. From 21,160 acres of this area the products were not reported in detail. Of the remaining 12,884 acres, concerning which detailed reports were received, 6,219 acres were devoted to sweet corn; 2,216, to watermelons; 1,430, to cabbages; 914, to tomatoes; 749, to cucumbers; 653, to muskmelons; 238, to beets; 122, to squashes; 104, to celery; 94, to pumpkins; and 145, to other vegetables.

SUGAR BEETS.

Though the sugar-beet industry began only in the last decade in Nebraska, it is rapidly becoming an important branch of agriculture.

In 1899, 535 farmers devoted to this crop an area of 8,662 acres, an average of 16.2 acres per farm. The total production was 62,470 tons of beets, an average yield of 7.2 tons per acre, and the total value was \$222,258, an average of \$415 per farm, \$26 per acre, and \$3.56 per ton.

Of the 90 counties in the state, 41 report the production of sugar beets. Dodge, Hall, Madison, and Merrick, ranking in the order named, reported 77.7 per cent of the total acreage.

SORGHUM CANE.

Sorghum cane was grown by 1,791 farmers in 1899, 4,778 acres being devoted to its cultivation, an average of 2.7 acres for each farm reporting. The producers sold 12,802 tons of cane for \$41,824, and from the remaining product manufactured 92,413 gallons of sirup, valued at \$32,993. In spite of a decrease in acreage of 61.8 per cent since 1889, the total value of the sorghum-cane products amounted to \$74,817, an average of \$42 for each farm reporting. The average yield per acre of the sirup was 19.3 gallons, and the average value per gallon, \$0.36.

The crop was distributed over 78 counties in the state, Jefferson county, with 445 acres, having the largest area under cultivation.

FLORICULTURE.

The area devoted to the cultivation of flowers and ornamental plants in 1899 was 86 acres, and the value of the products sold therefrom was \$142,636. These flowers and plants were grown by 73 farmers and florists, 38 of whom made commercial floriculture their principal business.

These 38 proprietors reported greenhouses with a glass surface of 393,205 square feet. The capital invested in land, buildings, implements, and live stock was \$248,805, of which \$121,350 represented the value of buildings. Their sales of flowers and plants amounted to \$125,910, and of other products to \$1,370, making an average value of \$3,849 for each farm reporting. They expended \$21,120 for labor, and \$580 for fertilizers. The average gross income per acre was \$528.13.

In addition to the 38 principal commercial florists' establishments, 173 farms and market gardens made use of glass in the propagation of flowers, plants, or vegetables. They had an area under glass of 187,736 square feet, making, with the 294,904 square feet belonging to the florists' establishments, a total of 482,690 square feet.

NURSERIES.

The total value of the nursery stock sold in 1899 was \$234,033, reported by the operators of 83 farms and nurseries, 44 of whom derived their principal income from the nursery business. The latter had 3,975 acres of land, valued at \$219,690; buildings, \$66,810; implements and machinery, \$7,085; and live stock, \$9,325. Their total gross income was \$243,258, of which \$228,408 was derived from the sale of trees, shrubs, and plants, and \$14,850 from the sale of other farm products. The expenditure for labor was \$65,040, and that for fertilizers, \$280. The average gross income was \$5,528 for each farm reporting, and the average gross income per acre, \$61.20.

LABOR AND FERTILIZERS.

The total expenditure for labor on farms in 1899, including the value of board furnished, was \$7,399,160, an average of \$61 per farm. The average was highest for the most intensively cultivated farms, being \$1,478 for

nurseries, \$556 for florists' establishments, \$212 for sugar farms, \$81 for live-stock farms, \$49 for vegetable farms, \$46 for fruit farms, \$45 for hay and grain farms, and \$35 for dairy farms. "Managers" expended on an average, \$698 per farm; "owners," \$56; "cash tenants," \$55; and "share tenants," \$36. White farmers expended \$61 per farm, and colored farmers, \$7.

Fertilizers purchased in 1899 cost \$153,080, an average of over one dollar per farm, almost eight times the amount expended in 1890. The average expenditure was \$15 for florists' establishments, \$7 for vegetable farms, \$6 for nurseries, \$4 for sugar farms, and \$1 for hay and grain, live-stock, and dairy farms.

IRRIGATION STATISTICS.

Nebraska, having an extreme length from east to west of 450 miles, lies in two distinct regions—one humid and the other arid. East of the one hundredth meridian the rainfall is usually sufficient for the successful cultivation of all crops, although some extensive irrigation systems have been established in this section, 31,805 acres having been irrigated there in 1899.

