*Expenditures in the eradication of pleuro-pneumonia from July 1, 1886, to September 1, 1892.*

| State. | Salaries. | Traveling. | Miscellaneous. | Affected cattle. | Exposed cattle. | Total. | Number of animals affected. | Number of animals exposed. |
|---|---|---|---|---|---|---|---|---|
| New York | $385,672.70 | $58,013.29 | $28,897.52 | $87,241.69 | $198,669.80 | $758,495.00 | 3,347 | 9,019 |
| New Jersey | 185,533.92 | 44,018.03 | 12,956.79 | 20,477.50 | 60,967.70 | 323,953.94 | 844 | 2,467 |
| Pennsylvania | 40,201.36 | 4,462.44 | 2,614.66 | 1,243.50 | 3,357.50 | 51,879.44 | 63 | 142 |
| Maryland | 124,948.22 | 33,705.74 | 5,667.42 | 48,363.41 | 76,115.85 | 288,800.64 | 1,974 | 2,930 |
| Illinois | 52,170.31 | 3,819.29 | 4,126.61 | 3,260.80 | 16,561.64 | 79,938.65 | 176 | 999 |
| Vermont,[1] Massachusetts,[1] Virginia, and District of Columbia | 3,342.28 | 1,177.72 | 19.55 | 739.00 | 754.50 | 6,033.05 | 45 | 57 |
| Total | 791,868.79 | 145,196.51 | 54,282.55 | 161,325.90 | 356,426.99 | 1,509,100.72 | 6,449 | 15,614 |

[1] Investigating reported outbreaks.

## TEXAS FEVER WORK.[1]

The direct losses to the cattle industry of the country from Texas fever at the time when the Bureau of Animal Industry was organized were much heavier than the losses from pleuro-pneumonia. Texas fever had been known under different names for many years, and had become thoroughly disseminated and established throughout the Southern portion of the United States. Although the true nature of the disease was not known, investigations had developed several important facts, namely, that Southern cattle, when taken to the North, though in the best of health, would carry with them the contagion; that Northern cattle, when taken to the South, would contract the disease; that there was, therefore, an infected and a noninfected area, between which it was necessary to draw a definite line; and that "even a fence was sufficient to arrest the disease."

If the cattle raisers of the noninfected region were to be protected from Texas fever, and if those of the infected area were to be permitted to ship their stock out of it, it was necessary that measures should be first adopted to control the transportation. Such measures were alike important in the South, where animals were imported from the North for the purpose of grading up the herds, and in the North, where Southern cattle were to find feed for fattening and a market. The noninfected area of the country was rapidly increasing its production of corn, and needed the feeders from the infected area to consume it.

When the Bureau of Animal Industry was established, it was recognized as one of its most important duties that the Texas fever

[1] Synonyms: Southern fever, splenetic fever, splenic fever, Spanish fever, acclimation fever, acclimatization fever, tick fever.

district must be accurately outlined, and that there must be laws absolutely preventing the driving of cattle from the infected to the noninfected sections, except during certain winter months. Previous to this, in 1883, the chief of the Bureau and his assistants had established the northern line of this district through Virginia. In 1884 the Bureau extended the line westward to the Mississippi River, and in the following year it reached the Rio Grande in Texas. Later it became necessary to include a part of California.

### REGULATIONS REGARDING TEXAS FEVER.

Regulations were issued by Secretary Rusk in 1889, addressed to the managers and agents of railroad and transportation companies in the United States, directing their attention to the area infected with Texas fever and to the quarantine line thereby established. These regulations have been modified from time to time as necessities have arisen; and in order to a satisfactory understanding of all the details of the work the regulations promulgated for the year 1899 are given below in their entirety. The quarantine line mentioned has since been amended by special orders, excluding on account of local cooperation the noninfected districts of some of the States, but in all essential points it is the same as originally defined:

*To managers and agents of railroads and transportation companies of the United States, stockmen, and others:*

In accordance with section 7 of the act of Congress approved May 29, 1884, entitled "An act for the establishment of a Bureau of Animal Industry, to prevent the exportation of diseased cattle, and to provide means for the suppression and extirpation of pleuro-pneumonia and other contagious diseases among domestic animals," and of the act of Congress approved March 22, 1898, making appropriation for the Department of Agriculture for the fiscal year ending June 30, 1899, you are hereby notified that a contagious and infectious disease known as splenetic, or Southern, fever exists among cattle in the following described area:

1. All that country lying south, or below, a line beginning at the northwest corner of the State of California; thence east, south, and southeasterly along the boundary line of said State of California to the southeastern corner of said State; thence southerly along the western boundary line of Arizona to the southwest corner of Arizona; thence along the southern boundary lines of Arizona and New Mexico to the southeastern corner of New Mexico; thence northerly along the eastern boundary of New Mexico to the southern line of the State of Colorado; thence along the southern boundary lines of Colorado and Kansas to the southeastern corner of Kansas; thence southerly along the western boundary line of Missouri to the southwestern corner of Missouri; thence easterly along the southern boundary line of Missouri to the western boundary line of Dunklin County; thence southerly along the said western boundary to the southwestern corner of Dunklin County; thence easterly along the southern boundary line of Missouri to the Mississippi River; thence northerly along the Mississippi River to the northern boundary line of Tennessee at the northwest corner of Lake County; thence easterly along said boundary line to the northeast corner of Henry County; thence in a northerly direction along the boundary of Tennessee to the northwest corner of Stewart County; thence in an easterly direction along the northern boundary of Tennessee to the southwestern corner of Virginia; thence northeasterly along

the western boundary line of Virginia to the northernmost point of Virginia; thence southerly along the eastern boundary line of Virginia to the northeast corner of Virginia where it joins the southeastern corner of Maryland, at the Atlantic Ocean.

2. Whenever any State or Territory located above or below said quarantine line, as above designated, shall duly establish a different quarantine line, and obtain the necessary legislation to enforce said last-mentioned line strictly and completely within the boundaries of said State or Territory, and said last above-mentioned line and the measures taken to enforce it are satisfactory to the Secretary of Agriculture, he may, by a special order, temporarily adopt said State or Territorial line.

Said adoption will apply only to that portion of said line specified, and may cease at any time the Secretary may deem it best for the interest involved, and in no instance shall said modification exist longer than the period specified in said special order; and at the expiration of such time said quarantine line shall revert without further order to the line first above described.

Whenever any State or Territory shall establish a quarantine line for above purposes, differently located from the above-described line, and shall obtain by legislation the necessary laws to enforce the same completely and strictly, and shall desire a modification of the federal quarantine line to agree with such State or Territorial line, the proper authorities of such State or Territory shall forward to the Secretary of Agriculture a true map or description of such line and a copy of the laws for enforcement of same, duly authenticated and certified.

3. From the 1st day of January, 1899, no cattle are to be transported from said area south or below said federal quarantine line above described to any portion of the United States above, north, east, or west of the above-described line, except as hereinafter provided.

4. Cattle from said area may be transported, by rail or boat, for immediate slaughter, and when so transported the following regulations must be observed:

(*a*) When any cattle in course of transportation from said area are unloaded above, north, east, or west of this line to be fed or watered, the places where said cattle are to be fed or watered shall be set apart, and no other cattle shall be admitted thereto.

(*b*) On unloading said cattle at their points of destination, pens, sufficiently isolated, shall be set apart to receive them, and no other cattle shall be admitted to said pens; and the regulations relating to the movement of cattle from said area, prescribed by the cattle sanitary officers of the State where unloaded, shall be carefully observed. The cars or boats that have carried said stock shall be cleansed and disinfected as soon as possible after unloading and before they are again used to transport, store, or shelter animals or merchandise.

(*c*) All cars carrying cattle from said area shall bear placards, to be affixed by the railroad company hauling the same, stating that said cars contain Southern cattle, and each of the waybills or bills of lading of said shipment by cars or boats shall have a note upon its face with a similar statement. Whenever any cattle have come from said area and shall be reshipped from any point at which they have been unloaded to other points of destination, the cars carrying said animals shall bear similar placards with like statements, and the waybills or bills of lading be so stamped. At whatever point these cattle are unloaded they must be placed in separate pens, to which no other cattle shall be admitted.

(*d*) No boat having on board cattle from said district shall receive on board cattle from outside of said district. Cattle from said district shall not be received on board when destined to points outside of said district where proper facilities have not been provided for transferring the said cattle from the landing to the stock yards and slaughterhouses without passing over public highways, unless permission for such passing is first obtained from the local authorities.

(c) The cars and boats used to transport such animals, the chutes, alleyways, and pens used during transportation, and at points of destination, shall be disinfected in the following manner:

Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime or saturating it with a 5 per cent solution of 100 per cent carbolic acid; or, if not disinfected, it may be stored where no cattle can come into contact with it during the period from February 1 to November 15 of each year.

Wash the cars and the feeding and watering troughs with water until clean.

Saturate the entire interior surface of the cars and the fencing, troughs, and chutes of the pens with a mixture made of 1½ pounds of lime and one-quarter pound 100 per cent straw-colored carbolic acid to each gallon of water; or a solution made by dissolving 4 ounces of chloride of lime to each gallon of water may be used; or disinfect the cars with a jet of steam under a pressure of not less than 50 pounds to the square inch.

5. Cattle originating in said area may, after having been properly dipped, under the supervision of an inspector of this Department, be shipped without further restriction, excepting such as may be enforced by local authorities at point of destination: *Provided*, That application be first made to this Department, and permission granted to establish the dipping stations, and that after being dipped the cattle are certified by an inspector of the U. S. Bureau of Animal Industry, and that the cattle when dipped be shipped in clean cars, and not be driven through the infected district or unloaded therein except at such point as may be duly designated by an order issued by this Department.

6. From November 1 to December 31, inclusive, cattle from said area which are found free of infection upon inspection by officers of this Department may be moved north of the quarantine line without restriction other than may be enforced by local regulations at destination. If evidence of infection is found upon such inspection, the cattle must be dipped in accordance with the provisions of section 5 before being moved north of the quarantine line.

7. Cattle from the Republic of Mexico may be admitted into the United States, after inspection according to law, as follows:

(a) Cattle free from splenetic, or Texas, fever, and from contact therewith during the three months preceding such inspection, and which have been grazed in a locality free from infection of such fever, may be admitted into any part of the United States. If destined to points in the noninfected area, a special permit must be obtained from an inspector of the Bureau of Animal Industry, said permit being issued according to the regulations of said Bureau; the cattle for which said permit is issued must not be driven through the infected area, nor be unloaded in any part thereof except at such point as may be duly designated by an order issued by this Department; if shipped in infected cars, or unloaded in the infected area, except as above stated, they will be subject to the regulations concerning infectious cattle.

(b) Cattle found upon inspection to be infected or to have been exposed to infection during the preceding three months must be dipped at port of entry under supervision of an inspector of this Department prior to admittance to the United States; after dipping said cattle shall be subject to the conditions specified in the last preceding paragraph.

8. Notice is hereby given that cattle infested with the *Boophilus bovis*, or Southern cattle tick, disseminate the contagion of splenetic, or Southern, fever (Texas fever); therefore cattle originating outside of the district described by this order, or amendments thereof, and which are infested with the *Boophilus bovis* ticks shall be considered as infectious cattle and shall be subject to the rules and regulations governing the movement of Southern cattle.

9. Stock-yard companies receiving cattle infested with said ticks shall place such cattle in the pens set aside for the use of Southern cattle, and transportation

companies are required to clean and disinfect all cars and boats which have contained the same, according to the requirements of this Department.

10. Inspectors are instructed to see that disinfection is properly done, and to report instances of improper disinfection. It is expected that transportation and stock-yard companies will promptly put into operation the above methods.

All prior orders conflicting herewith are hereby revoked.

JAMES WILSON, *Secretary*.

It will be observed that section 5 of the regulations relates to the dipping of the cattle for the purpose of killing the tick, which is the carrier of the contagion. The Bureau has been experimenting along this line for several years, but, while progress has been made, a mixture has not yet been found which will kill the ticks and at the same time result in no injury to the animal. The end sought is so desirable that the Bureau will continue its work in the belief that a substance will be found which will prove entirely satisfactory.

The beneficial effect of such regulations was apparent from the first. Export cattle were protected from infection, and consequently losses from disease in transit were fewer each year. In 1891 such losses of export cattle from Texas fever amounted to 524 head, but fell to the number of 131 the following year, and since that there have been but two or three cases, and these at rare intervals. The result has been increased prices abroad and a great reduction of insurance on cargoes of cattle, as will be noted further on.

## SHEEP SCAB AND HOG CHOLERA WORK.

In December, 1895, the regulations of the Bureau of Animal Industry were amended to the extent that "animals affected with hog cholera, tuberculosis, or sheep scab shall be considered animals affected with contagious or infectious diseases, * * * and shall not enter into interstate trade nor be brought into contact with other animals intended for such trade." Such animals are not permitted to enter any stock yards or other places where animals are handled for interstate trade, and when so found are condemned, tagged, and placed in quarantine. Stock-yard companies, transportation companies, and other parties receiving or handling such diseased animals are required to disinfect thoroughly such parts of their premises or property as contained such animals, subject to the approval of the inspectors of the Bureau. Animals so quarantined can not be removed except upon written permit of the inspector in charge. General instructions were given to the inspectors by the chief of the Bureau soon after the above-mentioned regulations were made, in which it was provided that sheep affected with scab might be liberated after being dipped one or more times and the inspectors convinced that the disease was cured.

Scab is one of the oldest diseases of sheep known to the veterinary profession, and while it is easily cured and methods for its eradication are well known, it has been permitted to spread among flocks, to the great damage of the sheep industry of the country. The efforts which the Bureau had so far been able to make were not sufficient to control the spread of the disease. It became necessary in 1897 to issue an order to managers and agents of railroads, transportation companies, and stockmen, calling their attention to the fact that it was unlawful to transport diseased sheep from one State to another, and requesting their cooperation to prevent the further spread of the disease. Inspectors were instructed to see that all cars, boats, or other vehicles of transportation were properly cleaned and disinfected by their owners.

As the facilities of the Bureau have increased, the sheep traffic has received more attention and the restrictions have become more rigid. The question of dips had to receive consideration, as some of the dips on the market were not satisfactory, in that they did not kill the mite which is the cause of the scab. In consequence of this fact the following order was issued in July, 1899:

*It is ordered*, That from and after August 10, 1899, no sheep affected with scabies, and no sheep which have been in contact with others so affected, shall be allowed shipment from one State or Territory into another, or from any State into the District of Columbia, or from the District into any State, unless said sheep shall have first been dipped in a mixture approved by this Department.

The dips now approved are:

1. The tobacco-and-sulphur dip, made with sufficient extract of tobacco to give a mixture containing not less than five one-hundredths of 1 per cent of nicotine and 2 per cent flowers of sulphur.

2. The lime-and-sulphur dip, made with 8 pounds of unslaked lime and 24 pounds of flowers of sulphur to 100 gallons of water. The lime and sulphur should be boiled together for not less than two hours, and all sediment allowed to subside before the liquid is placed in the dipping vat.

The owner of the sheep is privileged to choose which one of the above-mentioned dips shall be used for his animals. The Department will instruct inspectors to enforce due care in dipping sheep, but it assumes no responsibility for loss or damage to such animals, and persons who wish to avoid any risks that may be incident to dipping at the stock yards should see that their sheep are free from disease before they are shipped to market.

In the matter of hog cholera and swine plague, the administrative work of the Bureau is under the same law as that for sheep scab. In addition to the methods of quarantine and disinfection, however, hogs are being given the serum treatment for these diseases. The serum for this work is prepared by the Bureau, and at present is administered for experimental purposes by the Bureau officials. During the last two years the work has been undertaken on a large scale in Page County, Iowa, by the legislative consent of that State, and the results have been very satisfactory. It is estimated that the saving in the treated herds has been from 75 to 80 per cent.

The "stamping-out" process, the same that was so successfully employed in the eradication of pleuro-pneumonia, was tried experimentally in eight townships of the same county in 1897, and the results indicated that if the method were vigorously pursued for a few years the disease could thus be greatly reduced or possibly eradicated. A recapitulation of the work in 1897, giving also a comparison with the same period for 1896, shows wonderful success, especially if it be remembered that the disease in Page County was of long standing, and that therefore most farms were affected with the contagion:

| | |
|---|---|
| Number of outbreaks in 1896 (six months) | 218 |
| Number of outbreaks in 1897 (six months) | 80 |
| Difference | 138 |
| Number of head lost in 1896 (six months) | 12,849 |
| Number of head lost in 1897 (six months) | 1,111 |
| Difference | 11,738 |

These figures show that 138 fewer premises were affected and 11,738 fewer hogs died in the season of 1897, while the "stamping-out" methods were enforced, than for the same period in 1896. The total cost of this work, which included remuneration for slaughtered animals, was $10,157.12. It is assumed that if the average weight of the 11,738 hogs was 100 pounds, and their value 3 cents per pound, the saving to the eight townships under consideration was $35,214, a sum very much greater than the total expenses. It is true that the eradication of these diseases from a State by the "stamping-out" process would occasion the expenditure of a vast sum of money, and would cause more or less inconvenience and arouse some opposition. This plan has not been pursued, because the serum treatment promised equally good results without the slaughter of all animals in an infected herd, and consequently at comparatively slight expense, thus avoiding the inconvenience and irritation which invariably follow the more arbitrary measures.

## BLACKLEG WORK.

When the Bureau of Animal Industry undertook to investigate the prevalence of blackleg in the United States it was merely known that the disease existed in certain districts. From its recent investigations, it is "apparent that the loss from blackleg in certain portions of several States exceeds that from all other causes combined."[1] While this disease is infectious, it has not been considered necessary to quarantine it at any time. The results of investigations of the Bureau indicate very decidedly that the disease may be eradicated by inoculation and proper disinfection of premises.

At the beginning of this work the Bureau saw the necessity for a "single" vaccine, that is, a vaccine which when used once would

[1] Dr. V. A. Nörgaard, Fifteenth Annual Report of the Bureau of Animal Industry.

produce the same immunity as is produced by two vaccinations, or with a "double" vaccine. The use of the double vaccine involved the treatment of each animal twice, with an interval of ten days between the two inoculations. This work, when considered in connection with the large herds of the West, where it is necessary to each operation that the cattle be "rounded up" from a large section of country, oftentimes scores of miles in extent, involves much inconvenience and expense, and it never became popular with the cattle raisers. In July, 1896, Dr. V. A. Nörgaard, then a veterinary inspector for the Bureau, after having made an investigation, and appreciating all the objections to the double vaccine, stated that it was "desirable that some vaccine which will produce immunity after one inoculation be introduced in this country." Accordingly, experiments were begun in the fall of 1896 for the purpose of preparing such a vaccine. Hundreds of thousands of doses have been mailed to cattle owners, who are enabled, by following the directions accompanying the vaccine, to inject it themselves without the aid of a veterinarian. Each person who receives the vaccine is requested to answer a series of questions after the season closes, in order that an estimate of the results of the work may be made.

In 1898 the total number of reports received from the States and Territories where the disease was most prevalent (namely, in Texas, Nebraska, Kansas, Colorado, Oklahoma, Indian Territory, North Dakota, and South Dakota) was 522, covering 127,369 head of cattle. Previous to 1898 the average annual loss in the same sections was about 14 per cent. During the same season the loss previous to vaccination was 3.63 per cent and after vaccination 0.54 per cent. There were 700 deaths after vaccination, many of which, as stated by cattlemen themselves, would not have occurred if the vaccine had been injected properly. These results were so satisfactory that vaccine has been sent to all applicants since. The number of doses thus sent out during the fiscal year of 1898 exceeded 500,000.

Thus, in this brief time the Bureau of Animal Industry has made it possible to reduce the losses of cattle from blackleg to a minimum, and it is proposed to continue the manufacture and distribution of the vaccine until its efficacy is well known to the cattle owners of the country, when blackleg, it is believed, will cease to be classed among our more destructive cattle diseases.

## BOVINE TUBERCULOSIS WORK.

For some time past some of the States have been making efforts toward the eradication of bovine tuberculosis by the "stamping-out" method. The work of the Bureau in this connection is confined to the rejection at stock yards and abattoirs of animals so diseased and to the manufacture and distribution of tuberculin to State authorities, by which it may be ascertained which cattle are diseased and which are not. During the last year 35,000 doses were sent out for such official use. It is not furnished for private tests.

### INVESTIGATIONS OF OTHER DISEASES.

It must not be understood that the work of the Bureau has been confined to the diseases named above. The act creating the Bureau provides for the "extirpation of pleuro-pneumonia and other contagious diseases among domestic animals." All reports of outbreaks of such diseases are immediately investigated by an inspector and such action taken as is warranted in the premises.

### INSPECTION OF EXPORT ANIMALS BEFORE SHIPMENT.

While the rigid inspection in connection with contagious pleuro-pneumonia and Texas fever largely reduced the number of diseased animals that was offered for export, the officials of Great Britain still insisted that cattle affected with contagious pleuro-pneumonia continued to reach their shores from the United States. In consequence of these statements, arrangements were made with the British officials to permit the presence of inspectors of the Bureau of Animal Industry at the post-mortem examinations in Great Britain of all animals supposed to be thus diseased. These inspectors commenced their work at London, Liverpool, and Glasgow on August 16, 1890, and on November 8, after post-mortem examination of 104,296 head of cattle, they reported that not one animal was found affected with the disease.

This inspection has been continued in Great Britain, but is supplemented by work under the act of August 30, 1890, which provides for the inspection before shipment of all export cattle, sheep, and hogs. This inspection at both ends of the line of shipment could not fail to be efficient. Regulations under the act mentioned were issued on October 20, 1890. The points where cattle are to be inspected are named, and the cattle passing the inspection are to be tagged and inspected again at the ports of export. Cattle arriving at the ports of export from other parts of the United States are to be inspected and tagged there. Animals are to be carried, after tagging, in thoroughly cleaned and disinfected cars. Proper notification by inspectors and shippers is required. The thoroughness of this work is such that the history of any animal tagged for export may be traced back to the farm whence it came.

Very few hogs have been exported alive. The numbers of cattle which have been inspected, tagged, and rejected in connection with this work are shown in the following table, also the inspections and exports of sheep. The number of inspections does not mean an equal number of animals, for most cattle and sheep for export are inspected twice, and so appear twice in the totals in the table.

*Inspections of cattle and sheep for export, 1893–1899.*

| Fiscal year. | Cattle. | | | Sheep. | |
|---|---|---|---|---|---|
| | Number of inspections. | Number rejected. | Number tagged. | Number of inspections. | Number rejected. |
| 1893 | 611,542 | 292 | 280,570 | ........ | ........ |
| 1894 | 725,243 | 184 | 360,580 | 135,780 | ........ |
| 1895 | 657,756 | 1,080 | 324,339 | 704,044 | 179 |
| 1896 | 815,882 | 1,303 | 377,639 | 733,657 | 893 |
| 1897 | 845,116 | 1,565 | 410,379 | 348,108 | 189 |
| 1898 | 859,346 | 1,438 | 418,694 | 297,719 | 180 |
| 1899 | 643,301 | 1,593 | 327,741 | 174,717 | 118 |

## INSPECTION AND QUARANTINE OF IMPORT ANIMALS.

One of the first steps taken for the control of contagious diseases among animals was the establishment of quarantine stations at the principal Atlantic ports, where imported animals might be detained until there was no longer any danger of the development of disease from exposure to contagion in other countries. This system has been extended so as to include the frontiers bordering upon both Canada and Mexico. The stations were at first under the Treasury Department, but soon after the organization of the Bureau of Animal Industry they were transferred to its control. The wisdom of maintaining them has been attested very often. When pleuro-pneumonia was eradicated it was not permitted to enter again from Europe, where it was prevalent, and rinderpest, which almost annihilated the herds of South Africa, was not allowed to gain a foothold here. Foot-and-mouth disease had appeared several times, but was turned back through the vigilance of the Bureau inspectors.

The records kept at these quarantine stations give the date of arrivals of animals, port of shipment, name of breed, number received, and name and address of importer. Large numbers of cattle and sheep come in from Mexico and also from Canada for feeding purposes, but those landed at the Eastern seaboard are principally for breeding, and are not in large numbers.

## INSPECTION OF VESSELS THAT CARRY EXPORT CATTLE.

Reference has already been made to the fact that the Texas fever regulations governing interstate transportation of live stock were so efficient as to operate to reduce the losses usually occurring among export cattle. The reduction was so marked that the chief of the Bureau was enabled to say in his report for 1890 that—

> On the whole the effect of these regulations has been extremely beneficial. As compared with former years, but a small amount of the disease has been reported either in the United States or among cattle abroad. The losses during the ocean voyage have been so much less than usual that insurance is said by shippers to have been reduced over 50 per cent. If this statement is correct, it means a saving of over a million of dollars to our shippers by this reduction of insurance alone.

There continued to be losses at sea, however, that seemed to be unnecessary, and which were due in most cases to the improper construction of the ships engaging in the trade. The ventilation was very bad, proper facilities for feeding and watering were wanting, space was badly overcrowded, the ships were sometimes unseaworthy, and the attendants were often inexperienced and worthless. While all this was bad enough, there never were such cruelties practiced as were charged in English papers and documents, inspired partly by sensationalism and partly by commercial interests. However, the defects mentioned and many other similar ones in connection with the ocean transportation of cattle were such as might easily be avoided under proper supervision. This power of supervision was given by the act of March 3, 1891, by which the Secretary of Agriculture was authorized to examine all vessels which are to carry export cattle from the ports of the United States to foreign countries, and to prescribe by rules and regulations or orders the accommodations which said vessels shall provide for export cattle "as to space, ventilation, fittings, food, and water supply, and such other requirements as he may decide to be necessary for the safe and proper transportation and humane treatment of such animals." Regulations were formulated in accordance with this act which were acceptable to the British Government. They were modified from time to time as necessities arose, until now they appear to be all that can be desired. The first result of their rigid enforcement was to drive the poorer class of ships out of the trade. Magnificent steel ships were constructed for the cattle traffic, having every convenience, with permanent fittings built into the vessels, and all the comforts and safety which ingenuity could provide. The number of inspections of vessels have averaged about 900 a year.

These regulations, supplemented by the inspection of animals in the interior of the country and their reinspection at ports of export, insure the landing of animals in Great Britain in the best possible condition. It is stated upon authority that, as a direct result of these improved conditions, the insurance rates on cattle have been reduced from \$8 to less than \$1 per head. A saving of \$7 per head on the 397,879 exported in 1898 amounts to \$2,785,153, while the expense was less than \$50,000. The work should, in addition, be credited with the improved condition of live animals delivered.

It is interesting in this connection to note the percentage of losses at sea of cattle and sheep since this work was undertaken by the Bureau. The table on the next page gives the figures.

*Percentages of losses of cattle and sheep at sea, 1891-1899.*

| Fiscal year. | Cattle. | Sheep. |
|---|---|---|
| 1891 *a* | 1.6 | 1.7 |
| 1892 | .875 | ---------- |
| 1893 | .47 | ---------- |
| 1894 | .37 | 1.29 |
| 1895 | .62 | 2.7 |
| 1896 | .32 | 1.16 |
| 1897 *b* | .57 | 1.29 |
| 1898 *c* | .22 | .8 |
| 1899 *d* | .31 | 1.54 |

*a* Includes four and one-half months of 1890.
*b* With animals shipped from Canada the losses were: Cattle, 1.88 per cent; sheep, 2.17 per cent.
*c* With animals shipped from Canada the losses were: Cattle, 0.32 per cent; sheep, 1.39 per cent.
*d* The loss on horses shipped was 1.11 per cent.

On account of variation in conditions and weather, a uniformly low percentage can not be maintained.

GENERAL INSPECTION OF ANIMALS AND THEIR PRODUCTS.

An act of Congress approved August 30, 1890, provided for the inspection of meats for exportation, but this was supplemented on March 3, 1891, by an act "for the inspection of live cattle, hogs, and the carcasses and products thereof which are the subjects of interstate commerce, and for other purposes." It is doubtful if Congress, in passing this law, contemplated the magnitude of the work and expense thus placed upon the Bureau of Animal Industry. The organization of a force competent to conduct a work so extensive required years of training. It was not, therefore, until 1897 that the chief of the Bureau was able to say that "during the past year all of the beef exported to Europe, and the greater part of the pork and other meat products exported, have been inspected in accordance with law."

The regulations for this inspection are most rigid, and laxity in enforcement is never permitted. The proprietors of slaughterhouses and packing houses which prepare meat for interstate or foreign commerce must apply to the Secretary of Agriculture for inspection, whereupon there is given to the establishment a number which is used by the owners of the establishment and the inspectors to mark all products issuing therefrom. An inspector of the Bureau is stationed at each establishment, and among his duties is the ante-mortem examination of all animals arriving at the stock yards which are intended for slaughter at abattoirs where the Department has established inspection. When the inspector finds an animal unfit for human food he fastens in his ear a metal tag stamped "U. S., condemned," and a serial number. These condemned animals are at once removed by the owners and disposed of in accordance with State law or municipal ordinance. Animals are condemned when found upon ante-mortem or post-mortem examination to be affected as follows: Hog cholera; swine plague; charbon, or anthrax; rabies; malignant epizootic catarrh; pyæmia and septicæmia; mange or scab in advanced stages; advanced stages of actinomycosis, or lumpy jaw; inflammation of the lungs, the intestines, or the peritoneum; Texas fever; extensive or generalized tuberculosis; advanced state of pregnancy or recent parturition; any disease or injury causing elevation of temperature or affecting the system to a degree which would make the flesh unfit for human food; immaturity, or too young to produce wholesome meat; emaciation and anæmia sufficient to render meat unwholesome; distemper, glanders, and farcy, and other malignant disorders; acute inflammatory lameness, and extensive fistula. Any organ or part of a carcass of an animal which is badly bruised or affected with tuberculosis, actinomycosis, cancer, abscess, suppurating sores, or tapeworm cyst must also be condemned.

The carcasses of animals condemned upon post-mortem examination are properly marked and then placed in a room, which is in charge of the inspector, to remain until they can be "tanked" or removed under supervision to a rendering establishment. If the owners of the carcasses do not consent to such disposition the carcasses are marked with the condemnation tag, and all express companies and common carriers are notified of the particulars and warned not to transport them out of the State. To remove a condemnation tag renders one liable to prosecution.

All carcasses leaving such establishments for local, interstate, or export trade are marked with a numbered tag or branding stamp, and a record kept in detail. Carcasses or parts of carcasses which are to be used for canning purposes are not to be tagged, but when shipped from one abattoir to another the cars carrying them are sealed and tagged on both sides. Each article of food product made from inspected carcasses, whether in cans, barrels, firkins, kits, boxes, or canvas, must bear a label giving the official number of the establishment from which the product came, and also containing the statement that it has been inspected under the law. All such packages to be shipped to any foreign country or to another State must have printed or stenciled on the side or the top the information that it is for export or for interstate trade, giving the official number of the establishment, the number of pieces or pounds, the shipping marks, and the date of the act under which inspected. The inspector then affixes the stamp of the Department of Agriculture. Certificates are issued by the inspector for all carcasses examined and for every consignment of canned meats.

The appropriation acts since 1898 carry a provision "that live horses and the carcasses and products thereof be entitled to the same inspection as other animals, carcasses, and products thereof" that are named in the acts. Only one abattoir for the slaughter of horses was in operation during the year that regulations under this provision of law have been in force. The number of horses inspected was 3,232, of which number 181 were condemned on post-mortem examination. It is required that all packages containing horse meat be so marked as to indicate the fact, and no other animals may be slaughtered at abattoirs where horses are slaughtered.

The work of general meat inspection has had a wonderful growth during the nine years of its existence. The number of animals inspected before slaughter was 3,809,459 during the fiscal year of 1892, whereas the number for the fiscal year of 1899 was 34,405,973. The number of abattoirs and packing houses in operation in 1891, when inspections were begun, was 22. It increased in 1892 to 38, and in 1899 to 138. The latter are located in forty-one cities. The following table shows the number of animals of all kinds which have been inspected before slaughter for abattoirs since the beginning of the work:

*Number of animals inspected before slaughter for abattoirs having inspection, 1891–1899.*

| Fiscal year. | Cattle. | Calves. | Sheep. | Hogs. | Horses. | Total. |
|---|---|---|---|---|---|---|
| 1891 | 83,891 | | | | | 83,891 |
| 1892 | 3,167,009 | 59,089 | 583,361 | | | 3,809,459 |
| 1893 | 3,922,174 | 92,947 | 870,512 | | | 4,885,633 |
| 1894 | 3,862,111 | 96,331 | 1,020,764 | 7,964,850 | | 12,944,056 |
| 1895 | 3,752,111 | 109,941 | 1,344,031 | 13,576,917 | | 18,783,000 |
| 1896 | 4,050,011 | 213,575 | 4,710,190 | 14,301,963 | | 23,275,739 |
| 1897 | 4,289,058 | 259,930 | 5,179,643 | 16,813,181 | | 26,541,812 |
| 1898 | 4,552,919 | 241,092 | 5,706,092 | 20,713,863 | | 31,213,966 |
| 1899 | 4,654,842 | 245,859 | 5,718,464 | 23,783,576 | 3,232 | 34,405,973 |

While the above table shows an enormous increase in the number of animals inspected from year to year, the number of animals rejected has not increased in like proportion. This indicates that the farmers of the United States are placing upon the market a healthier lot of animals than formerly. A table showing the different species of animals rejected upon ante-mortem and post-mortem inspections for the period of 1896 to 1899, inclusive, is given herewith; the figures for previous years are not considered accurate:

*Number of animals rejected upon ante-mortem and post-mortem inspections, 1896–1899.*

| Fiscal year. | Cattle. | Sheep. | Calves. | Hogs. |
|---|---|---|---|---|
| 1896 | 31,113 | 17,560 | 3,874 | 97,170 |
| 1897 | 35,489 | 15,998 | 3,202 | 104,393 |
| 1898 | 37,613 | 12,902 | 2,850 | 132,741 |
| 1899 | 36,396 | 23,471 | 3,473 | 162,953 |

The preceding statements do not show all of the work in connection with general meat inspection. Besides animals inspected for immediate slaughter, many thousands are inspected for shipment to other cities and for miscellaneous buyers. The following table shows the magnitude of this work:

*Number of animals inspected for shipment to other cities and for miscellaneous buyers, 1895–1899.*

| Fiscal year. | Cattle. | Sheep. | Calves. | Hogs. |
|---|---|---|---|---|
| 1895 | 1,083,013 | 648,358 | 10,708 | 3,360,642 |
| 1896 | 3,479,512 | 1,608,094 | 101,271 | 7,452,863 |
| 1897 | 3,960,967 | 2,864,712 | 189,053 | 8,753,563 |
| 1898 | 4,675,318 | 4,322,195 | 227,107 | 10,896,812 |
| 1899 | 4,288,562 | 3,119,920 | 253,404 | 10,455,317 |

MICROSCOPIC INSPECTION OF PORK.

In 1881 the importation of American pork into Germany, France, and the principal countries of the continent of Europe was prohibited on the assumption that it was infested with trichinæ, and was therefore injurious to health. Although it could not be shown that American pork had caused disease, it being manifestly more wholesome than European pork, and notwithstanding the most vigorous protests by this Government, the trade was crushed and destroyed. The year before the prohibition went into effect the United States sold to France 70,000,000 pounds of pork, and to Germany 45,000,000 pounds. For ten years thereafter American pork was shut out of nearly every market of continental Europe, and the prohibition was not raised until the Bureau of Animal Industry began the microscopic inspection and certification of pork destined for those markets. The trade had to be built up anew over the prejudices that had been so firmly rooted, and it has been a slow and difficult process. Vexatious and burdensome restrictions have constantly to be met, but the trade has continued to grow notwithstanding. During the fiscal year 1892 there were 38,152,874 pounds inspected for export, 22,025,698 pounds going to countries requiring inspection and 16,127,176 to countries not requiring it, while in 1899 the total shipment was 108,928,195, of which 108,858,149 went to countries requiring inspection and 70,046 to countries not requiring it.

The regulations for this work provide that a microscopic examination be made of all hog products which are for export to countries requiring such examination. The following extract from the regulations shows the method of operation:

When the slaughtered hog is passed into the cooling room of said establishment, the inspector in charge, or his assistants, will take from each carcass three samples of muscle—one from the "pillar of the diaphragm," one from the psoas muscle, and the other from the inner aspect of the shoulder, and also from the base of the tongue when that organ is retained for exportation; and said samples will be placed in small tin boxes, and a numbered tag will be placed upon the carcass from which said samples have been taken, and a duplicate of said tag will be placed in the box with said samples. The small boxes will be placed in a large tin box provided with a lock. The boxes containing the samples from the hogs in the cooling room so tagged will be taken to the microscopist for such establishment, who shall thereupon cause a microscopic examination of the contents of each box containing samples to be made, and shall furnish a written report to the inspector, giving the result of said microscopic examination, together with the numbers of all carcasses affected with trichinæ. The samples of pork microscopically examined shall be classified as follows:

*Class A.*—Samples in which there are no signs of trichinæ, living or dead, calcified cysts, or other bodies or substances having any resemblance to trichinæ or trichinæ cysts.

*Class B.*—Samples in which there are disintegrated trichinæ or trichinæ cysts, calcified trichinæ or trichinæ cysts, or bodies having any resemblance thereto.

*Class C.*—Samples in which there are living or dead trichinæ bodies not disintegrated.

All carcasses coming within Class C are removed from the cooling room and disposed of by tanking, or they may be rendered into edible lard at a temperature of 150° F., or made into cooked meat products if the temperature is raised to the boiling point a sufficient time to cook thoroughly the interior of the pieces. Carcasses belonging to Class B are rejected for shipment to countries requiring inspection and certification. In all this work (the microscopic examination, the cutting up of carcasses, the marking of parts, and the keeping of records) the most careful and painstaking efforts are maintained. The result is that the pork exported to countries which require inspection is not only absolutely free from trichinæ, but has never been affected by these parasites. The amount of affected pork under Class B and Class C is less than 2 per cent of the whole amount examined microscopically.

The following table shows the amount of pork examined microscopically for export to countries requiring the inspection and to countries not requiring it for the fiscal years 1892 to 1899, inclusive:

*Pork inspected microscopically for export, 1892–1899.*

| Fiscal year. | To countries requiring inspection. | To countries not requiring inspection. | Total. |
|---|---|---|---|
| | *Pounds.* | *Pounds.* | *Pounds.* |
| 1892 | 22,025,698 | 16,127,176 | 38,152,874 |
| 1893 | 8,059,758 | 12,617,652 | 20,677,410 |
| 1894 | 18,845,119 | 16,592,818 | 35,437,937 |
| 1895 | 39,355,230 | 5,739,368 | 45,094,598 |
| 1896 | 21,497,321 | 1,403,559 | 22,900,880 |
| 1897 | 42,570,572 | 1,001,783 | 43,572,355 |
| 1898 | 120,110,356 | 161,303 | 120,271,659 |
| 1899 | 108,858,149 | 70,046 | 108,928,195 |

Before this work was undertaken, it was estimated that it would cost from 15 to 50 cents per carcass, but in fact the cost has been only about 6 cents per carcass. The cost per pound of the pork exported was 0.248 cent in 1894, 0.2 cent in 1895, 0.264 cent in 1896, 0.256 cent in 1897, 0.142 cent in 1898, and 0.182 cent in 1899. There were many and strong objections to the work of microscopic inspection when it was begun, but the results have been so gratifying, especially from a commercial point of view, that not only is there little criticism, but the applications for inspection are numerous. While there is room for discussion of the proposition as to whether the packer or the Government should pay the cost of the microscopic inspection, there is no longer any doubt of the wisdom of having the inspection made under the supervision of the Government.