The western or arid portion of the state is typical of the Great Plains country. The rainfall is variable, but always deficient, and the snowfall usually light, while the climate is generally hot in summer and cold in winter. It is in this section of the state that irrigation has reached its greatest development.

The Platte, Kansas, and Niobrara rivers, draining portions of the arid region, furnish the water supply for practically all the irrigation systems. Nearly 90 per cent of the irrigated area of the state is found within the drainage basin of the Platte. This stream has two heads high up in the Rockies in Colorado, the North Fork flowing northward into Wyoming, and thence, in a general easterly direction, into Nebraska. The South Fork, after following a general easterly course through Colorado, flows through Nebraska for a distance of 80 miles to its junction with the North Fork at North Platte.

The valley of the North Platte is deep and broad and surrounded by wide areas of table-lands, smooth or very gently rolling, and sloping toward the east. The slopes along the sides of the river are irregular, changing from broad flat lands, lying nearly level with the river, to terraces rising to a height of 200 feet. Back of these terraces are the high, steep-sided table-lands. The flow of the North Platte is greater and more constant than that of the South Platte, so much water being diverted from the latter in Colorado, that its channel in Nebraska is dry for a portion of the year. In the fertile valley through which the North Platte flows in Scotts Bluff, Cheyenne, Deuel, and Keith counties, several large canals have been constructed and irrigation has been extensively developed. Below the junction of the North and South Platte, the main stream contributes water to some of the largest and most important irrigation systems in the state.

The counties in southwestern Nebraska bordering on Kansas are drained by the Republican River, a tributary of the Kansas. This stream has its sources in the Colorado plains and is intermittent in flow. In 1899 about 9,000 acres were irrigated from ditches supplied by the Republican and its tributaries.

Some irrigation development has taken place in the extreme northwestern part of the state along the White River and its branches. Most of the ditches are small and of private ownership.

Niobrara River, a stream of considerable importance, rises in the Pine Ridge in northwestern Nebraska, and flows across the northern tier of counties into the Missouri at Niobrara. It has a fall of about three feet to the mile and its valley is rarely more than one-half mile in width with regular slopes and an elevation of about 400 feet above the North Platte. Throughout the greater part of the year there is water in the channel of this stream. In 1899 the ditches diverting water from the Niobrara River irrigated 7,317 acres.

The collection of statistics relating to irrigation in Nebraska has been attended with considerable difficulty. The year of 1899 was one of severe drouths, and, owing to the scarcity of the water supply, many of the ditches were abandoned or operated only during the early portion of the season. In many sections of the state, crops which received but one irrigation were not reported by the enumerator as irrigated, and it is exceedingly probable that a very large acreage of land partially irrigated is not included in the census report. In the same manner many irrigation systems which were not successfully operated in the census year have been omitted from the reports.

The following table gives, by counties, an exhibit of the number of irrigators and the acreages irrigated in 1899 and 1889.

TABLE A.—NUMBER OF IRRIGATORS, AND ACRES IRRIGATED, BY COUNTIES: 1899 AND 1889.

| COUNTIES. | NUMBER OF IRRIGATORS. | | ACRES IRRIGATED. | |
|-------------------------|-----------------------|------------------|------------------|------------------|
| | 1899. | 1889. | 1899. | 1889. |
| The State..... | 1,932 | 214 | 143,538 | 11,744 |
| Buffalo..... | 20 | (¹) | 1,898 | (¹) |
| Cheyenne..... | 162 | 36 | 21,268 | 3,154 |
| Dawes..... | 105 | 12 | 4,027 | 257 |
| Dawson..... | 333 | (¹) | 20,097 | (¹) |
| Deuel..... | 101 | 4 | 11,794 | 125 |
| Dundy..... | 63 | 4 | 4,552 | 41 |
| Holt..... | 21 | (¹) | 2,213 | (¹) |
| Keith..... | 73 | 6 | 12,040 | 295 |
| Kimball..... | 21 | 11 | 4,225 | 411 |
| Lincoln..... | 200 | 37 | 22,508 | 3,049 |
| Platte..... | 46 | (¹) | 1,488 | (¹) |
| Redwillow..... | 31 | 3 | 1,542 | 72 |
| Scotts Bluff..... | 291 | 70 | 29,244 | 2,733 |
| Sioux..... | 50 | 28 | 1,433 | 1,316 |
| All other counties..... | 415 | 8 | 10,033 | 231 |

¹No irrigation reported in 1889.