## EXPERIMENTAL EXPORTS OF DAIRY PRODUCTS.

Early in the year 1897 a series of experimental exports was begun, under the supervision of the dairy division of the Bureau of Animal Industry, by which choice butter and cheese made in the United States have been offered for sale in various foreign markets in competition with the best products of like kind from other countries. The object was to obtain information which might be of use to those wishing hereafter to sell such products in foreign markets. By practical operations under usual commercial conditions, although upon a small scale, it was possible to determine the wants of different markets, the peculiarities desirable in the products themselves or in their form of preparation, the incidental expenses, the facilities for transportation, the effects of long journeys, and the comparative merits of the dairy products of this and other countries. These experiments have been continued during the years 1897, 1898, and 1899, the shipments being made weekly most of the time and at greater intervals for a part of it.

Special agents for the Bureau of Animal Industry have visited foreign countries to investigate markets and determine where sales agencies should be established. Exports have accordingly been made to England, Germany, China, Japan, the Hawaiian Islands, Cuba, and Puerto Rico.

These trials have resulted in showing that the markets of Great Britain are by far the best for butter and cheese from the United States, if these products are to be exported. They offer the most active and continuous demand, the most discriminating judgment, and the best prices.

American cheese is the equal of any found in British markets, when it is carefully made and cured, and some lots sell at highest prices; but collectively, it now occupies a position secondary to the Canadian product, because of the patronage of the dairy industry by that Government and the official guaranty which it offers as to the purity and uniform high quality of all cheese exported from the Dominion.

# PROGRESS OF PLANT BREEDING IN THE UNITED STATES.

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## INTRODUCTION.

At the beginning of the nineteenth century a few of the most advanced scientific horticulturists were commencing to recognize that plants, like animals, are capable of being improved by breeding. During the century the knowledge of the factors involved in plant breeding gradually increased and became disseminated among practical American growers. As a natural consequence of this there came to be a better understanding of the methods of plant breeding and a greater appreciation of the necessity of securing varieties adapted to local conditions, and therefore improved sorts of American origin have been gradually but surely supplanting foreign varieties.

While at the beginning of this period almost all of our cultivated fruits, cereals, vegetables, and flowers were of foreign origin, an inspection of the present trade lists shows a marked increase of native sorts and a corresponding decrease of foreign sorts. In the case of flowers, for the production of which artificial conditions largely are maintained, home-produced sorts vie in numbers with those from abroad. In cereals and vegetables a majority of the most extensively grown sorts are of American origin, and in fruits, upon which probably the most attention and skill have been brought to bear and the greatest stimulus given by well-organized societies, the native sorts have almost entirely taken the place of the foreign ones. "In the beginning of the colonization of this country," writes Bailey, "all the varieties of apples were of European origin. But in 1817, over 60 per cent of the apples recommended for cultivation here were of American origin, that is, American-grown seedlings from the original stock. At the present time [1895], fully 90 per cent of the popular apples of the Atlantic States are American productions."

The same increase of American sorts has taken place in the case of pears. As early as 1853 Hovey wrote: "It is certainly somewhat remarkable, as it is surprising, that, in the course of twenty-four years, a larger number of really fine pears have been brought to notice, of American origin, than have been introduced from Europe in the same time, or we think we might safely add, in the last fifty years." While in plums the American seedlings of the European and Japanese species rival the sorts of foreign production, the improved sorts of our native species and hybrids of these with the Japan and apricot plums are rapidly increasing and will probably soon predominate in this industry. In the cultivation of grapes, raspberries, blackberries, etc., little advance was made until our native species were taken up and improved. All of these have been profoundly modified and improved as the result of merely half a century of cultivation and breeding.

It is interesting to note that the present century has witnessed the first introduction and wonderful amelioration of some of our now most important plants. A striking instance of such a plant is the tomato, which is said to have been first brought from Santo Domingo to Philadelphia in 1798, but was not sold in the markets of that city, according to Manning, until 1829, and did not come into general use in the North until some years later. Tomatoes were introduced into Salem, Mass., by an Italian painter, Michelo Corne, in 1802; but he was said to have had difficulty in persuading the people to eat them. They were, however, used as an article of food in New Orleans in 1812. The wonderful amelioration of the tomato has thus taken place wholly within the memory of men now living, and it is not an uncommon thing to find aged people, particularly among the pioneers of the West, who remember when the tomato was cultivated as an ornamental plant, but not thought to be valuable for food. The tomato is therefore an excellent illustration of what a century of plant breeding may accomplish.

The flowers now so extensively grown were hardly known a century ago, when different varieties were just beginning to appear. The modest chrysanthemum or the carnation of that day would hardly create a sensation in our modern flower markets. The immense cut-flower trade and the hosts of elegant varieties adapted thereto are the results of less than a century of plant breeding. The greenhouse has exerted a marked influence on the plants which are thus grown, as special varieties are demanded, and the skillful cultivator breeds and selects till he secures what is desired. In all forcing-house industries special varieties adapted to this sort of culture have sprung up. The changes which have already been wrought are the wonder of naturalists and laymen alike, but the end has not yet been reached. Everything indicates increased activity in the near future. Recent developments, obtained by a few independent experimenters, have forcibly called attention to the great improvements which skill and patience may achieve in this field, and a renewed interest in such matters is very evident throughout the country.

## EARLY AGRICULTURAL AND HORTICULTURAL CONDITIONS.

In the early settlement of America agriculture was limited mainly to the cultivation of such plants as were known to the settlers in their

Old World homes. Each expedition brought seeds and plants to use in starting agricultural industries, and subsequent importations of desirable varieties continued to be made; hence, the attention of the settlers was largely given to testing these experimentally to determine their usefulness. The different conditions obtaining in America from those found in Europe, from which latter place most of the introduced sorts came, rendered the outcome of the early attempts very uncertain. No exact record of the agricultural development during this period exists, but it is probable that the early introduced varieties of the various annual crops (cereals, vegetables, etc.) went through a gradual evolution and adaptation to conditions by seed selection from those plants and strains found to do the best. This selection, which the settlers almost certainly exercised, probably did not have any definite improvement or change in view other than to secure the best and most vigorous seeds. Some of our now most important agricultural crops, like corn and tobacco, are native American plants, and their main improvement consequently dates from the discovery of America. In some places, however, the Indians had developed a comparatively high state of agriculture, and many sorts of such native cultivated plants were obtained from them, as, for example, the Golden Sioux, King Philip, and Tuscarora races of field corn. An early sweet corn is also recorded as having been obtained from the Indians. According to one account it was found and introduced into Connecticut by an officer in General Sullivan's expedition against the Indians in the Genesee country in 1779. According to another account it was introduced into Massachusetts by Capt. Richard Bagnol, of Plymouth, who obtained it from the country of the Susquehanna on his return from the Sullivan expedition. The Six Nations, against which the Sullivan expedition was sent, had made considerable progress in agriculture, and are known to have cultivated large fields of corn. Besides this, they are said to have had "gardens of beans, peas, turnips, cabbages, melons, carrots, parsnips, and potatoes."

The earliest attempts at fruit growing in America were mostly failures. The varieties grown in early days were nearly all of European origin. The recorded history of American horticulture may be said not to have begun until the publication of Bernard M'Mahon's American Gardener's Calendar in 1806. At this comparatively late date native varieties had already become prominent, about 66 per cent of the 59 varieties of apples catalogued being of American origin. Even at this time, however, very great efforts were still being made to extend the range of cultivated products by introductions, the only very definite method by which the securing of new sorts was attempted. It was a costly experiment, however, and to a great extent disappointing. William Kenrick, in a letter to General Dearborn (quoted from Robert Manning), says: "From among 150 varieties imported into Boston by Eben Preble, about 1805, the only additions to the list of desirable kinds were two cherries—the Black Tartarian and White Tartarian, and a single pear."

If we had to-day only the apples and pears known at the beginning of the century, the present extensive apple culture of the prairie States and the Northwest and the pear culture of the South would be wholly impossible. American varieties, the result both of chance discoveries and of the most careful and complex methods of plant breeding, have almost entirely supplanted the introduced varieties, and are destined to become even more important. To-day we look upon plant introduction as being to a large extent a means to an end. Russian apples are being extensively introduced, not wholly with the idea that they may become important commercial sorts themselves, but that select seedlings from them and hybrids between them and native varieties may be obtained, and through these the desired hardy, cold-resistant sorts of good quality.

In the culture of strawberries, raspberries, gooseberries, grapes, etc., no material progress was made until the improvement of the native species was begun. All these fruits went through an initial stage of depending upon foreign varieties, and following this an era of improvement, during which, by careful breeding of the native species and infusion into them of the improved European blood by hybridization, strains better adapted to American conditions were obtained. This change from an almost total reliance upon introduced varieties to a marked supremacy of sorts originated here has taken place almost wholly within the past century.

## EARLY METHODS OF PLANT BREEDING.

The early settlers probably practiced crude selection in growing their plants, as anyone, whatever his degree of intelligence, will unconsciously do. It is this unconscious selection of individual plants through centuries that has led to the important changes which have taken place in our principal cultivated plants. So marked has been this amelioration that in very many instances the wild forms can not now be recognized and are unknown, the most careful study of modern scientists having failed to reveal the original types.

The necessity of having varieties adapted to existing conditions was early understood, as was also the necessity of selecting the best seed. Manning, in the History of the Massachusetts Horticultural Society, says: "And in 1621 the governor requested Massasoit to exchange some of their corn, for seed, with ours, that we might judge which best agreed with the soil where we lived. The natives were acquainted with the advantage of selecting the finest ears of corn for seed, and taught the settlers to do the same. They possessed varieties adapted to the warmer or colder parts of the country."

We are inclined to think of plant breeding as based on old and well-established laws. The fact is, however, that the fundamental



TWO PROMINENT EARLY PLANT BREEDERS.

principles of intelligent plant breeding were not made known until the latter part of the eighteenth century. The sexuality of plants was not established until proved experimentally by Camerarius in 1691, and the first hybrid of which we have any record was not made until 1719, when Thomas Fairchild, an English gardener, crossed the carnation with the sweet william.

Our first exact knowledge of hybrids dates from about 1761, when Koelreuter began publishing the results of his observations. His work was entirely scientific, however, and had but little bearing on practical plant breeding, though it served to pave the way for the valuable work, soon to follow, of Thomas Andrew Knight (Pl. XXXVI), the eminent English plant physiologist. The systematic breeding of plants may be said to have begun with the work of Knight and Van Mons about the beginning of the nineteenth century. Knight was the first to show the practical value of crossing and hybridizing in the production of plant varieties. In 1806 Knight said: "New varieties of every species of fruit will generally be better obtained by introducing the farina of one variety of fruit into the blossoms of another, than by propagating any from a single kind."

Another important idea emphasized by Knight, and now quite generally accepted, is that one of the principal factors causing or inducing variation in plants is an increase of food supply or a modification thereof.

In one sense Knight may be recognized as the father of plant breeding, no other experimenter having contributed so much toward the development of the present system. Of almost equal importance, however, was the work of a contemporaneous Belgian horticulturist, Jean Baptiste Van Mons, who emphasized mainly the principle of selection. His theories were published in various papers, but mostly in his Arbres Fruitiers in 1835. His method of obtaining new varieties of fruit was to gather seeds from young trees in a state of variation, taking the fruits before they were fully ripe and allowing them to rot, with the idea that this would tend to "subdue or enfeeble" the tree, a factor which he thought to be of primary importance. These seedlings were then grown in a seed bed until they were large enough to enable him to judge of their character. He then selected the promising ones and planted them in nursery form a few feet apart, where they could be fruited on their own roots. When these selected seedlings fruited, seeds were taken from the first fruits of the most promising and sown, the same process of selection being exercised in this second generation, and so on through several or many generations of selection till success was attained. The whole process is expressed in his own words as follows: "To sow, to re-sow, to sow again, to sow perpetually, in short to do nothing but sow, is the practice to be pursued, and which can not be departed from; and in short this is the whole secret of the art I have employed."

As to the theory of selection, time has justified Van Mons's conclusions, with some modifications, but some of the ideas he advanced have been abandoned. He claimed that the older varieties of good fruit generally yield inferior seedling sorts, while new inferior varieties reproduced uninterruptedly for several generations would certainly yield good fruit. In these claims the results of recent years have shown him to have been somewhat in error. The general theory now advanced and used is to select seed for planting from the best fruits of the best tree of the best variety.

The importance of selection in improving varieties was well recognized before the publication of Van Mons's great work above referred to, and while the main credit of establishing the principle of selection is due to Van Mons, yet other independent workers accomplished nearly as important results. Bailey, in his Survival of the Unlike, called attention to the work done by Joseph Cooper, of New Jersey, in the closing years of the last century. Cooper's observations, recorded in a letter written in 1799 and published in the first volume of the Memoirs of the Philadelphia Society for Promoting Agriculture, show that he thoroughly understood the action of selection in producing changes in varieties. As an illustration, he says: "A striking instance of plants being naturalized happened by Colonel Matlack sending some watermelon seed from Georgia, which, he informed me by letter, were of superior quality. Knowing that seed from vegetables which had grown in more southern climates, required a longer summer than what grew here, I gave them the most favorable situation, and used glasses to bring them forward, yet very few ripened to perfection; but finding them to be as excellent in quality as described, I saved seed from those first ripe; and by continuing that practice four or five years, they became as early watermelons as I ever had."

It is probable that many other advanced horticulturists of that period understood and used selection in an intelligent manner. The directions given in 1822 by James Thatcher, in his American Orchardist, for the selection of seeds in attempting to produce improved sorts, would be regarded to-day as better than the recommendations given by Van Mons. "The seeds for planting," Thatcher wrote, "should always be selected from the most highly cultivated fruit, and the fairest and ripest specimen of such variety." Thatcher also described Knight's method of forcing seedlings into fruit by grafting them, and the use of hybridization in the production of varieties. It will thus be seen that even at this early date (1822) the fundamental principles of plant breeding had apparently become the common property of American agriculturists and horticulturists.

## EVOLUTION OF METHODS OF PLANT BREEDING DURING THE NINETEENTH CENTURY.

It has been seen that the fundamental laws of plant breeding were fairly well understood at the beginning of the century and had come to be expounded in horticultural text-books and papers. It must be borne in mind, however, that it requires years for scientific principles to become thoroughly understood and widely disseminated, so that they form a part of common practice. The early native varieties were largely chance seedlings, and there now seem to be very many choice fruits—pears, apples, grapes, etc.—which originated in this way. However, thousands and even millions of worthless wild seedlings, of which we have no record, have grown and perished, and in reality only one here and there excels and survives.

During the first fifty years of the century almost the sole method of breeding was to select seeds from the best fruits and raise numerous seedlings, which, when they fruited, were carefully examined, and those selected for further propagation which produced desirable fruits, of better quality than the parent sorts. One of the earliest systematic attempts of this sort known to the writers is thus described in the Magazine of Horticulture of 1847: "In the fall of 1817, and in the following spring, Governor Edwards planted the seeds of pears, with the design of obtaining new and superior varieties of this fruit. In doing so, he selected the seeds of the best which could be procured, including many sorts, but the number was then very limited compared with our day." This being one of the first systematic attempts in this country to secure improved sorts, it was largely ridiculed. The results obtained, however, were of great value, as from some forty trees thus produced several fairly good sorts were secured, among them being the Calhoun, Elizabeth, Dallas, Henrietta, and Citron.

In early days, furthermore, up to the fifties, orchards were to some extent made up of ungrafted seedlings. When a particularly good fruit was produced its seeds were carefully preserved and planted, and some varieties were reproduced in the main true to seed. Immense numbers of seedling apples were thus grown, and furnished excellent opportunity for selection, but only a few produced superior fruit or new varieties. In 1845 Rev. Henry Ward Beecher wrote from Indiana to the Magazine of Horticulture: "An immense number of seedling trees are found in our State. Since the Indiana Horticultural Society began to collect specimens of these, more than 150 varieties have been sent up for inspection. * * * Of all the number presented, not six have vindicated their claims to a name or place—and not more than *three* will probably be known ten years hence."

Improvement by selection, in the strictest sense of the term, has been employed mostly with annual plants, such as wheat, corn, cotton, etc., and the methods used have been gradually perfected in different industries, until in some, as in the sea-island cotton, all growers make annual selections with the utmost care to maintain and perfect the strain they grow. Very careful methods of selection have also been devised to develop and improve corn, and many of the most productive and valuable races are the result of continuous selection through numerous generations. In such selection the greatest care is taken to secure impregnation with pollen from vigorous, productive plants. To insure this the field in which selections are being made is carefully gone over when the first silks and tassels begin to appear, and all stalks are cut out which are not vigorous and well formed and which do not show indications of being productive. By this practice it is brought about that fertilization is effected by pollen from vigorous, productive stalks only. The final selections are made in the field when the corn ripens, the seed ears being taken from the most productive and vigorous stalks that are true to the type that the breeder is selecting to establish.

In selecting wheat to improve the strain the early attempts were mainly confined to simply taking the largest grains—a practice which is now recognized as failing in the primary factor of considering the productivity and vigor of the individual plant. Many experimenters in this country have worked on the improvement of wheat by selection, but in general with rather indifferent success. Recently, however, Professor Hays, of the Minnesota Agricultural Experiment Station, has used a very careful method of selecting wheat, grown in nursery form, which has given valuable results.

Hybridization and cross-fertilization in improving plants were very little utilized in the first half of the century. Knight had started the leaven, however, and in some directions it had shown results. The idea gradually became current that there was too much chance in raising seedlings of unknown parentage. Still, as late as 1857, we find the Rural New Yorker giving the following directions in regard to raising new fruits: "Eminent pomologists disagree on this subject. Our advice, however, is to plant the best seeds of the finest varieties, take good care of the plants, and trust to Providence for the result." Considerably before this time, however, the most advanced plant breeders had given rather different directions. In 1836 A. J. Downing, one of America's best-known pomologists, wrote: "Assuming Professor Van Mons to be strictly correct, we would suggest that a great saving of time and a considerable improvement in quality and vigor, might be gained by calling in *cross fertilization* to the aid of the cultivator, as soon as the fruit of the trees (say the second generation) begins to show symptoms of amelioration. By impregnating them with the pollen of the finest varieties, we conceive that the next generation would produce excellent fruit, and at a saving of twenty or thirty years." In 1844 C. M. Hovey, one of the most successful of all American horticulturists in the production of improved sorts, said with regard to the grape: "Without stopping to institute an inquiry into the merits of his [Van Mons] theory, compared with that of artificial impregnation, as practiced by Mr. Knight and others, we shall recommend to those who would raise seedlings, the importance of commencing with the Isabella or Catawba, for one of the parents, and impregnating them with the Sweet Water, Chasselas, or some other early foreign variety. The results will be obtained in a shorter period, and, we believe, equally as favorable as by the method of successive generations alone." In 1860 Marshall P. Wilder, in his presidential address before the American Pomological Society, gave advice regarding the origination of varieties in almost exactly the same words that might be used to-day: "It was my first, so it shall be my continual and last advice;—Plant the most mature and perfect seed of the most hardy, vigorous, and valuable varieties, and, as a shorter process, ensuring more certain and happy results, cross or hybridize your best fruits."

The first record which we have been able to find of the production of a hybrid variety in America is given by Manning, in the History of the Massachusetts Horticultural Society, as follows: "Probably the first attempt in this country to produce a new fruit by cross-fertilization was by William Prince, who raised the Prince's St. Germain [pear] from seed of the old St. Germain impregnated by the White Doyenne, about 1806." One of the most successful early attempts in using hybridization was by C. M. Hovey, in the improvement of the strawberry, his first hybrid seedlings having been brought to notice in 1838. He was eminently successful in obtaining good varieties by this method, and his success led to the extensive use of hybridization in the improvement of this fruit.

In this connection, it is interesting to note that a striking success achieved by any intelligent cultivator in producing valuable varieties of any plant has often led to the general adoption of his particular methods by other breeders of the same plant. Van Mons's success in originating pears by selection led to this method being mainly used in breeding this fruit. Allen's success, in 1854, in producing a good hybrid grape doubtless stimulated the adoption of this method in preference to other methods in improving the grape.

Since the middle of the century the advance in methods of improving plants has been altogether in minor factors. The early hybridizers often used a mixture of pollen, believing that it was possible for the same seed to be influenced by pollen from several varieties, or species. The details of the process of fecundation were not well worked out at that time, and it is not surprising that early experimenters frequently erred in their conclusions and were thus led to pursue false methods. With the gradual increase in knowledge of the methods of fecundation the idea of the effectiveness of using two kinds of pollen at the same time was abandoned, and in casting about for other methods of securing the results sought growers evidently began the practical use of compound hybrids, as the method came into practice about this time. Numerous hybrid rhododendrons, begonias, etc., contain the blood of several species, mingled with the definite idea of securing in the offspring certain characteristics from each parent. Compound hybrids have been particularly valuable in grapes, among the numerous excellent sorts of such hybrids being Lady Washington, Brighton, and Brilliant.

Another important factor in the application of hybridization to securing improved strains, and one which has but very recently become prominent, is the securing of what have been termed dilute hybrids, that is, hybrids containing more blood of one variety than of the other. If in any hybrid the character of one of the parents is found to be too pronounced to give a successful combination, it is crossed with the other parent, the result being a three-fourths hybrid, that is, a hybrid deriving three-fourths of its characters from one of the original parents and one-fourth from the other.

The value of selecting distinct parents and introducing new species into combination with old ones was early recognized, but mainly among florists, where a change of color was desired. In 1836 Hovey called attention to the change in color produced in calceolarias by the introduction of a different-colored species. "It was not until the introduction of a purple species, *C. purpurea*, in 1827," writes Hovey, "that any variation took place in the color of the flowers; the previously introduced ones being yellow, of course no other shade was produced until the impregnation of the former with the latter. At the present time, however, plants are to be found of almost every tint, from the palest yellow to deep orange, and from light red to bright scarlet, as also, two or three of these shades distinct in the same flower." The results of more recent work have emphasized the importance of using very distinct parents when marked changes or new creations are desired. The improved strains of begonias and roses resulting from the introduction of *Begonia socotrana*, *Rosa rugosa*, and *R. wichuraiana*, and Burbank's walnut hybrids (crosses of *Juglans californica*, *J. regia*, and *J. nigra*) illustrate the importance of this practice. This has led in recent years to the extensive introduction of and experiments with various wild species of common cultivated plants, and the field here opened to the horticulturists and florists is one of promise.

The importance of growing hybrids through several or at least two generations, in order to secure greater variation, particularly where the hybrid is from widely distinct parents, was scientifically demonstrated by Naudin and Nägeli in 1865. The practical importance of this discovery, however, has come to be thoroughly understood and appreciated by American plant breeders only in the closing years of the century.

In very recent years there has been much discussion of the question of the improvement of certain cultivated plants by selection of the vegetative parts used in propagation. It seems to have been proved beyond question that certain plants can be greatly modified in this way, particularly as to vigor and productiveness. This method of improvement seems likely to play a very important part in the future by aiding to secure strains of standard sorts suitable for growth in special localities and varying but slightly from the original varieties.

### IMPROVEMENTS EFFECTED DURING THE NINETEENTH CENTURY.

In the present paper it is possible to call attention to only a few of the most important improvements illustrative of the advances made in certain fields of agriculture and horticulture. In early days, as previously indicated, the majority of the native varieties introduced were merely chance seedlings, which grew uncared for until their good qualities were discovered, when they were brought into cultivation. The sorts obtained in this way are not primarily due to plant breeding, being simply the result of intelligent choice of chance-sown plants, yet some of these varieties have had a marked influence on the development of certain industries. Of far greater importance, however, has been the introduction of varieties which have been produced by careful methods of selection, carried through from one to many generations.

Hybridization also has already had a very marked effect in the development of many cultivated plants, and in the future it will doubtless be extensively utilized in securing desired modifications.

### IMPROVEMENT IN GRAPES.

The grape has been very much improved by American cultivators and furnishes an excellent illustration of the great amelioration which may be obtained in a comparatively short period. For many years after the settlement of America the only grapes cultivated were of European origin. Numerous trials, however, proved that these were not hardy in Eastern America, and that they soon succumbed to attacks of Phylloxera and other diseases. Curiously enough the native American grapes, which were found in great abundance throughout the eastern part of the country and attracted considerable attention, were for years neglected, and it was only after the failure of the European sorts had been demonstrated that the native sorts were brought into cultivation. The first of these to attain prominence was the now famous Catawba, which was found wild in North Carolina in 1802, and was brought into general notice by Maj. John Adlum, of Georgetown, D. C. A few years later the Isabella, another wild grape, was introduced, and after the success of these two sorts had been demonstrated many other wild forms were brought into cultivation.

Apparently very little systematic effort was made to improve the grape until the appearance of Pond's Seedling in 1835. The time of its introduction is worthy of notice as being the beginning of a period of planting seeds of the native species for the purpose of making selections.

The greatest advance in grape culture in this country is without doubt due to the famous Concord, which was also produced by selection. About the year 1840, Mr. Ephraim Bull, of Concord, Mass. (Pl. XXXVI), found growing on his grounds a wild grapevine, which was apparently a seedling from some wild grapes that had been scattered about his place by boys the preceding year. He took up the vine and moved it to his garden, giving it good care until it fruited in 1843, the fruit, which was of good quality, ripening as early as the latter part of August. He was so impressed with the superior quality of this fruit and the lack of foxy flavor that "the idea at once occurred to him that another generation would be a still greater improvement." Following this out, he planted seeds of this grape, obtaining a number of seedlings. One of these, which fruited first in 1849, was so markedly superior to the others that it alone was preserved, later being named the Concord. This grape, because of its vigor, productiveness, and fine quality, at once became very popular. Not only has the variety proved of great value itself, but it has been the parent of a great number of varieties, many of them of considerable merit. Probably the best known of these are the Worden and Moore's Early. Mr. Bull continued to plant seeds of the Concord year after year until he had produced over twenty-two thousand seedlings, but of these there were only twenty-one which he recommended for cultivation, and none of them have become as popular as the parent variety.

In the last twenty years very many varieties of the grape have been produced, but no select seedlings of striking importance have appeared, the good new varieties being mainly hybrids. In this connection it is worthy of notice that the grape owes more to hybridization than does any other fruit. The Delaware grape, which is even yet a standard of excellence, is probably a natural hybrid, containing some blood of the fine European grape. This was found in a garden of foreign grapes in New Jersey about the year 1850, but received its name from Delaware, the Ohio town in which it was first brought to general notice. It is undoubtedly the best of our chance seedlings, and was the last introduced that proved of much merit.

Many of our most widely cultivated varieties of grapes, such as the Salem, Niagara, Brilliant, etc., which are common sorts in the markets, are the results of careful hybridization. The first hybrid grape produced in this country, known as Allen's Hybrid, was introduced in 1854, and was a cross of the Isabella with a European variety, supposedly Golden Chasselas. This is the epoch-making grape as far as hybrids are concerned. It was regarded with much interest because of its fine quality and appearance, and while the bright hopes regarding it were never realized, it was of the greatest importance, as it served to stimulate the improvement of grapes by hybridization. Shortly after this E. S. Rogers, of Roxbury, Mass., began introducing his new hybrid varieties, the first being sent out in 1856. His Salem is an excellent chestnut-colored sort, and is probably the most extensively grown of any hybrid grape. Rogers was closely followed by Ricketts, Burr, Caywood, Moore, Rommel, Stayman, and several others, who were very active in the production of new sorts, mainly hybrids, and more recently still, by T. V. Munson, of Denison, Tex., who has probably conducted the work on a more extensive scale than any other experimenter in this field. Munson has already sent out thirty-six new varieties, for the most part hybrids, and is still actively engaged in the work.

A tabulation of the grapes described in Bush & Son & Meissner's Grape Grower's Manual shows that, of 554 varieties described, 287 are hybrids, 141 select seedlings, 57 chance seedlings, 68 of unknown origin, and 1 a sport. Considering those of known parentage, 59 per cent are hybrids, 29 per cent select seedlings, and 12 per cent chance seedlings. These figures show the marvelous extent to which hybridization has affected the improvement of the grape.

### IMPROVEMENT IN PEARS.

One of the first native varieties of pears to be introduced was the Seckel, which has remained to the present time our standard of excellence. It was found near Philadelphia during the eighteenth century, apparently being a chance seedling. Many other early native varieties introduced were obtained in this way, among them Tyson, Andrews, and the Columbia Virgoulouse, the last named remaining a popular pear for a considerable time. It was not long, however, before the practice of planting seeds of the best fruits and selecting from the resulting seedlings came to be adopted in the improvement of the pear. One of the first attempts of this kind to attract attention was that of Governor Edwards, of Connecticut, as mentioned elsewhere. Probably the most systematic and successful attempt at growing seedlings for selection was that made by Mr. Dana, of Massachusetts. He planted seeds of the best varieties and raised five or six thousand seedlings, from which he obtained many good varieties, the best being Dana's Hovey, introduced about 1860. It is worthy of note that Dana always planted the seeds of the best varieties, a practice directly opposite to Van Mons's theory, and yet succeeded in producing many good sorts.

The pear owes but little of its development to artificially produced hybrids, and yet in no other fruit have hybrids played such an important rôle. The Kieffer, Le Conte, and Garber, all widely-grown commercial pears, through which this industry has been greatly extended, are naturally-produced hybrids of the European pear and the Chinese sand pear.

The European pear, noted for its excellent quality, succeeds admirably on the Pacific coast, but has never proved wholly satisfactory in the Eastern States, and can not be successfully grown on a commercial scale south of Virginia. The Chinese sand pear comes from a region having climatic conditions very similar to those of the Eastern and Southern States, and thus finds here a congenial home. The fruit is of poor quality, however, and the variety is grown only as an ornamental tree and for stocks on which to bud other sorts. The Kieffer and Le Conte are both seedlings of the Chinese sand pear, and from their characters show that the seeds from which they grew must have been accidentally crossed with the pollen of some good variety of the European pear. It is probably to the father parent, the European pear, that is due the improved quality of the fruit, while the vigor and adaptability to growth in warm climates evidently come from the mother parent, the sand pear. These hybrid sorts practically revolutionized pear culture in the Eastern United States, extending the limit of profitable commercial pear growing several hundred miles southward. From Virginia to Florida these varieties grow luxuriantly and have practically driven out all other sorts. Even as far north as Philadelphia the Kieffer is by far the most important commercial variety.

### IMPROVEMENT IN APPLES.

Among apples, as in the case of pears, the variety that is considered to be a standard of excellence, the famous Newtown Pippin, was obtained as a chance seedling. It was introduced to notice about two hundred years ago. The Baldwin apple, which has exercised such an important influence on the apple industry, was also a chance seedling, which sprang up about 1742 on the farm of Mr. John Ball, in eastern Massachusetts, and was brought into general notice by a Colonel Baldwin, from whom it took its name. This apple proved to be of such importance that its origin has recently been commemorated by the erection of a monument on the spot where the original tree stood.

Many other chance seedlings have proved to be of great value, but a large proportion of the varieties of most importance, obtained during the nineteenth century, are the results of selection either of seedlings grown for the purpose or from seedling orchards. Of these may be mentioned the Northern Spy, originated in New York about 1800; the Jonathan, introduced in 1829; the Summer Bellflower, and many others.

One of the important problems which has recently taxed the skill of apple breeders has been to secure varieties suitable for growth in the northwest prairie region. The Wealthy apple, the first variety to meet this condition, furnishes one of the most striking examples of improvement in apples effected by planting numerous seeds and selecting from the seedlings. About the year 1855 Mr. Peter M. Gideon, of Minnesota, began fruit culture, planting fruit trees of various kinds, among them thirty named varieties of apples, and also a bushel of apple seeds. Each succeeding year for nine years he planted more trees and also enough seeds to produce about a thousand trees each year, but the cold winters kept killing them off until at the end of the ten years there was left only one small seedling crab. All of Mr. Gideon's neighbors gave up the attempt to grow fruit, characterizing it as an impossibility, and urged him to do the same, but he persisted and sent to Bangor, Me., for scions and seeds. From the seeds of the Cherry Crab thus obtained one seedling proved hardy and was named the "Wealthy." Upon these varieties the apple culture of the northern Mississippi River region has been built. Within very recent years there has been great activity in hybridizing our different varieties of the apple with the varieties of Russian apples recently introduced and with the native wild crab, the object being to obtain hardier varieties. This line of experiment, started in the closing years of the century, will probably in a few years yield results of the greatest practical value.

### IMPROVEMENT IN PLUMS.

For many years plum culture in America was almost entirely limited to the cultivation of introduced varieties of the European plum, but

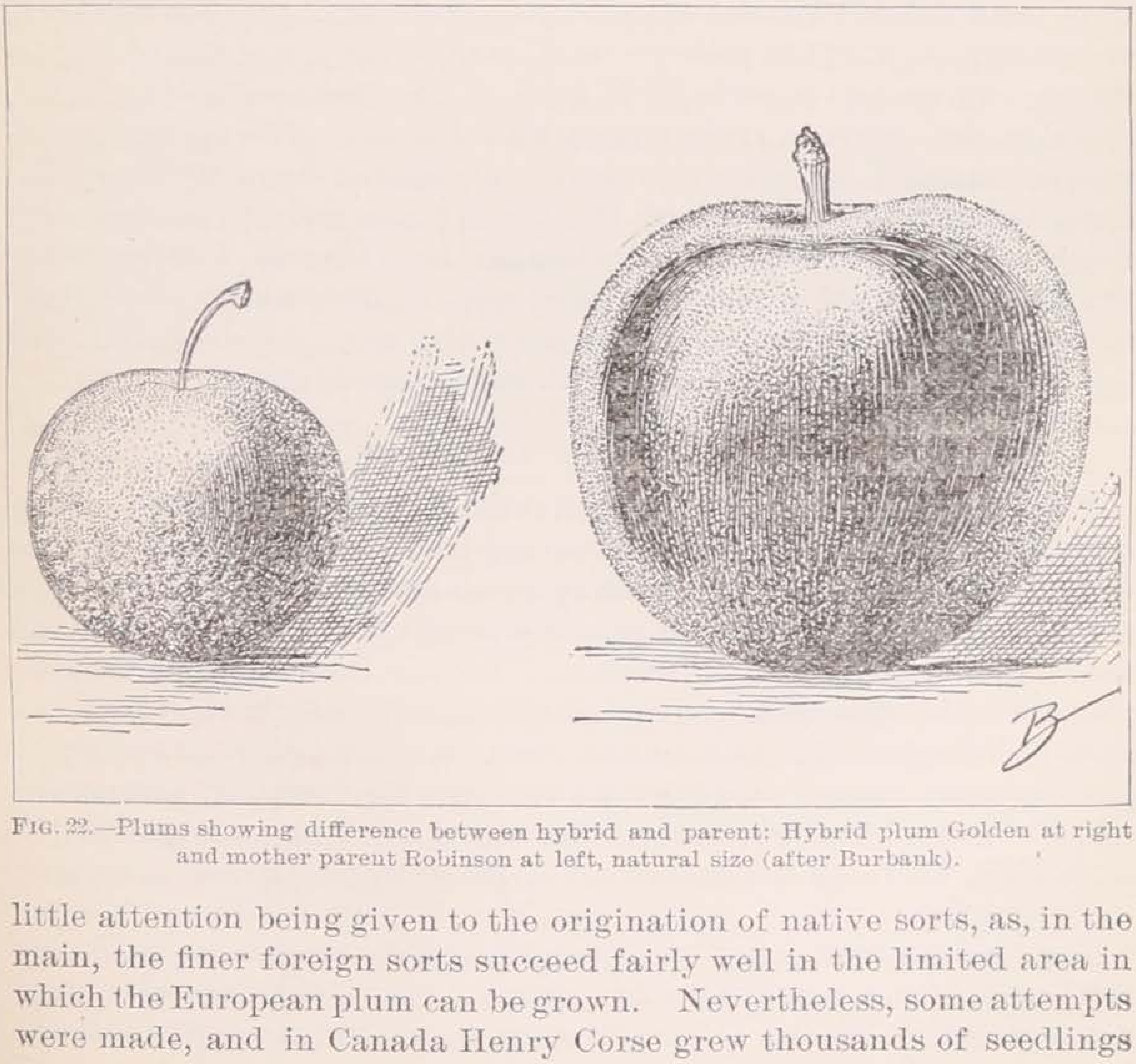


FIG. 22.—Plums showing difference between hybrid and parent: Hybrid plum Golden at right and mother parent Robinson at left, natural size (after Burbank).

little attention being given to the origination of native sorts, as, in the main, the finer foreign sorts succeed fairly well in the limited area in which the European plum can be grown. Nevertheless, some attempts were made, and in Canada Henry Corse grew thousands of seedlings for several years previous to 1840 with the hope of procuring something which would excel existing varieties. From this great number he selected several which promised well, and to four, of whose excellent quality there was no doubt, he gave the names Dictator, Victoria, Colonel Wetherell, and Nota Bena. About the middle of the century the value of our native species came to be recognized. Many selected chance seedlings were brought into cultivation, and it is to these that we owe the development of our native species of plums, nearly all the best-known varieties of which were obtained in this manner.

It is only recently that any attempt has been made to improve our plums by artificial hybridization, and this attempt has been brought about mainly by the introduction of the Japan plum (*Prunus triflora*), which has entered into most of the valuable combinations thus far produced. The first Japan plum grown in this country, the Kelsey, was not introduced until 1870. The great activity in introducing the Japanese varieties and crossing them with American sorts did not begin, however, until several years later, but, according to Professor Waugh, the Japan plum already constitutes one parent of twenty-seven hybrids which have been found valuable and named. The introduction of this plum and its use in hybridization bids fair to be of the greatest importance to the plum industry. Luther Burbank, of California, was the pioneer in plum hybridization, and has produced very many valuable sorts, such as the Golden (fig. 22), Juicy, and America (crosses of Robinson with Botan). The apricot plum, another species, has also been used a number of times by American experimenters in crossing with the Japan plum, and has yielded such fine combinations as the Climax, Chalco, Late Conical, and probably the Wickson, all of which were produced by Burbank. Some valuable hybrids of our native species have also been produced, but they are not so promising as hybrids with the Japan plums.

### IMPROVEMENT IN RASPBERRIES.

The varieties of raspberries cultivated in this country are almost entirely of the native species, it having been found difficult to grow the European varieties. Accordingly, we find that our first varieties are derived mostly from wild plants picked up in the woods and the fields and brought into cultivation. Among those thus cultivated, probably the first to be named and generally distributed was the so-called English Red, which was really a native American variety. Among other chance seedlings are the Ohio Everbearing, Catawissa, and Cuthbert. The last named was found growing in a garden in Riverdale, N. Y., in the latter part of the seventies, and soon became a popular sort.

The systematic improvement of the raspberry by growing seedlings for selection was much retarded by the earlier growers of this fruit attempting to make use of the European instead of the native species.

In the meantime, however, many wild plants of the American species were domesticated on farms and in gardens. Among the early experimenters with this fruit was Dr. Brincklé, of Philadelphia, who produced a great many varieties, but only one which proved important. This was the Brincklé's Orange, produced in 1844, from an English sort known as Dyark's Seedling. It has proved to be a very popular berry, and has been widely grown, being one of the very few varieties of the European species to prove hardy in America. Soon there appeared other varieties, many of them being seedlings of foreign sorts, but probably in many cases accidentally crossed with the native species. Most of the varieties now grown, however, are improved varieties of the American species.

In the last quarter of the century several valuable hybrids have been introduced which have become popular sorts. Among these may be mentioned the Dictator (Gregg crossed with Schaffer) and the Caroline (Brincklé's Orange crossed with Black Cap).

IMPROVEMENT IN BLACKBERRIES.

The blackberry, as a cultivated plant, is entirely an American production, and we owe nothing to the European plant breeders so far as it is concerned. All the earlier varieties were merely wild plants taken up and set out in the garden. One of the first attempts to improve the blackberry was that by Mr. Lovett, of Massachusetts, who for many years attempted to find good plants and bring them into cultivation. It was not until 1850, however, that the Dorchester, the first variety to be named, was introduced. In 1854 a berry was introduced that marked an epoch in blackberry culture, and showed what the fruit was capable of becoming. This was the Lawton, or New Rochelle, as it is often called. It was found by the roadside near New Rochelle, N. Y., and was introduced by Mr. Lawton. This berry long remained popular, but its place was finally taken by Wilson's Early, also found as a wild plant.