In the decade from 1889 to 1899, the number of farmers who irrigated all or a portion of their land increased more than eight times, while the total acreage irrigated in the state was nearly thirteen times as great in 1899 as in 1889. Deuel county records the greatest relative gains in both the number of irrigators and the number of acres irrigated, the former having increased twenty-fourfold and the latter ninety-threefold. Dawson county has the largest number of irrigators, while Scotts Bluff county reports the greatest acreage irrigated in 1899.

An examination of the above table indicates that irrigation is being extended over widely distributed areas. It is probable that, as its benefits are more fully appreciated, the construction of irrigation systems will rapidly follow in all sections where water in sufficient quantities can be diverted without involving too great expense.

Table B presents the statistics of the crops grown on irrigated land in 1899. For purposes of comparison between the irrigated and unirrigated crops of the state, the figures should be used in connection with those in Table 18. Table C gives, by counties, the value of the irrigated crops of 1899.

TABLE B.—ACREAGE AND YIELD OF CROPS PRODUCED ON IRRIGATED LAND IN 1899.

| CROP. | Acres. | Unit of measure. | Quantity. |
|-----------------------------------|--------|------------------|-----------|
| Corn | 33,078 | Bushels | 978,428 |
| Wheat | 14,143 | Bushels | 185,481 |
| Oats | 5,090 | Bushels | 150,070 |
| Barley | 940 | Bushels | 20,920 |
| Rye | 741 | Bushels | 8,346 |
| Buckwheat | 10 | Bushels | 160 |
| Grass seed | | Bushels | 750 |
| Wild, salt, or prairie grasses | 47,890 | Tons | 57,898 |
| Millet and Hungarian grasses | 868 | Tons | 1,478 |
| Alfalfa and lucern | 22,172 | Tons | 58,665 |
| Clover | 47 | Tons | 78 |
| Other tame and cultivated grasses | 206 | Tons | 347 |
| Grains cut green for hay | 892 | Tons | 1,407 |
| Forage crops | 417 | Tons | 705 |
| Dry beans | 126 | Bushels | 922 |
| Potatoes | 1,075 | Bushels | 95,890 |
| Sweet potatoes | 5 | Bushels | 108 |
| Onions | 68 | Bushels | 11,717 |
| Miscellaneous vegetables | 651 | | |
| Dry pease | 2 | Bushels | 23 |
| Grapes | 7 | Centals | 25 |
| Orchard fruits | 1,234 | Bushels | 8,238 |
| Small fruits | 64 | Quarts | 71,680 |

TABLE C.—VALUE OF CROPS PRODUCED ON IRRIGATED LAND IN 1899, BY COUNTIES.

| COUNTIES. | All crops. | Hay and forage. | Cereals. | Vegetables. | Orchard fruits. | Small fruits. | Other crops. |
|------------------------|------------|-----------------|-----------|-------------|-----------------|---------------|--------------|
| The State ¹ | \$982,615 | \$488,528 | \$405,806 | \$75,125 | \$2,083 | \$5,918 | \$5,155 |
| Buffalo | 10,689 | 5,080 | 4,700 | 860 | 5 | 24 | |
| Cheyenne | 125,892 | 103,224 | 18,558 | 8,919 | 18 | 120 | |
| Dawes | 29,112 | 23,215 | 1,846 | 8,914 | 19 | 118 | |
| Dawson | 155,507 | 14,591 | 132,958 | 6,508 | 803 | 652 | |
| Deuel | 61,888 | 20,687 | 38,516 | 2,486 | 1 | 248 | |
| Dundy | 26,151 | 19,811 | 5,014 | 1,297 | 2 | 27 | |
| Holt | 4,411 | 200 | 3,978 | 233 | | | |
| Keith | 44,628 | 29,080 | 14,156 | 1,266 | 16 | 110 | |
| Kimball | 31,434 | 30,786 | 576 | 122 | | | |
| Lincoln | 152,055 | 50,076 | 92,900 | 7,285 | 680 | 1,080 | 84 |
| Platte | 3,972 | 298 | 1,054 | 2,506 | 102 | | 12 |
| Redwillow | 10,589 | 8,000 | 4,927 | 2,531 | 96 | 85 | |
| Scotts Bluff | 220,297 | 141,256 | 62,225 | 11,581 | 4 | 289 | 4,990 |
| Sioux | 32,832 | 25,010 | 5,791 | 1,145 | 20 | 366 | |
| Other counties | 78,740 | 22,264 | 18,614 | 29,522 | 372 | 2,899 | 69 |

¹Exclusive of Indian reservations.