The culture of the blackberry is still in its infancy, and comparatively little attention has been given to its improvement. Quite a number of hybrid varieties, such as Iceberg, Autumn King, Minnewaska, etc., have been introduced, but none have as yet become very well known.

The raspberry and blackberry have been repeatedly hybridized by experimenters like Burbank and Carman, and some suggestive results obtained. Burbank's series of raspberry-blackberry hybrids are in many respects the most remarkable ever produced between distinct species. The most noteworthy of these hybrids are Primus (Western dewberry crossed with Siberian raspberry), Paradox (Crystal White blackberry crossed with Schaffer raspberry), and Humboldt (Improved California Wild dewberry crossed with Cuthbert raspberry). Burbank, in speaking of the Primus, says: "It is also remarkable that the hybrid should ripen its fruit several weeks before either of the parents, and excel them much in productiveness and size of fruit, though retaining the general appearance and combined flavors of both." The Paradox was the only one retained out of some forty thousand hybrid seedlings.

IMPROVEMENT IN STRAWBERRIES.

Strawberry culture in this country was conducted on a small scale at first because no varieties well suited to the climatic conditions were known. Many were tried without success, especially the Keen's Seedling, which was represented as very promising; but while it was an exceedingly valuable berry in England, its place of origin, it failed to fulfill the expectations of those who imported it into this country. After cultivating this and many other sorts of more or less note, Mr. C. M. Hovey, an eminent American pomologist, became satisfied that there existed in this country at that time no variety possessing the qualities necessary to make its cultivation profitable. "There seemed to be wanting," says Hovey, "a variety combining the qualities of two or more of these, and we set out upon the experiment of attaining this desirable result, determined, if time would allow, to pursue it until our object was accomplished." He prepared plants of seven distinct varieties, and in 1833 made six series of crosses, having first carefully removed the stamens from the flowers to be pollinated, so as to prevent self-fertilization. The following year the resulting seeds were planted and produced plants of very varied appearance and characteristics. Only a few of these surpassed the best of the parent varieties, but one in the size and number of its berries, as well as in fine flavor, excelled anything known in this country. This plant was kept under observation six years, at the end of which period, having fulfilled the expectations of its producer, it was put on the market under the name of Hovey's Seedling (fig. 23).

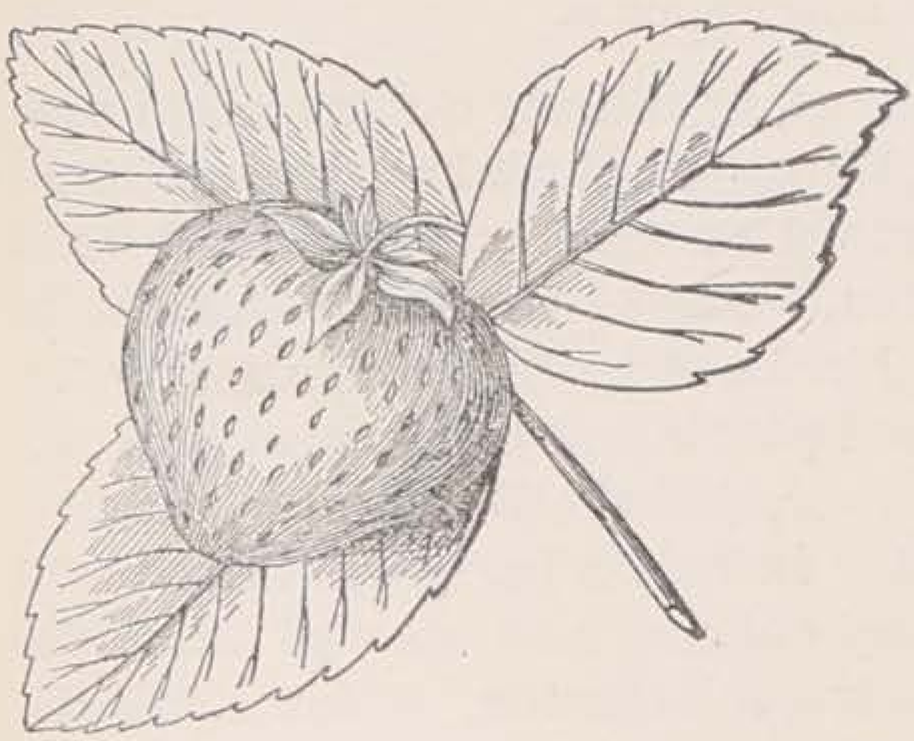
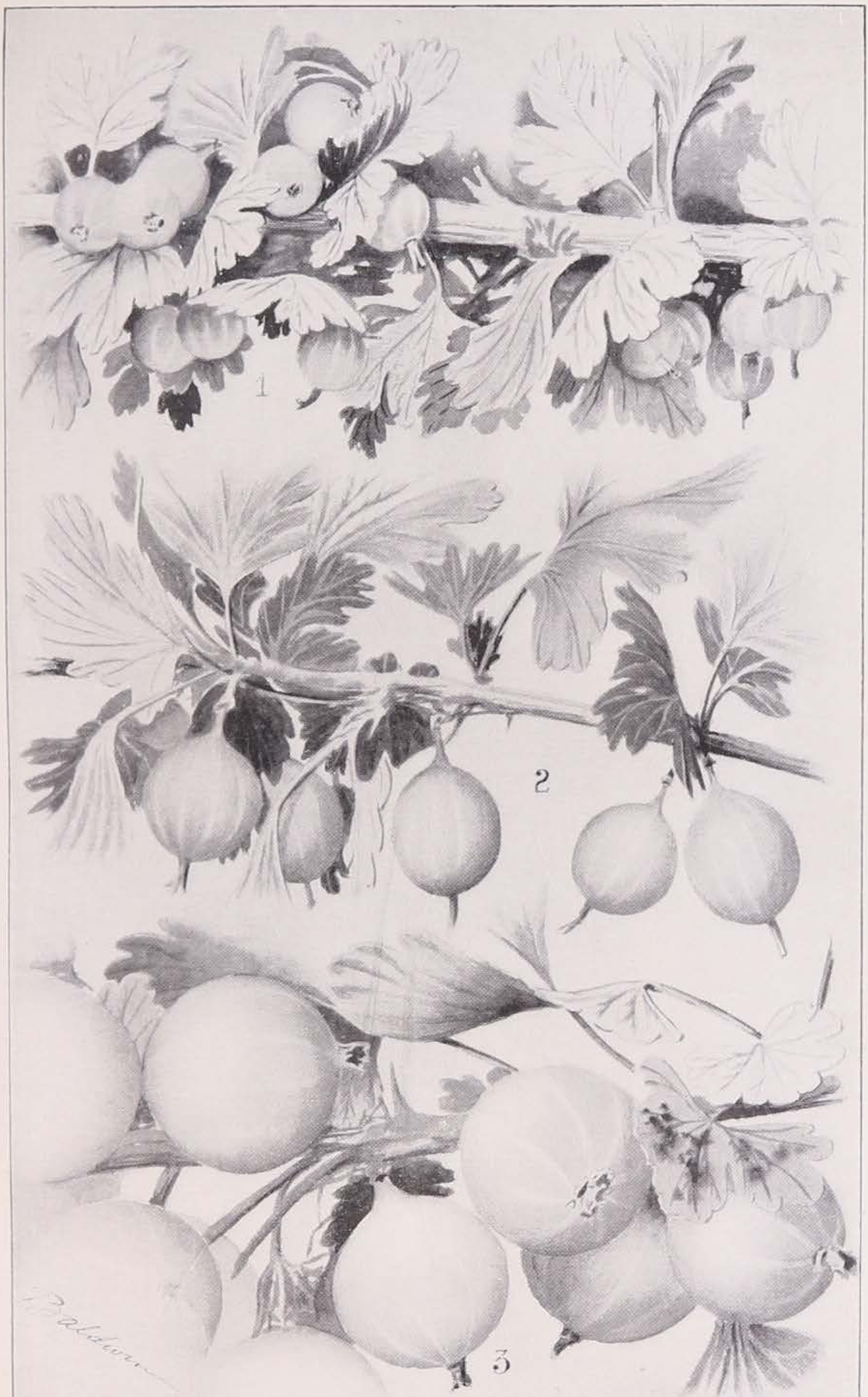


FIG. 23.—Hovey's Seedling strawberry, half natural size (from the Magazine of Horticulture).

The effect of the production of this berry was truly wonderful, and resulted in making strawberry culture popular and profitable. Other experimenters began to make crosses and to grow new sorts, but in spite of the almost innumerable varieties thus produced Hovey's Seedling remained the leading berry for almost thirty years. It is worthy of note that although it was probably the most famous variety ever produced, it is now extinct, it being impossible to obtain typical plants.




IMPROVEMENT OF THE NATIVE GOOSEBERRY: 1, RIBES OXYACANTHOIDES, WILD FORM; 2, HOUGHTON GOOSEBERRY, SEEDLING OF THE WILD FORM; 3, DOWNING GOOSEBERRY, SEEDLING OF THE HOUGHTON. (ALL NATURAL SIZE, ADAPTED FROM BAILEY.)

The Wilson, which supplanted it, is itself being gradually supplanted by other sorts, and will probably eventually disappear. Among the varieties produced from Hovey's Seedling may be mentioned Moyamensing Pine, which in 1849 was awarded the prize offered by the Philadelphia Horticultural Society for the best new berry. This was in turn the parent of many other varieties, some of which were of considerable merit.

Hybridization has been the favorite method of producing new varieties of strawberries, perhaps because the first successful variety was obtained in this way. Among the recent hybrids may be mentioned the Hunn, which also illustrates the difficulty of systematic breeding, it being the only one deemed worthy of preservation out of about seventeen hundred hybrid seedlings tested.

### IMPROVEMENT IN GOOSEBERRIES.

As in the case of most other fruits, the first varieties of gooseberries grown in this country were of foreign origin. However, these mildewed very badly, especially when their cultivation became more general; hence, in the course of time the growing of this fruit was almost totally abandoned. Soon the native species began to attract attention, however, and one of the first varieties to be described was Houghton's Seedling, produced near Lynn, Mass., about 1845, from the wild gooseberry. A few years later Mr. Downing, of New York, produced from this already popular variety the Downing, a seedling which has since become extremely popular. The Houghton and Downing, compared with the wild type from which they sprang, furnish an interesting illustration of the evolution of a native wild plant. (Pl. XXXVII.) Since then a number of seedling varieties of good quality have been produced, and have come to be quite extensively cultivated. However, now that the use of fungicides has become general, the English varieties are again coming into cultivation, and it is still a question whether the advantage gained by the American varieties, owing to the exclusion of the former by mildew for so many years, will enable the American sorts to retain their supremacy.

### IMPROVEMENT IN VEGETABLES.

THE TOMATO.—The tomato illustrates well what can be accomplished by careful breeding. In the early part of the century the races of tomatoes had mostly small and lobed fruits, but in the course of fifty years or more of selection the type has changed until the fruit is now large and smooth and the habit of the plant very different. As in the case of the strawberry, the first great advance in the development of the tomato in this country was made by hybridization. The Trophy tomato, introduced by the late Colonel Waring, was the first of our modern, smooth, round tomatoes, and its production and advertising, probably more than anything else, served to make the tomato a popular garden vegetable. "The Trophy tomato," in the words of Colonel Waring, "is a product of crossing and careful cultivation by Dr. Hand, of Baltimore County, Md., who began his work in connection with it about 1850. He crossed the small, smooth 'Love Apple,' which was filled with juice and seeds, with the compound, convoluted tomato of that period. This latter was practically four or five separate fruits packed together in one, with the skin running far into the convolutions. He succeeded in putting the solid mass of this compound growth into the smooth skin of the Love Apple, and then, by careful selection, year after year, increased its size and the solidity of its contents until it became a mass of flesh interspersed with small seed cells." The Trophy remained for a number of years the principal race on the market, but was finally superseded by others bearing larger and better fruits, in the production of which hybridization played an important part. The effect of selection in recent years is illustrated in the production of the Paragon by A. W. Livingston. In passing through a field of tomatoes, he selected one plant because of the uniformly smooth fruits and because of its being very prolific. The seeds from this plant were sown the next year, and the stock of seeds for planting was saved from the earliest and best specimens. By continuing this process for five years the Paragon was produced. The Acme, Perfection, and many other races were originated in a similar manner.

THE POTATO.—The potato has long been the subject of more or less systematic improvement in this country. According to Bailey, even as early as the end of the last century, Joseph Cooper made "successful experiments in keeping and improving strains of the potato." There is a record in 1835 of the production of a new variety called Perkin's Seedling, originated by planting a seed ball a year or two before. In 1841 the Pollard, a seedling of the Chenango, was introduced, but the most popular potato originated during this period was the Mercer, which was also a select seedling. For a good many years after this it was a general practice to plant potato seeds to produce new varieties, but these for the most part remained known only locally.

The introduction of new wild strains from South America marked the beginning of a very distinct epoch in the culture of the potato. About 1850, or possibly two or three years earlier, a Mr. Goodrich began experiments with a view of improving the potato, using the varieties known as the Wild Peruvian and the Rough Purple Chili, which were either direct importations from South America or but slightly improved. He grew seedlings of these varieties for fifteen years, obtaining over sixteen thousand, but considered only ten of this number worthy of cultivation. The best two of these were the Cuzco, a seedling of the Wild Peruvian, and the Garnet Chili, from the Rough Purple Chili. Later the Cuzco gave rise to several fairly valuable varieties, but it was surpassed by the Garnet Chili, from which several of our best-known varieties have been produced.

In 1860 or 1861 a grower of the Garnet Chili preserved a seed ball of this variety, pinning it up against his window until it was old and dry, when, fortunately for the potato industry of the United States, he gave it to Mr. Albert Breese, of Vermont. Mr. Breese planted the seeds and obtained widely varying plants, some producing many tubers and others but few, while there was no uniformity in their size or shape, some being large and others small, some round and others elongated. Seven of the plants proved to be of exceedingly good quality, but one of these, an early sort, far surpassed the others and was named the Early Rose. When this potato was put on the market a few years later, it commanded almost fabulous prices, and in a few years became the leading variety in America, a position which it still retains over a considerable part of the country. The other varieties of similar origin also became quite popular, and soon the old sorts were completely abandoned. In fact, there can be found in the catalogues of varieties grown at the present time scarcely a single variety popular forty years ago.

In the production of many sorts, such as the White Elephant, Snowflake, Nebula, etc., hybridization has been used, but so far none of the varieties thus produced have proved as valuable as the Early Rose.

The potato has been also somewhat improved by the selection of its tubers. Thus, when the Early Ohio was introduced, a careful selection was made of the "medium-sized, well-ripened tubers of a desired shape," with the result, according to C. L. Allen, of "fully a week's gain in earliness; a great increase in productiveness, with a marked decrease in the quantity of vines." A few of our well-known varieties originated as bud sports from the tubers; for example, Thorburn's Late Rose from tubers of the Early Rose.

THE GARDEN PEA.—The garden pea furnishes an example of great improvement produced largely by hybridization, the most marked result obtained in this country being the production of the dwarf pea American Wonder about the year 1880, up to which time the varieties grown were almost all of foreign origin. This variety was the result of a combination of McLean's Little Gem and the Champion of England. The former long stood at the head of the dwarf peas, but was unproductive; the latter at the time the cross was made was considered the best in quality and the most productive of the tall peas. The American Agriculturist says: "We look upon the production of this pea as one of the most important steps made of late in its department of horticulture."

THE SQUASH.—It is interesting to note that among squashes, which hybridize so readily, the Butman, originated by Mr. Clarendon Butman, of Maine, about 1875, was the result of crossing the Hubbard with a Japanese race and of several years of careful selection. This, according to Mr. James J. H. Gregory, was the first instance of a race of squashes produced in America, all of our standard races previous to the production of this one having been originated abroad.

IMPROVEMENT IN CEREALS.

CORN.—Corn has probably been more or less the subject of improvement by selection ever since it was first cultivated, and it is a general practice among farmers who grow their own seed to select the best ears for the next year's planting. There have been some experimenters, however, who have given special attention to its improvement, among the earliest being Mr. J. S. Leaming, who began in the early fifties by going through his fields—then producing an ordinary, not very prolific, yellow corn—and selecting seed from the best-formed plants bearing two or three well-formed ears. In this way, by a continuous selection extending over thirty years, the famous Leaming corn was produced and kept up to its standard. About fifteen years later Mr. James Riley, of Indiana, also began the careful selection of corn, taking a fine white sort as the original. He used essentially the method followed by Leaming, but in addition went through the fields just as the tassels were appearing and cut out all imperfect and barren stalks. He selected seed for the next year's planting from the finest stalks and the best and most evenly developed ears. By continuing this selection for several years he produced the Boone County White (Pl. XXXVIII, fig. 1), which has given noteworthy yields at the Illinois experiment station.

Corn has been greatly modified and improved by hybridization, but no improvement stands out as marking a distinct epoch. The earliest account of a new race being originated by hybridization which has come under the notice of the writers is that of the Smith's Early White, described in a letter by Dr. Gideon B. Smith, in the Albany Cultivator for 1838, the experiments being said to have been started some ten or twelve years earlier. It was the result of a cross between the Tuscarora and the Sioux. Dr. Smith's discussion shows that the results to be expected from crossing different races of corn were thoroughly understood even then. The original Old Colony sweet corn, a race originated about 1849, and extensively cultivated for years, was one of the first and best of the sweet-corn hybrids.

The ease with which corn hybridizes naturally in the field has led to great mixing, and doubtless many forms now cultivated are selected types of such accidental crosses. Very many of the best races, however, were originated as carefully produced hybrids.

WHEAT.—The early races of wheat grown in this country were, as was the case with almost all our cultivated plants, of foreign origin, and even now a great many sorts are being imported, especially from Russia. A large number, however, have had their origin in America,

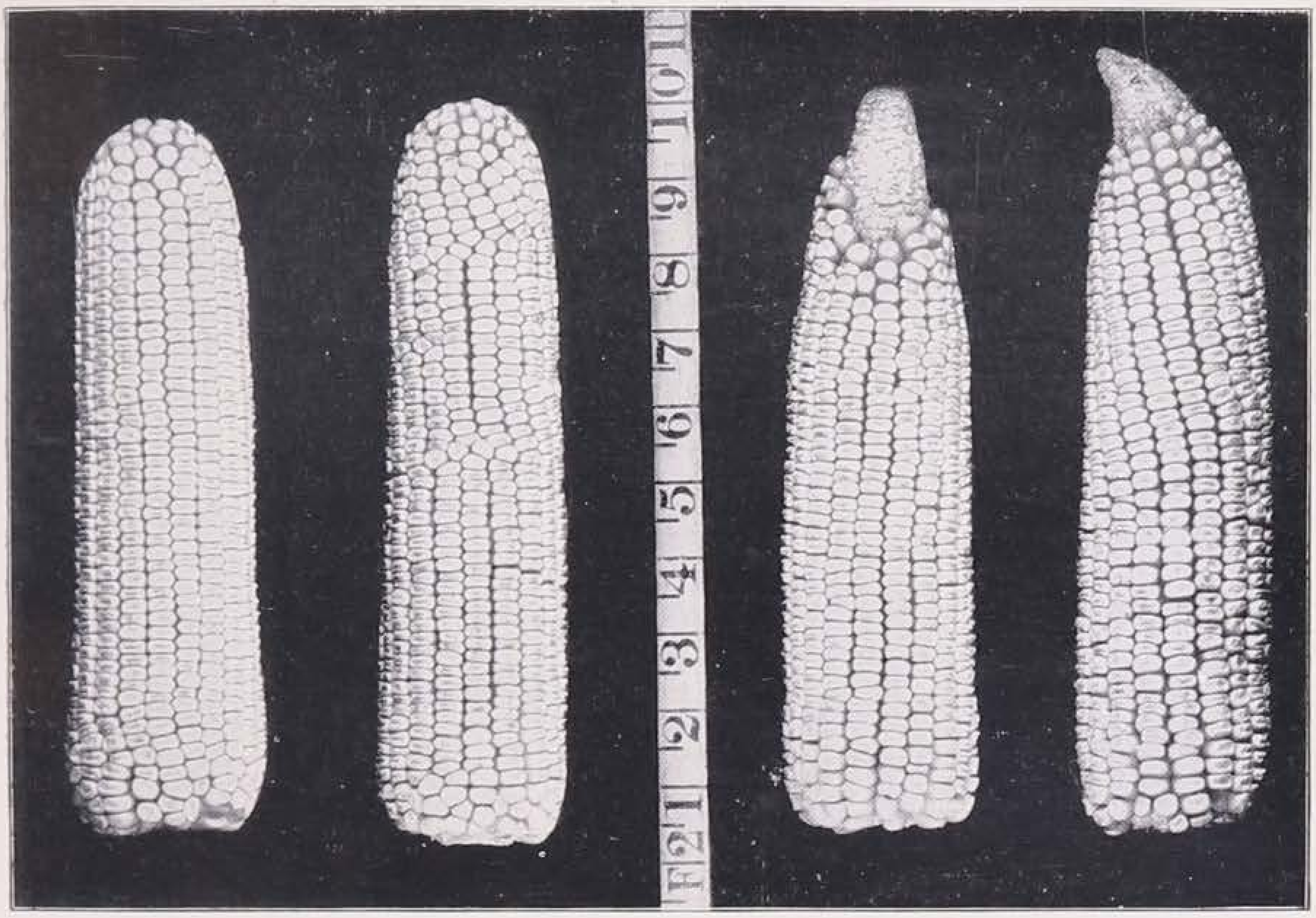


FIG. 1.—IMPROVEMENT OF CORN BY SELECTION: BOONE COUNTY WHITE CORN ON LEFT AND ORIGINAL TYPE FROM WHICH IT WAS DEVELOPED BY SELECTION ON RIGHT.

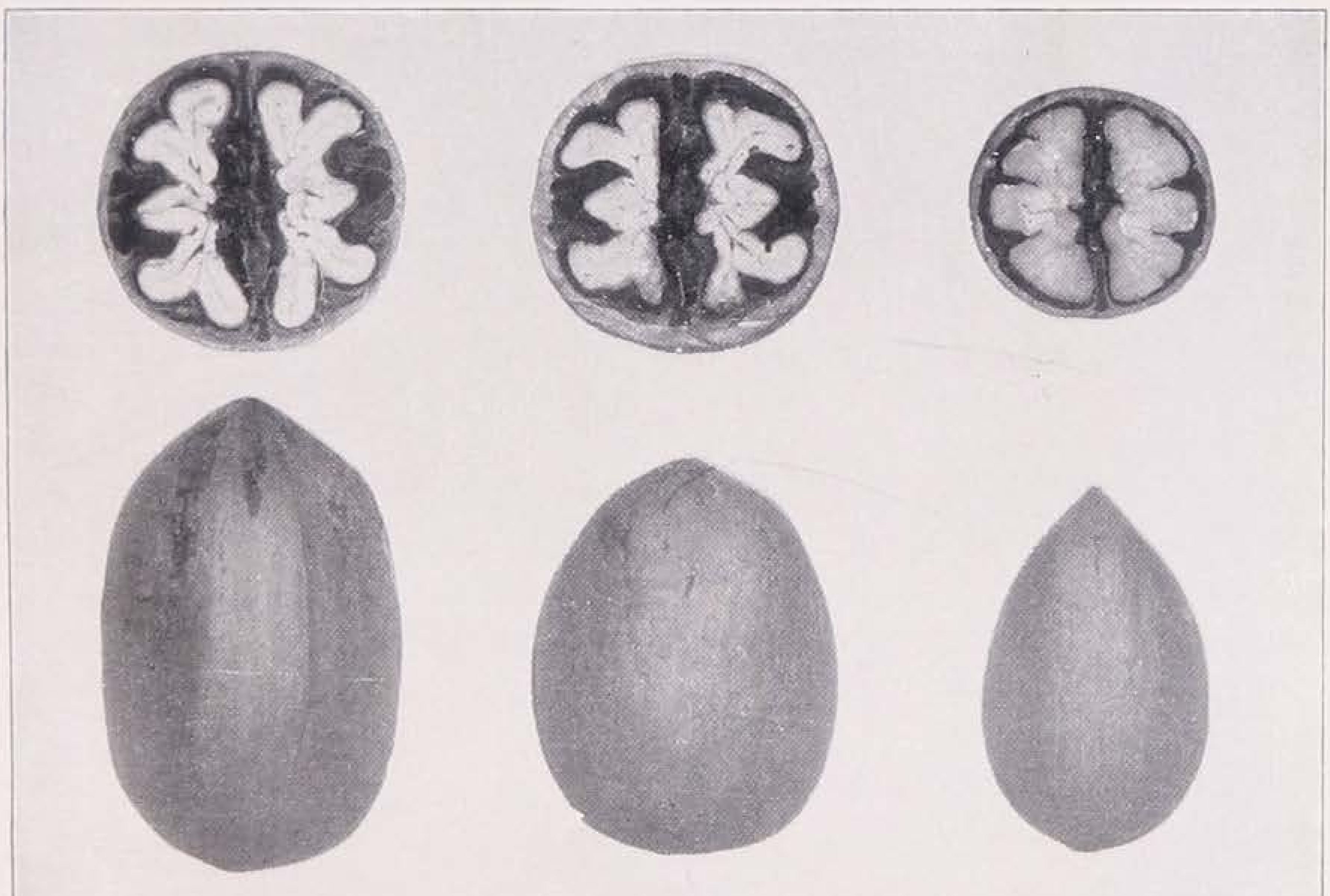


FIG. 2.—VARIATION IN SEEDLING PECANS: FROTSCHER PECAN ON LEFT AND TWO SEEDLINGS FROM IT, SHOWING VARIATIONS IN THICKNESS OF SHELL, SIZE, ETC. (NATURAL SIZE.)

the first of these being mainly such as originated in fields of wheat or from chance-sown seeds, which, owing to their differences from other wheat, were preserved and perpetuated. Such, for example, were the Tappahannock, found in Virginia in 1854, and the famous Fultz wheat, found in a field of Lancaster Red wheat in Pennsylvania in 1862 by a Mr. Abraham Fultz. Mr. Fultz was attracted by some beautiful heads of smooth wheat, which he saved and planted by themselves, and from these the new race was developed.

But little attention has been given to the systematic growing of wheat for selection until quite recently. The most important experiments of this kind in the United States are those by Prof. W. M. Hays, of the Minnesota experiment station, which are still in progress. From the year 1888 up to the present year 552 different races have been tested, from which eight were finally selected as worthy of preservation. From these eight, selection experiments were started in 1892, and as a result, even at the end of the first year, four of the best eight new strains surpassed in yield and in some other qualities the best four of the old varieties. Though it is too early yet to give more definite results, it is evident that the use of selection is very promising as regards the improvement of even the best races.

Within recent years considerable attention has also been given to hybridization, and many valuable hybrids have found places in our lists of important races. Attention has been directed mainly to increasing the yield by crossing different strains and to securing earlier and hardier sorts. Among the earlier experimenters in this field Arnold and Pringle were eminently successful. Arnold's Hybrid No. 9, a cross of Michigan Amber with White Soules, has in some places given good results. Pringle's Defiance, said to be "a hybrid of a white wheat common in California upon an Eastern club variety," has proved very valuable in California, Colorado, and other places. Prof. A. E. Blount, while at the Colorado experiment station, made many wheat hybrids and obtained several improved varieties. Blount's Hybrid No. 15, a cross of Lost Nation with Sonora, has become a well-known race, giving excellent results in some States. Probably the most valuable work in wheat hybridization in this country has been done by A. N. Jones, of New York. Mr. Jones writes: "Most of my crossbreeds are from Russian and American varieties, with some blood from Mediterranean Longberry or offspring from these combinations." Of the sixteen or more hybrid wheat races introduced by Jones, several have become standard sorts. Winter Fife, which is extensively grown in Indiana, Ohio, and other places, is probably his best-known race. His Early Red Clawson, Early Genesee Giant, etc., are among our widely grown races.

From 1888 to the present time Prof. William Saunders, director of the experimental farm, Ottawa, Canada, has been hybridizing wheats particularly to secure early ripening races. To accomplish this he has sought to secure earliness and hardiness in the best American races by hybridizing them with various Russian sorts. Preston and Stanley, derived from Ladoga, a Russian sort, crossed with Red Fife, and Alpha, Percy, and Advance, derived from Ladoga crossed with White Fife, are proving valuable additions. Tests of Preston and Advance at the Minnesota experiment station have given good results. Professor Hays, of that station, says: "Preston is the most interesting and promising variety of wheat procured outside of the State, and it bids fair to be a strong rival of our best Fife and Blue Stem wheats." Besides his important work on selection mentioned above, Professor Hays has been in recent years conducting experiments in hybridization and has obtained results of the greatest promise. It is noteworthy that in this country the wheat hybrids thus far produced which have given valuable results are racial hybrids, in many cases very complex, including several different races.

Oats.—No oat hybrids produced in this country have as yet become very important so far as the writers are informed, although some are of exceptional interest, as, for instance, Pringle's Excelsior, a so-called hull-less oat produced by crossing the common Chinese Hull-less (*Avena nuda*) with the Excelsior, a race of the common oat. This remarkable hybrid is said to possess the strength and robust character of the common oat and to retain the peculiarity of the naked seed derived from the Chinese Hull-less. It was introduced about the year 1881, but does not appear to have proved satisfactory for general culture. Recently Garton Bros., of England, have introduced a similar "naked oat," which gives great promise of proving a valuable sort, particularly for the preparation of oatmeal and similar foods. Apparently hybridization in this line promises important results.

### IMPROVEMENT IN FLOWERS AND ORNAMENTAL PLANTS.

In no plants has scientific plant breeding been carried further than in those grown for their flowers or for ornamental purposes. Growers of such plants are compelled to produce new and striking varieties and races, and so must take advantage of all available methods.

An interesting example of the result of continuous selection is the Blanche Ferry sweet pea, which resulted from over twenty-five years of selection from the old Painted Lady, in northern New York. In successive years the plants gradually became more stocky and compact, until after ten or twelve years they needed no outside support. From the Blanche Ferry there have arisen independently at least two of the dwarf varieties known as "Cupids." These arose as seedling sports and soon became very widely diffused.

Probably in no other plants has hybridization given such marked results as in those cultivated for their flowers. This is due largely to the fact that in such plants variation of form and color of flowers are the greatest desiderata, and such modifications are most easily obtained by hybridizing different-colored species, varieties, etc. Orchids, roses, begonias, chrysanthemums, cannas, and many other of our common flowers have been crossed and recrossed until it is frequently impossible to determine their origin. In this country probably the most attention has been given to roses, carnations, and chrysanthemums. It is to hybridization, directly or indirectly, that we are indebted for almost all the beautiful forms of these flowers. By the introduction of foreign species and their utilization in hybridization with those already in cultivation, new and almost totally different strains are frequently produced. As an illustration of this may be mentioned the important results that have been produced by the recent introduction of the hardy roses *Rosa rugosa* and *R. wichuraiana* and their hybridization with our common varieties of roses. Manda says: "By crossing *Rosa wichuraiana* with greenhouse teas the result is astonishing, as the plants are not only hardy, but retain their foliage during the winter. Thus a new race of evergreen roses has been added to our collection, and promises to be the beginning of a new and useful class."

Advantage has been taken of still another principle in growing plants of this class. It sometimes occurs that certain buds give rise to branches that vary abnormally and produce flowers or leaves of a different color or shape from those borne on the rest of the plant. These so-called bud sports can often be perpetuated, and thus give rise to new varieties. In this way many of the cut-leaved forms of various ornamental plants have originated. Perhaps the most striking examples of the production of new sorts by bud sporting are found in certain plants, such as the chrysanthemum, rose, carnation, etc. Many of these are sports merely in color, but in some cases even the form of the flowers and of the leaves is different. It is said that within the last ten years there have been over fifty cases of new varieties of chrysanthemums originated as bud sports.

### IMPROVEMENT IN NUTS.

Among the native nuts, probably the chestnut and the pecan are the only ones that have received much attention from plant breeders, though Burbank has given some care to improving the walnut. A few varieties of chestnuts have been obtained by the selection of wild trees of desirable quality, though but little more than this has been done. The pecan, however, has received more attention. In its wild state, it varies very greatly in its characteristics, and this has led to the selection of a number of varieties from wild trees because of some special quality, as thinness of shell, small amount of corky substance between the halves of the kernel, productiveness, size, or other good qualities. One of the best known of such selected pecans is the Frotscher, the original tree of which is still standing in Louisiana, and is probably over two hundred years old. Within the last fifty years many growers have been planting the nuts of this and other varieties and selecting from among the seedlings thus produced those with the best qualities. Pl. XXXVIII, fig. 2, shows the variations and the possibilities of improvement when careful selection is exercised. The systematic improvement of the pecan, however, has just begun.

### IMPROVEMENT IN COTTON.

The history of sea-island cotton is extremely interesting, as it serves as an example of the possibility of adapting a tropical plant to the conditions of culture in temperate regions. About 1785 seeds of this cotton were brought to Georgia from the Bahamas. Notwithstanding the good care they received and the mild winter, the plants were killed down, but they came up again from the roots, and with this start succeeded in ripening a few seeds before the first frost in the fall. The earliest of these seeds were sown in turn, and by continuing this process of selection the flowering period became earlier and earlier, until now the plants ripen a large proportion of their seeds before frost, even along the coasts of the Carolinas. Besides striving to obtain earlier maturing sorts, very careful selection has for years been made with a view of increasing the length, fineness, and strength of the staple. This selection is regularly practiced by all intelligent growers and to-day it may be regarded as one of the necessary cultural methods. Every year a special patch of cotton is grown from selected seed; the plants in this patch are examined very carefully and the seed of the best individuals retained for planting a similar patch the next year, the seed of the remaining plants being used to plant the general crop. Under such continuous and vigorous selection the length and fineness of the fiber have gradually increased, until it is now recognized as superior to that grown anywhere else in the world and commands the highest price in the market.

# DEVELOPMENT OF AGRICULTURAL LIBRARIES.

By Charles H. Greathouse, M. A.,

*Editorial Clerk, Division of Publications.*

### A NEW FIELD FOR AGRICULTURAL LIBRARIES.

To furnish the right book to the right man at the right time is a problem that faces every student of agricultural affairs who would help men to better ways of farming. The need of offering the book at the right time presents a new opportunity for the agricultural library.

### THE FARMER'S SPECIAL NEED OF BOOKS.

The production of fit books for the advancement of agriculture has long engaged the attention of promoters of scientific farming, but it is only during the last century that these books, or the information in them, have been supplied directly to the farmer. Furthermore, this supply has been thus far chiefly by books singly at home, and through the agricultural papers; and because the newspaper and the single book can not cover the whole great field of agriculture, the farmer has constantly found himself wanting information on one subject and his book or his paper offering him information on another. When cholera suddenly breaks out among his hogs, his paper has an article on sheep scab and his book deals with the diseases of the horse. His need is a library within reach that will furnish in concise form the entire body of thoroughly proved agricultural science.

Libraries have multiplied and have grown in numbers of volumes and in activity wonderfully during the past twenty-five years, and of late they have begun to come to the farmer. Granges, farmers' clubs, farmers' institutes, and farmers' reading circles have all helped to create a demand for books, and to some extent have helped to meet it. During the past ten years the traveling library movement has developed. As a result many small libraries are sent out to rural communities and are constantly exchanged among them. But these libraries are made up chiefly of "light reading," and even such as are agricultural can not be depended on to meet cases of urgent demand, because they are at one place only a few months. The establishment of permanent libraries of standard agricultural works near the farm home is a suggested need. In this direction seems to lie another step, both in library development and in the progress of scientific farming.

### SCIENCE UNAVAILABLE TO FARMERS IN MOST COUNTRIES.

For centuries agricultural investigators have gathered facts by observation and experiment, and have wrought out in library and laboratory improvements in farm practice. The learning and advances of one age have been preserved in libraries for the students of the next. Libraries have had a large share in making a science of farming possible. But the great total of agricultural operatives in the world have hardly been effected by science. The facilities for producing the books necessary to teach better ways are ample, but the problem of making them available to the masses has not been solved; in most countries it has not even been approached. The bulk of agricultural products are still wrung from the soil by main strength and awkwardness. Indian ryots, Chinese coolies, and Egyptian fellaheen, comprising more than half of the agricultural labor of the world, continue to farm by traditional methods; and the peasants of Europe are little better off. The clog to their progress has not been a lack of books; it has been the lack of an elementary education; the lack not merely of a habit of reading, but of knowing how to read at all.

### AMERICAN FARMERS READY FOR LIBRARIES.

But in this country the first great step has been taken; most farmers are readers. They have proved themselves capable of understanding and applying improvements in farm practice. They are the right men. It remains to put the tested and approved results of agricultural science within easy reach at the right time. In doing this, it is believed agricultural libraries may find a wide field for usefulness. An attempt will be made at the close of this paper to suggest how they may occupy it.

### BEGINNINGS OF AGRICULTURAL LIBRARIES.

The founding of agricultural libraries in this country was first undertaken by the agricultural societies established in several of the States just after the close of the Revolutionary war. These organizations made part of their first work the collection of papers on farming and the publication of them first in newspapers and then in books. These papers and publications, with exchanges, and gifts of similar material from learned societies and persons, both in this country and abroad, formed the beginning of agricultural libraries. Two of these societies, the Philadelphia and the New York, besides the provision of agricultural books for themselves, projected the establishment of numerous branch libraries, and a third, the Massachusetts society, systematically promoted the founding of kindred societies similarly supplied with libraries.

### WORK OF THE PHILADELPHIA SOCIETY.

The Philadelphia Society for the Promotion of Agriculture, established in 1785 at the seat of government, with Washington and

Franklin as members, in 1794 considered the founding of libraries throughout the State of Pennsylvania. This was in connection with the movement to organize a Pennsylvania agricultural society, to be made up of farmers to a much larger extent than the Philadelphia society was ever likely to be. The constitution and rules for the new society were prepared by a committee consisting of George Clymer, Timothy Pickering, then Secretary of State, John R. Bordley, and Richard Peters. One of the paragraphs was as follows:

It will also be the business of the society to recommend the collection of useful books on agriculture and rural affairs in every county. The citizens of the county should be drawn into a spirit of inquiry by the establishment of a small but well-chosen library on various subjects. This would not only promote the interests of agriculture, but it would diffuse knowledge among the people and assist good government, which is never in danger while a free people are well informed.

The country schoolmasters were to be the secretaries of the proposed branch organizations and the schoolhouses were to be the repositories of the "transactions, models, etc." But the country was not ready even for an attempt to carry out this proposal. It was years before the Pennsylvania agricultural society was established, and the schoolhouse libraries of agricultural books are still to come.

### PLAN OF THE NEW YORK SOCIETY.

The New York Society for the Promotion of Agriculture and Manufactures in 1793 considered a plan, presented by Amasa Dingley, for the establishment of branch societies throughout the State. This provided for the formation of an agricultural library in connection with each society, as follows:

And also that each county society should be furnished with all the publications on agriculture in America as well as the most approved European publications. This will lay the foundation of county libraries for the promotion of information in every town and neighborhood in the whole State, and will doubtless in a few years be the means of disseminating much useful knowledge. But it is intended that each county society shall always defray its own expenses.

This plan was never realized, and there is no evidence that the parent society ever had a very large library of its own as compared with present collections. Some idea of the character of its library may be gained from the writings of Dr. Samuel Mitchill and others, as published in the society report for 1791. Among other authorities referred to are Count Ginanni of Ravenna on diseases of wheat (Delle malattie del grano in Erba in Pesaro, 1759), given by Sir Joseph Banks, president of the Royal Society of England; Chateauvieux, who describes a wheat parasite; Headrick's Essay on Manures; Summerville on Manures; Home's Principles of Agriculture and Essay on Bleaching; Swinburne's Travels into the Two Sicilies; Fourcroy's Chymistry; also, Tissot, Reaumur, Count Rumford, Lowthorp, Van Mons, Pliny, and Columella.