Of the irrigated lands, 129,726 acres produced crops, and 18,802 acres were used for pasture only. The total value of all crops produced on irrigated land was \$982,615, an average of \$7.57 per acre. Of the total crop area irrigated, 55.9 per cent was in hay and forage; the output was valued at \$428,528, or 48.7 per cent of the total value of irrigated crops.

Table D presents, by counties, the principal statistics relating to the canals and ditches receiving water from streams by gravity.

TABLE D.—LENGTH, AND COST OF CONSTRUCTION, OF MAIN CANALS AND DITCHES RECEIVING WATER FROM STREAMS BY GRAVITY.

| COUNTIES. | Miles of ditch. | COST OF CONSTRUCTION. | | |
|--------------------|-----------------|-----------------------|-----------|-----------------------------|
| | | Total. | Per mile. | Per acre irrigated in 1899. |
| The State | 1,701 | \$1,276,978 | \$750.72 | \$7.43 |
| Buffalo | 10 | 4,352 | 435.20 | 3.14 |
| Cheyenne | 152 | 83,029 | 546.24 | 3.91 |
| Dawes | 132 | 39,208 | 297.03 | 9.78 |
| Dawson | 180 | 199,075 | 1,105.97 | 9.92 |
| Deuel | 110 | 67,140 | 610.36 | 5.70 |
| Dundy | 42 | 38,655 | 920.36 | 8.52 |
| Holt | 18 | 22,010 | 1,693.08 | 10.00 |
| Keith | 97 | 122,219 | 1,259.99 | 9.67 |
| Kimball | 25 | 32,321 | 1,292.84 | 7.65 |
| Lincoln | 282 | 142,507 | 505.56 | 6.39 |
| Platte | 17 | 190,500 | 11,211.76 | (³) |
| Redwillow | 20 | 12,156 | 607.80 | 3.05 |
| Scotts Bluff | 179 | 237,161 | 1,324.92 | 8.12 |
| Sioux | 84 | 7,899 | 94.51 | 5.52 |
| All other counties | 358 | 78,586 | 219.51 | 8.10 |

¹Includes the Great Eastern Canal System, which cost \$190,000, and was planned to cover 205,000 acres. Irrigation from this system was nominal in 1899.

²Does not include cost of Great Eastern Canal System.

³Water supplied principally by Great Eastern Canal System.

The cost of construction per mile of ditch in Nebraska is high in comparison with other sections having a similar topography. This is explained by the fact that many of the systems are of large dimensions, and the number of small ditches of private ownership is fewer in proportion to the number of irrigators than in other Western states. It is probable that the cost of many large canals has been reported in excess of the amount actually expended. The large streams flow in narrow valleys considerably below the surface of the plain, and in order to get the water out upon broad areas, canals of great length are required. This also explains the small number of acres—82 irrigated per mile of ditch.

While no comprehensive investigation has been made of the state's geological structure to ascertain the prospects for underground water, Prof. N. H. Darton of the Geological Survey has made a report based on Nebraskan field-work in 1897. His investigation was made of the region west of the one hundred and third meridian, and included the counties of Scotts Bluff, Banner, Cheyenne, Box-butte, Dawes, Kimball, and Sioux, comprising an area of 7,400 square miles. The report states that the relations of underground waters there present a variety of features, there being large supplies at moderate depths in many localities, while in others the amount of water within reach of the average farmer is so small as to seriously

interfere with the settlement of very extensive areas. This has been the case particularly where large volumes of water were needed for cattle. In the flats adjoining the river in the Platte Valley, and in the Lodgepole Valley, a good supply of water can usually be obtained from wells varying in depth from ten to forty feet; on the table-lands on either side of the Lodgepole, large volumes are secured at depths ranging from one hundred and fifty to three hundred feet. In the Niobrara Valley water is obtained from shallow wells in the narrow strips of allu-

vial deposits near the river, while back on the table-lands, a plentiful supply is found at depths ranging from fifty to three hundred feet. In the sand hills water accumulates in basins at moderate depths so that shallow wells ordinarily obtain satisfactory supplies.

Where the well system is employed, water is pumped by windmills into reservoirs and thence diverted to the areas cultivated. In 1899, 843 acres were irrigated in this manner, nearly half of the area being located in the region described above.