In closing his address to the society on January 10, 1791, Dr. Mitchill said: "My hearers have numerous volumes written within a few years on economical subjects in the different modern tongues displayed before them; or, if their classical taste should lead them to turn over the pages of the Latin authors whose works are extant, Columella and Cawley will afford them abundant pleasure, while the Georgica of Virgil and the Prædium Rusticum of Vanier shall convey most solid instruction to their minds."

### LIBRARY OF THE MASSACHUSETTS SOCIETY.

The Massachusetts Society for Promoting Agriculture had something of a library in 1797. The society began the publication of agricultural notes and extracts from agricultural discussions in the Boston journals in 1793, and in 1795 printed a pamphlet containing, among other things, two premium essays on the cankerworm, a history and description of "forward wheat," a premium essay on compost, an account of maple-sugar making, and selections from foreign publications, including some account of Robert Bakewell's breeding of sheep and cattle and of the methods of making Stilton and Cheshire cheeses. Similar publications were afterwards made from year to year and distributed to societies and persons interested in agriculture. To these and the books received in return were added "the most reputable books and authoritative works on agriculture, purchased as issued." In 1815 there was published in the society quarterly, which had then been established, a list of the standard works on agriculture of that day, about 125 volumes, and it may be presumed that nearly all of them were in the society library.

### THE INDIGO SOCIETY IN SOUTH CAROLINA.

In the South the only agricultural society library of this period of which notice has been found is that of the Winyah Indigo Society at Georgetown, S. C. This society was founded about the middle of the eighteenth century by well-to-do planters of that section, whose staple product was indigo. Their original purpose was discussion of public affairs and of their business interests, and in this way they probably gathered a considerable number of publications, including books on indigo culture. In 1755 they secured a charter, and in succeeding years they gathered a library of such an extent that it became well known.

### AGRICULTURAL BOOKS IN COLLEGE LIBRARIES.

In the collection of agricultural works the colleges early took a leading part. Bowdoin, Harvard, Yale, Williams, Columbia, Dickinson, Princeton, the University of Pennsylvania, Brown (then the University of Rhode Island), Rutgers, William and Mary, the University of Virginia, and other schools of less prominence gathered libraries. Among the books of each of these institutions there were undoubtedly some volumes bearing on agriculture, though in some instances no record has been found to show the fact.

COLLECTION IN HARVARD LIBRARY.

The following list of books on agriculture in the Harvard library catalogue of 1790 indicates what these agricultural departments of college libraries probably amounted to. The catalogue form and punctuation are retained.

*Books on agriculture, Harvard College catalogue, 1790.*

Blith (Walter) English improver, or a new survey of husbandry, 4to, London. 1649.

Certain ancient tracts concerning the management of landed property. 8vo. Lond. 1767.

Columella (L. Junius Moderatus): Of husbandry, trans. into Eng., 4to, Lond. 1745.

Dossie (Rob) Memoirs of agriculture, and other economical arts. 8vo. Lond. 1768.

Du Hamel (Mons) Traité des arbres et arbustes, qui se cultivent en France, 2 tom, 4to, Paris. 1755.

—— —— Elements of agriculture, 2 vol. 8vo, Lond. 1764.

Farmers' Letters to the people of England, 8vo, 2d ed. Lond. 1768.

Georgical Essays, 12mo, Lond. 1769.

Harte (Walter) Essays on husbandry, 8vo, Lond. 1764.

—— —— —— — —— —— 2d ed. Lond. 1770.

Home (Francis) Principles of agriculture and vegetation, 8vo, 3d ed. Lond. 1762.

Hunter (A.) Georgical Essays, 8vo., York, 1773.

Memoires concernants l'œconomie rurale, par une societé a Berne, 6 tom. 8vo., Zuric, 1760, 61, 62.

Miller (Philip) Gardner's Dictionary, fol. 7th ed. Lond. 1759.

Scriptores rei rusticæ veteres latini, a Gesnero, 4to, 2 tom. Lipsiæ. 1735.

Switzer (Stephen) Ichnographia rustica, or system of agriculture and gardening, 3 vol, 8vo, 2d ed. Lond. 1741.

Whately (Thomas) Observations on modern gardening, 8vo, Lond. 1770.

Worlidge's two treatises on husbandry, cyder and the cyder mill, 8vo, Lond. 1694.

Of 350 pages in this catalogue, 200 were devoted to theological books and pamphlets, and a large portion to law and the classic languages. It is not to be inferred, however, that this list represents all the books in Harvard library at that time that would to-day be put in the agricultural class. There were undoubtedly in the total of 12,000 volumes many treatises on botany, chemistry, entomology, and geology which were valuable to the occasional student of farm problems. They were not written, however, with any special reference to agriculture, and it was not yet common for even progressive farmers to pay much attention to any of these sciences.

AGRICULTURE IN GENERAL LIBRARIES.

In those early days agricultural books were no more numerous in general libraries than at the colleges, and were probably not as much used. Everywhere theology first by far, then law, medicine, history, travels made up the great body of the books in the libraries outside of such as were devoted to mere amusement. The volumes on agriculture in the classic tongues were about as numerous as those in modern languages, and were generally better known.

### FRANKLIN'S INFLUENCE.

There was something of an exception to the theological and classical character of the early libraries in that founded by Benjamin Franklin in Philadelphia; there most of the books were devoted to the useful arts, comparatively few to the professions. One of the two volumes sent over as a present to the society by Peter Collinson, the London mercer through whom the first purchase of books was made, was Philip Miller's Gardener's Dictionary. But even in Franklin's library the books on agriculture must have been very few. One reason for this was that comparatively few of such works were in existence. In the list of approved agricultural books given by the Massachusetts Society for Promoting Agriculture in 1815 about 125 volumes were noted. This list probably included nearly all the valuable books on agriculture known in this country at that date. Now there are more printed in almost any year than the whole number then extant. In a list made up in the Office of Experiment Stations for the years 1896 to 1898, inclusive, there are 451 titles.

### BOOKS ON FARMING IN THE NEW YORK SOCIETY LIBRARY.

The agricultural books in the library of the Society of New York, established in 1754, numbered about 100 at the beginning of the century. This is shown by the early catalogues. Among the titles are the following: New System of Husbandry, Varlo; Agricultural Chemistry, Davy; Husbandry of the Ancients, A. Dickson; Phytologia, E. Darwin; Horse-hoeing Husbandry, Jethro Tull; Letters to Arthur Young, Washington; American Gardener, Cobbett. There were also a full set of the Annals, Rural Economy, and other writings of Arthur Young.

### AGRICULTURAL WORKS IN PRIVATE LIBRARIES.

A feature of this early period was the fact that a larger proportion of public men lived in the country and managed farms than has been the case for the past fifty years. These men often had libraries in their homes about as extensive as the college and society libraries, and they spent much time in study. The details of public affairs were not then so numerous nor the complications so intricate, and more opportunity was afforded them for reading and investigation. The greater part of library work for agriculture in those early years was undoubtedly done in the private collections of such men.

### SOME OF JEFFERSON'S BOOKS.

Among the notable private libraries of the beginning of the century were those of Washington, Jefferson, Pickering, Livingston, and Mitchill. A part of Jefferson's books, including many of those which he used in his agricultural investigations, are in the Library of Congress. (Pl. XXXIX, fig. 1.) Among these are the following: Cazalet's

FIG. 1.—BOOKS OF JEFFERSON'S LIBRARY NOW IN THE LIBRARY OF CONGRESS.

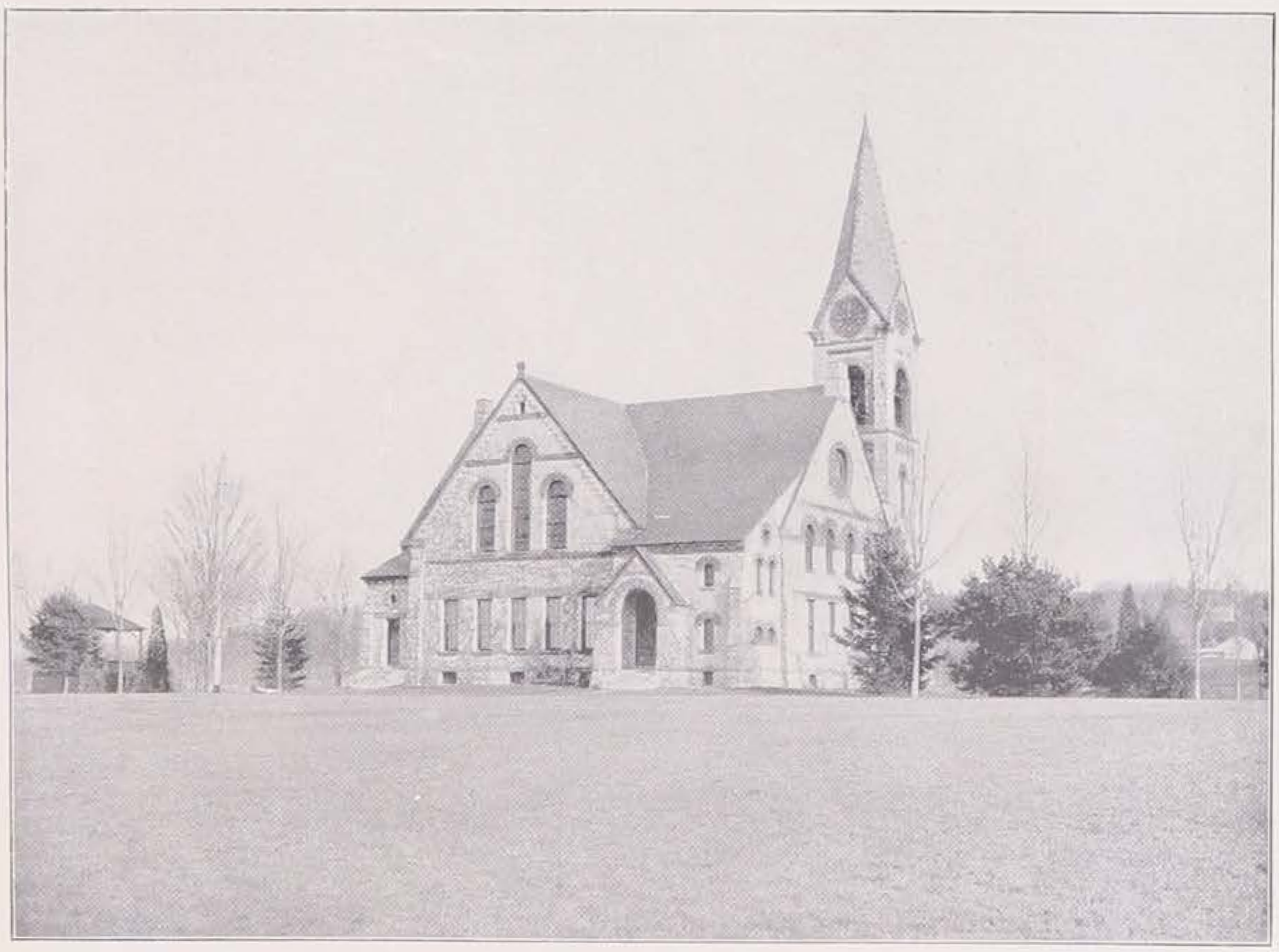


FIG. 2.—LIBRARY BUILDING, AGRICULTURAL COLLEGE AND EXPERIMENT STATION, AMHERST, MASS.

Théorie de la Nature; Chaptal's Elements of Chemistry; Fourcroy's Elements d'Histoire Naturelle et de Chimie, four volumes; Ingenhousz's Expériences et Observations sur Divers Objets Physiques, and his Expériences sur les Vegetaux; Lavoisier's Traité de Chimie; Arthur Young's Six Months' Tour Through the North of England, and his Travels in France; Bibliothèque Physico-Economique, fourteen volumes; Watson's Chemical Essays, five volumes; Scheele's Memoire de Chimie; Traité Chimique de l'Air et du Feu; also a volume of agricultural essays in English and French. One of the latter is dedicated to "John Jefferson," President of the United States.

Jefferson's interest in agriculture is best known perhaps from his improvement of the plow; but, like Washington, he directed practical operations on his own estate, and his books were a constant aid to him for the purpose.

### SLOW GROWTH OF AGRICULTURAL LIBRARIES.

Agricultural societies continued to be established with the development of the States, and usually gathered libraries, but none of these were of much importance. Indeed, the really efficient agricultural libraries made their appearance only when the agricultural colleges and experiment stations had attained such a growth as to make such libraries a necessity.

A good library is said to have been gathered, along with collections of material illustrative of agricultural instruction, at the Gardner Institute, founded in Maine in 1823, but Jewett's account of American libraries, written for the Smithsonian Institution in 1850, makes no mention of it. In 1839 the establishment of the division in the Patent Office for the collection and publication of agricultural statistics and the promotion of agricultural interests generally, was accompanied with the collection of agricultural works; but even here growth of the library was slow, for this Patent Office collection was turned over to the Department of Agriculture when it was founded in 1862, and with all the impetus of this new movement to promote its increase, the total number of its books in 1875, after thirty-six years of existence, was only 7,000 volumes.

### AN AGRICULTURAL LIBRARY SOCIETY.

The only agricultural library society of which any record has been found was established at Amherst, Mass., about the middle of the century. A meeting of persons interested was held in Agricultural Hall in that town on January 9, 1858, and the Amherst Agricultural Library Association was organized, with a membership of eighty. Luke Sweetser was made president and Henry Holtz librarian. The books were kept in a store in Amherst. The membership fee was $3 a year, and on February 15, 1859, an assessment of 20 cents on each member had to be made to pay the debts of the association. After a few years of struggling existence the society disbanded and the books were scattered. Two volumes, Ure's Dictionary of Arts, Manufactures, and Mines, are still shown as part of the Amherst public library.

### SIZE OF EARLY AGRICULTURAL LIBRARIES.

Perhaps the best evidence of the slow progress of agricultural libraries in early years is to be found in the small numbers of volumes gathered, but it must be remembered in making comparisons that no libraries were large in that day. The following list of agricultural libraries, with the numbers of volumes in each, is from the Manual of American Libraries, published by William J. Rhees in 1859: Massachusetts Board of Agriculture, including 125 books belonging to the Society for Promoting Agriculture, Boston, 1,000 volumes; Essex County Agricultural Society, Salem, Mass., 650; Michigan State Agricultural Society, Detroit, 253; Michigan State Agricultural College, Lansing, 300; Mississippi Agricultural Society, Washington, Miss., 1,000; New York Agricultural Society, Albany, 2,300; Philadelphia Horticultural Society, 1,050; Cincinnati Horticultural Society, 500; Wisconsin Agricultural Society, Madison, 300; United States Agricultural Society, Washington, D. C., 200. It is true that there are occasional omissions in this list, such as the Massachusetts Horticultural Society at Boston, with 900 volumes, but they are not sufficient to materially affect the fact that such libraries were few and small.

Even the founding of the agricultural colleges under the Morrill Act did not at once hasten the growth of agricultural libraries. This is shown by the fact that the report of the Bureau of Education on libraries, made for the Centennial Exposition in 1876, though it has a chapter on college libraries, hardly mentions one of them in its text. In its tabular statement, however, it notes libraries at agricultural colleges at the following places: Auburn, Ala., 1,720 volumes; Fayetteville, Ark., 300; Oakland, Cal., 12,000 (entire library of University of California); Irvington, Ill., 500; Urbana, Ill., 10,600 (entire library of Illinois Industrial University); Ames, Iowa, 3,540; Manhattan, Kans., 3,000; New Orleans, La., 300; Orono, Me., 2,200; College Station, Md., 1,500; Amherst, Mass., 1,500; Boston, Mass. (Bussey Institution, Harvard), 1,500; Agricultural College, Lansing, Mich., 3,700; Columbus, Ohio, 1,000; State College, Pa., 1,800; Knoxville, Tenn., 3,039; Blacksburg, Va., 600.

Agricultural libraries in this Centennial table, in addition to those just named, are as follows: Department of Agriculture, Washington, D. C., 7,000 volumes; Illinois Board of Agriculture, Springfield, 801; Massachusetts Horticultural Society, Boston, 2,800; Cambridge Horticultural Society, Cambridge, Mass., 350; Botanical Gardens, Cambridge, Mass., 2,500; Worcester County Horticultural Society, Worcester, Mass., 1,100; Sherwood Hollow Farmers' Club, Binghamton, N. Y., 1,200; Board of Agriculture, Columbus, Ohio, 1,456;

Pennsylvania Agricultural Society, Harrisburg, 2,000; Pennsylvania Horticultural Society, Philadelphia, 800; Winyah Indigo Club, Georgetown, S. C., 2,000; Agricultural Library, Montpelier, Vt., 300; Agricultural Library Association, Royalton, Vt., 350; State Agricultural Society, Madison, Wis., 1,000.

At the time of the Centennial report above referred to, general libraries had grown rapidly, keeping step with the progress of the nation. Thousands of new libraries had been founded since the beginning of the century, and marked improvement had been made in library management.

## AGRICULTURAL LIBRARIES OF THE PRESENT TIME.

Agricultural libraries have now been established in connection with the agricultural colleges and experiment stations in every State and Territory in the Union. In addition to their use by students in the colleges and stations, most of these libraries are free to all who are likely to be helped. In States in which the agricultural college and the experiment station are separated there are two such libraries, one at the college and one at the station. In a majority of them the shelves are open to all readers. Farmers are especially welcome.

### TYPICAL AGRICULTURAL COLLEGE LIBRARIES.

Of these college libraries, three or four will serve as typical. They show management in three ways, namely, by the principal executive officer of the school, by a board of the faculty, and by a university library board of control. In the last case the agricultural college is a department of the State university and the agricultural library a division of the university library.

#### *Massachusetts College Library.*

One of the largest of such collections is at Amherst, Mass. It has had the advantage since its establishment in 1886 of personal management by President H. H. Goodell, of the Massachusetts college and experiment station, who was at one time offered the position of librarian of Amherst College. He has, as a rule, selected the books for the agricultural library, has superintended their cataloguing and location on the shelves, and can in a few moments place his hand on almost any book in the whole collection.

This is probably the only agricultural library in the country having a house devoted exclusively to its use. The library building (Pl. XXXIX, fig. 2) is located on a low elevation near the main college building and faces east. It is of granite, and has large, handsome windows, affording ample light all through the alcoves. The minimum of space is given up to office work, and the maximum to shelving for the books and space in the alcoves for reading. The shelves are open, and any person who is allowed the privileges of the place is free to select the volume he wants, examine it on the spot and read as much as he wishes or as time will permit, and then return the book to the shelf, or take it to the assistant librarian and have a proper record made, leaving him free to take it home. The purpose has been to make as perfect a working library for agricultural students as possible with the means at command, but some agricultural books that are literary treasures have also been gathered. The chief of these are unique at once in their usefulness for study and in their position among books by reason of completeness and thoroughness of the text or by unusual illustrations.

The principal agricultural periodicals are on the table in the reading room, and files, complete and nearly complete, of the more notable of these, present and past, are on the shelves. Of the total of 19,980 volumes in this library, 3,664 titles of books, embracing 9,192 volumes, are on subjects distinctly agricultural. They are divided as follows: Agriculture, agricultural chemistry, horticulture, the domestic animals, and the dairy, 1,911 titles, 5,753 volumes; botany, 946 titles, 1,736 volumes; entomology, 564 titles, 1,211 volumes; veterinary, 243 titles, 492 volumes. Books scientific, with agricultural bearing, number 774 titles, 1,737 volumes, divided as follows: Chemistry, 326 titles, 861 volumes; geology, 110 titles, 330 volumes; meteorology, 164 titles, 251 volumes; biology, embryology, bacteriology, miscroscopy, 174 titles, 295 volumes.

*Michigan College Library.*

At the Michigan Agricultural College, one of the oldest of these schools in the country, and with a large number of alumni holding responsible positions in scientific agricultural work, the library appropriation was at first distributed in equal amounts to the several professors, but the library is now under the supervision of a committee composed of five members of the faculty appointed by the president of the college. All recommendations for purchases of books must be approved by this committee. The general policy tends toward a generous supply of agricultural periodicals, and from $200 to $400 a year is spent in that way. Purchases of books for the departments, as of botany, entomology, etc., are made rather cautiously, though not in a niggardly manner, with the purpose of maintaining a reserve fund from which important and expensive works can be bought when occasion offers. The library is considered especially strong in general works on agriculture and on cultivation of the soil. In this line, including horticulture, pretty much everything that is asked for is bought, though not many books in foreign languages are approved. Since 1884 a good many books on mechanical engineering have been added, and with the establishment of the woman's department, household economy has received much attention. Duplicate volumes of expensive books are sometimes bought so as to supply all members of a class.

The library now occupies the main portion of a large building, in the front of which are President Snyder's office rooms. The books belonging most closely to each branch are kept at the rooms where that study is taught, so as to be convenient as possible for students, but a report of them is made annually to the librarian. The students have access to the library alcoves during work hours, and two or three of the older students act as assistants to the librarian. The administration is thorough and businesslike. The accession book and shelf list, together with the orders for purchases and receipted bills, form a complete account of the handling of the books as they come in, and show where the volumes are to be found. These accounts are kept separately for the college and experiment station. The main floor contains the books of the college, while the station collection is in the galleries. The total number of volumes in October, 1899, was 19,380, of which about half were strictly agricultural.

*Agricultural Library at Cornell.*

The New York Agricultural College is a part of Cornell University at Ithaca, and the books on agriculture in the main are kept in the

FIG. 24.—Horticultural Library at Cornell (owned by Prof. L. H. Bailey).

general library. Besides those in the general library, however, the teachers of the various branches have private libraries, which are generally quite as free for proper use as the volumes belonging to the school. Since 1883 the agricultural library as part of the general library has been under the supervision of a council consisting of the president of the university, the librarian, one member of the board of trustees, and four members of the faculty.

The volumes in the library relating directly to agriculture, horticulture, and dairy husbandry number about 5,000. Aside from these there about 500 volumes on forestry, 1,200 on entomology, 1,200 on veterinary science, and a very large collection of related chemical, botanical, and other scientific literature, making in all from 15,000 to 20,000. The library is rich in serial publications. In addition to these, of special importance is the library (fig. 24) of L. H. Bailey, professor of horticulture. It is the largest collection extant of American horticultural writings, and is open to all special or advanced students in the college of agriculture. It is the general purpose to make the university library rich in foreign horticultural publications, while Professor Bailey's library provides American books of that kind.

In the teaching at this school it is the custom to take one book as the general guide in any subject, and then refer the students to many other books for special topics. In that way something like 200 volumes are much used by students in the college of agriculture. It is the purpose to give the student a thorough training in the literature of scientific farming.

*Wisconsin College Library.*

At the University of Wisconsin the agricultural library is in Agricultural Hall under the general library control, and numbers nearly 5,000 volumes. It is open to students and visitors between 8 a. m. and 5 p. m. Everybody has access to the books on the shelves, and anyone may take out books by obtaining a deposit card from the secretary of the board of regents. The library is used almost exclusively by the students and the faculty, but occasionally farmers and others make use of it, especially of the collection of herd and stud books, which now number 700 volumes.[1]

SOCIETY AND STATE BOARD LIBRARIES.

Agricultural libraries now found in many States consist of the collection of books belonging to agricultural and horticultural societies, breeders' associations, etc., and to State boards of agriculture. Prominent among these, are the libraries of the Massachusetts Horticultural Society and of the Massachusetts Board of Agriculture at Boston; of the Philadelphia Horticultural Society; of the New York Agricultural Society at Albany; and of the Illinois Board of Agriculture at Springfield.

*Massachusetts Horticultural Society Library.*

The library of the Massachusetts Horticultural Society, founded in 1829, has about 10,000 volumes. It is one of the most notable collections on horticulture in the world. It has been gathered largely by

[1] The numbers of volumes in agricultural libraries, including those of other agricultural colleges, will be found in the Appendix to this Yearbook.—Ed.

the efforts of Robert Manning, the present secretary of the society, who is also librarian. Many works in this library probably can not be found elsewhere in America. Among its treasures are the following: Martius's Flora Brasiliensis, begun in 1840 and not yet completed; Host's Gramina Austriaca, 4 volumes, with plates; Tussac's Flore des Antilles, 1808–1827; Basilius Beslerus Philiatri, 1613, the oldest edition de luxe of any botanical work in existence; The Flowers of Japan and the Art of Floral Arrangement, by Josiah Conder, professor of architecture and architect of the Imperial Japanese Government; The American Grove, the earliest botanical work published in America; Pinetum Woburnensis, published in 1839 by the Duke of Bedford, only 100 copies being printed, and the copy here costing the society about $100; Old Trees of New England, a series of photographs, with typewritten text, including pictures of the first Seckel and Bartlett pear trees in New England; Elms and Other Trees of New England, by Brooks and Dame, containing a picture of the Clark Elm, at the house where Adams and Hancock were sleeping when aroused by Paul Revere; Flora Danica, published by the Danish Government in numbers from time to time between 1764 and 1883; Pomona Italiana, by Gallesio, with illustrations unusually true to nature, cost 960 marks; Duhamel's Traité des Arbres Fruitièrs, 7 volumes, cost $500; Brooke's Gardens of England, with vignettes of palaces and colored plates of surrounding grounds. There are also very complete files of the leading horticultural periodicals of the past century and a half, including all publications edited by William Robinson, of London, and the most expensive work in the collection, Curtis's Botanical Magazine, begun in 1793, 125 volumes, with 7,691 colored plates.

The library is now crowded into the front room at the Horticultural Hall, 101 Tremont street, in the heart of the business district of Boston, but it is to have ample space in a fireproof building to be erected by the society near the Public Library and other notable public edifices at Copley Square.

*The Pennsylvania Horticultural Society Library.*

The Pennsylvania Horticultural Society Library, located at Horticultural Hall, Broad street, above Spruce, Philadelphia, was founded in 1827. It now has over 3,500 volumes, consisting of works on horticulture and agriculture, including all reports of the leading societies of this country. On its tables are kept regularly the leading horticultural and agricultural publications of this country, as well as some from abroad. The library is open to the public for research, but books are loaned only to members.

*New York Agricultural Society Library.*

The New York Agricultural Society Library was founded in 1832. In 1857 it had 2,097 volumes, and was reported as "much used." It had on its tables 76 agricultural journals, including nearly all of this country and 18 from abroad. It now has about 3,000 volumes. It is open to the public, but is "more especially for the benefit of life members of the society."

*Library of the Massachusetts Board of Agriculture.*

The library of the Massachusetts Board of Agriculture began to accumulate soon after the board was established in 1852. In 1857 its secretary stated in his report that it was probably "the most extensive in the United States;" in 1860 he added, "The collection of works on the honey bee is believed to be the best and most extensive in the country;" and, in 1865, "It is of great service to the public, more especially during the sessions of the legislature." The catalogue which classifies and describes the books was published in 1899. It was prepared by the librarian, Mr. F. H. Fowler. There are 3,200 volumes, many of them rare and valuable. A card catalogue is in course of preparation.

*Library of the Illinois Board of Agriculture.*

The library of the Illinois State Board of Agriculture was started in 1853, and there were 801 volumes in 1875. Since that date the growth has been much more rapid, and there are now 5,000 books and pamphlets, 75 per cent of which relate to agriculture and kindred industries. The library is open to the public; the live stock records are most frequently consulted.[1]

AGRICULTURAL LIBRARIES OF THE NATIONAL GOVERNMENT.

The most important agricultural libraries of this country, both from the number of books and the use made of them, are the collections of the Government, namely, the library of the Department of Agriculture, at Washington, the library of the Weather Bureau, at the central office in Washington City and at the stations throughout the country, and the agricultural books in the Library of Congress.

*Library of the Department of Agriculture.*

The library of the Department of Agriculture (Pl. XL) now contains 68,000 volumes, in charge of W. P. Cutter, librarian, and a corps of assistants. Of these books fully 75 per cent are strictly agricultural. Most of the remaining are historical, biographical, or such documents connected with the work of Congress or the other Departments as are likely to be frequently in demand. The purpose is to have a complete working library for the use of the various Divisions of the Department. The books are received and placed according to the methods most generally approved by leading librarians, with such modifications as adapt them to evident needs. The shelves are open to the employees of the Department, but books are to be left at the desk, to be returned to their places by the librarian's assistants.

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[1] For list of agricultural libraries, including those of other boards of agriculture, see the Appendix to this Yearbook.—ED.

LIBRARY OF THE DEPARTMENT OF AGRICULTURE (EAST HALF SHOWN).

Under proper regulations the books are also free for reference to the public generally. Volumes needed in researches which are being prosecuted in the several Divisions of the Department are taken to the Division rooms, and there remain until the work in which they are needed is completed or until an urgent call comes from some other direction. Each Division has some books which are kept constantly in its rooms. In the Bureau of Animal Industry and the Division of Statistics the numbers run into the thousands. These books are in use every day by the Department scientists and other workers, and the results of their investigations are continually issuing from the Government Printing Office in publications which are sent to investigators and libraries throughout the world and to public men and farmers in all parts of the Union. Probably nowhere in the world is an equal use made of books on agriculture.

The growth of the library on the whole has been gradual, though much accelerated in recent years and with much improved library methods. The beginning was made in 1840 with the appointment of a clerk in the Patent Office to gather agricultural statistics. When the Department of Agriculture was established in 1862 the library which had been collected in the agricultural section of the Patent Office was given to it, but some time elapsed before all the books were removed to their new quarters. Indeed, as late as 1877 the first report of the New York Society for the Promotion of Agriculture was received at the Department library from the Patent Office.

Purchases of books are made by the librarian with the approval of the Secretary. Very generally such books as are recommended by the head of a Division are procured, especially when wanted for an investigation actually in progress. Accessions in 1899 numbered about 4,000 volumes. Lists of accessions are published quarterly.

### *Library of the Weather Bureau.*

The Weather Bureau has about 20,000 volumes. Of these 12,000 are upon meteorology and climatology, constituting one of the largest collections of the kind in the world. Possibly that of the National Library at Paris is larger. But, certainly, no other similar collection is used so directly and constantly for the advancement of agriculture. The remaining 8,000 books are chiefly upon physics, including a special collection on electricity and magnetism. There are also groups on mathematics, astronomy, and other related subjects. A few old and rare volumes are kept, but entirely for their scientific value. Such are La Place's Mécanique Céleste and Boyle's works, in handsome quarto editions. The leading periodicals on meteorology and physics are on the shelves. The accessions are about 1,000 annually, being largely exchanges from meteorological institutions throughout the world. The books are constantly in use by the scientific corps of the Bureau and are issued to employees generally, subject to recall when needed. They are free to the public for reference. The Bureau stations are all supplied with small technical libraries, while in several of the large cities, as Boston and New York, considerable collections have been made.

### *Agriculture in the Library of Congress.*

The books on agriculture in the Library of Congress occupy a unique position. Their chief use is by Congressmen when considering legislation concerning the farming interests, and thorough work among these books for the information of a committee may lead to far-reaching and most important results. In addition to this they are free for use in the reading room. The collection fills six book stacks and numbers 10,000 volumes. It includes sets of United States and State reports of the earlier periodicals, of herdbooks and studbooks, and under the copyright law all American publications on agriculture that are protected by copyright. There are also a few notable old books on agriculture, including some in foreign languages. Besides the books classed together as agricultural there are many rare and valuable volumes in the special collections, such as the Jefferson library previously mentioned.

## AGRICULTURAL BOOKS IN PUBLIC LIBRARIES.

In addition to agricultural libraries there are several hundred public libraries in the United States which have considerable collections of agricultural books. Some of these devote a dozen alcoves to this class, furnishing to the intelligent and industrious student a good opportunity to fit himself either to write upon agricultural topics or to engage actively in farming, so far at least as reading can accomplish that result.

The shelves in such libraries are not, as a rule, open to the reader. In some of them it would be of little use to him if they were; for the books are not carefully arranged according to classification. For example, in one of the great city libraries it puzzled one of the most experienced attendants to point out even the main portion of the books on agriculture. But the card catalogue affords a ready key and supplies the student in some respects more satisfactorily than he could supply himself in a thoroughly well-arranged library. There is always, of course, the drawback that it is impossible to judge of the availability of a book by reading the catalogue entry anything like as well as by a glance at it upon the shelf or by a moment's running through its pages. Among the most important of these collections in public libraries are those in Boston, New York, Chicago, and Philadelphia.

### *Boston Public Library.*

At Copley Square, near Boylston street, in Boston, the public library offers to readers for twelve hours daily each week day and for a part of Sunday nearly 750,000 books and a very large number of newspapers and periodicals. Of these, some 20,000 are useful for reading in one branch of agriculture or another.

The reading room, thoroughly well lighted, will accommodate 310 persons, and the force of attendants is at all times sufficient to secure delivery of books in eight or ten minutes. The reader consults the card catalogue, which is kept in a separate room in a semicircular case 8 feet high, with a subtending diameter 40 feet long. The classification and cross references are so complete that hardly anything on agriculture would be overlooked.

After determining what books he wishes to consult, the reader fills out the call blanks and drops them into one of the small boxes which stand at the end of each table in the reading room. The attendants, who constantly pass along the aisle for the purpose, collect the cards and bring the books. For home use, books may be drawn, and they will be delivered at numerous branch stations.

*Two New York public libraries.*

The public library in New York, for which a magnificent building is under construction at Forty-second street and Fifth avenue, has about 8,000 volumes on agriculture grouped in one of the galleries and easily accessible for reference through the card catalogue. It has also an index kept up to date for its periodicals, so that anything on agriculture in current literature is at once accessible.

The Cooper Union Library has only a few hundred agricultural books, but they are recent; and probably no collection in the country is as much used by persons engaged in agriculture. The publications of the Department are received regularly and lists of them are posted.

*Philadelphia Public Library.*

The Philadelphia public library has some 2,500 volumes on agriculture. These are in the great Ridgway Building at Christian and Broad streets and in the main library building on the corner of Juniper and Locust streets. While the work is in the hands of a private organization, the books are practically free for reference, as in any public library. The library is well supplied with books of the earlier decades of the closing century, but little effort is made to keep up with current publications, except in landscape gardening.

*Chicago Public Library.*

The public library of Chicago has 7,000 volumes on agriculture and science bearing upon agriculture. These books are free to the public either for use at the library reading room or may be taken home. There are fifty-nine branch stations throughout the city at which a request may be left, and the book will be delivered at the station free. The printed finding lists issued by the library contain, in classified form, short author and title entries of all the books in the library. There is also a card catalogue giving fuller author, title, and subject entries than the finding lists. The John Crerar library also has a considerable collection of agricultural books, and, under a division of labor agreed upon with the Public and the Newberry libraries, will eventually have the agricultural library of Chicago.

### COLLEGE AND SOCIETY AGRICULTURAL BOOKS.

In addition to the agricultural collections in the public libraries are the books on agriculture in society libraries and in public schools, colleges, and universities. Of these, may be mentioned several thousand volumes at Columbia University in New York, which include the most important of recent publications; also collections at Harvard, Yale, Princeton, University of Pennsylvania, University of Chicago, University of Michigan, University of Wisconsin, and the University of Indiana. In Harvard and Yale books of recent date are not found in the main library. At Harvard work on agriculture has been given over to the Bussey Institution, while at Yale the agricultural teaching has been transferred to the agricultural college at Storrs. Nevertheless, the agricultural books in the Yale collections are among the most interesting and important from the librarian's standpoint of any in the country. Most notable are books on horse breeding and horsemanship, collected by Prof. W. H. Brewer, and a complete set of the agricultural essays of Jared Eliot, published from 1748 to 1760. Among these latter is a volume of the essays published in 1760, which bears on the fly leaf Roger Sherman's autograph as a mark of ownership.

### AGRICULTURAL LIBRARIES FOR FARMERS.

Farming wisely followed affords large opportunities for reading and investigation. The long winter nights by the fireside are proverbial as offering time for study. Strong inducements are now presented by granges, farmers' clubs, reading circles, and traveling libraries to spend these quiet hours in the satisfying mental exercise of reading upon the daily problems of farm life. Books for this purpose are supplied mainly by the Department of Agriculture, the agricultural colleges, and State libraries, by granges and farmers' clubs.

#### *Reading courses with libraries.*

The establishment of farmers' reading courses in Pennsylvania, New York, Connecticut, Michigan, and other States has been accompanied by the supplying of books to farmers, but in most cases these books have not been sufficient in numbers to be called libraries. In Connecticut, however, a library of fifty to one hundred volumes is furnished to clubs of ten or more farmers who have completed a prescribed two years' reading course and received a diploma. The library is kept one year by such a club and then forwarded to another recently formed club of the same kind. This plan gives a sort of post-graduate course, which promises to be very attractive to farmers actually engaged in the business, who want to farm according to scientific principles. Prof. L. H. Bailey, who started the reading courses in New York and has made a study of those of other States, said recently of this feature in Connecticut: "The reader often receives more benefit from these libraries than from the two years' preliminary reading."

In New York some of the books have been supplied for the farmers' reading clubs by writing and printing them expressly for the time and purpose. The plan of work was made with the intention of reaching farmers who were not already studying their business in books. Simple, short, and easily digested treatises were, therefore, desired, and it was found best to prepare them from the beginning. With the same purpose of spreading an interest in scientific agriculture to the most remote farming districts, societies of children called Junior Naturalist Clubs were organized. It was felt that in this, as in all instruction, the most hopeful efforts would be with the young. If the most important facts and the fundamental principles of agricultural science could be imparted to the children in rural communities generally, a wide advance in farming would be made when these children come to work the land. Here, again, leaflets and bulletins were specially prepared, and during the season of 1899–1900 great progress has been made. At the close of 1900 nearly 20,000 children were studying in this way. One of these clubs is shown by fig. 1, Pl. XLI.

*Traveling libraries of agricultural books.*

The traveling library movement originated in 1892 by Melvil Dewey, librarian of the New York State Library at Albany, has from the start been an especial boon to rural communities, and an effort has usually been made by the organizers in the various States where the system exists to encourage farmers to read books on farming and domestic science. But in some of the early libraries sent out to farm neighborhoods in Wisconsin, and probably in other States, there was not a single book dealing with agricultural topics. The reason was that the managers of the work believed the books must be entertaining and attractive, and this opinion was founded on experience. Now, however, in several States it is made a point to send at least one book on agriculture with every library, and many traveling libraries are made up entirely of works on farming, horticulture, and home making and keeping.

New York, through the home-education department of the University of the State of New York, offers, among fifty lists of traveling libraries, two that are made up entirely of agricultural books. One of these lists contains thirty-four volumes and the other sixty. With the smaller, some volumes on other subjects may be secured if asked for. The agricultural lists are specially recommended to farming communities. They are loaned under proper regulations to existing libraries, to granges, farmers' clubs, and similar organizations.

In Wisconsin a list of "good books for the farmer" is now sent by the State library commission to rural applicants, and offers are made to encourage the use of these books by farmers and their families. Small pamphlets and leaflets from the Department of Agriculture and the Wisconsin bulletins have been well received, but longer and more difficult works have gone slowly.

In Connecticut a special list of works on agriculture is sent out by the State library commission and are strongly commended to libraries in rural neighborhoods.

In Illinois the traveling libraries (Pl. XLI, fig. 2) are made an adjunct of farmers' institutes. There are two branches of the library work as organized. One in charge of A. B. Hostetter, superintendent of the farmers' institutes, who has general supervision of the other branch also, provides books on crops, stock, soils, fertilizers, etc., while the other, under the management of Mrs. Joseph Carter, Mrs. Emma T. Davenport, and other women interested in farm progress, furnishes works on domestic science. The legislature in 1898–99 appropriated $15,000 for the farmers' institute, and a share of this has been set aside for the traveling libraries. The lists of books have been made up during the winter of 1899–1900, and the libraries are sent out as fast as proper attention can be given to the applications.

The Indiana traveling libraries which are sent out by the State commission offers one book on agriculture in each of the first twenty lists made up by the commissioners for general reading. There has been considerable demand from Indiana, as from other States, for publications of the Department of Agriculture to add to the agricultural books furnished by the traveling libraries.

In Iowa a movement is on foot for the creation of a library commission. In the meantime the State librarian is sending out 73 traveling libraries, mostly to rural communities. In the first 23 are 41 books on agriculture. The number will be increased as the demand warrants.

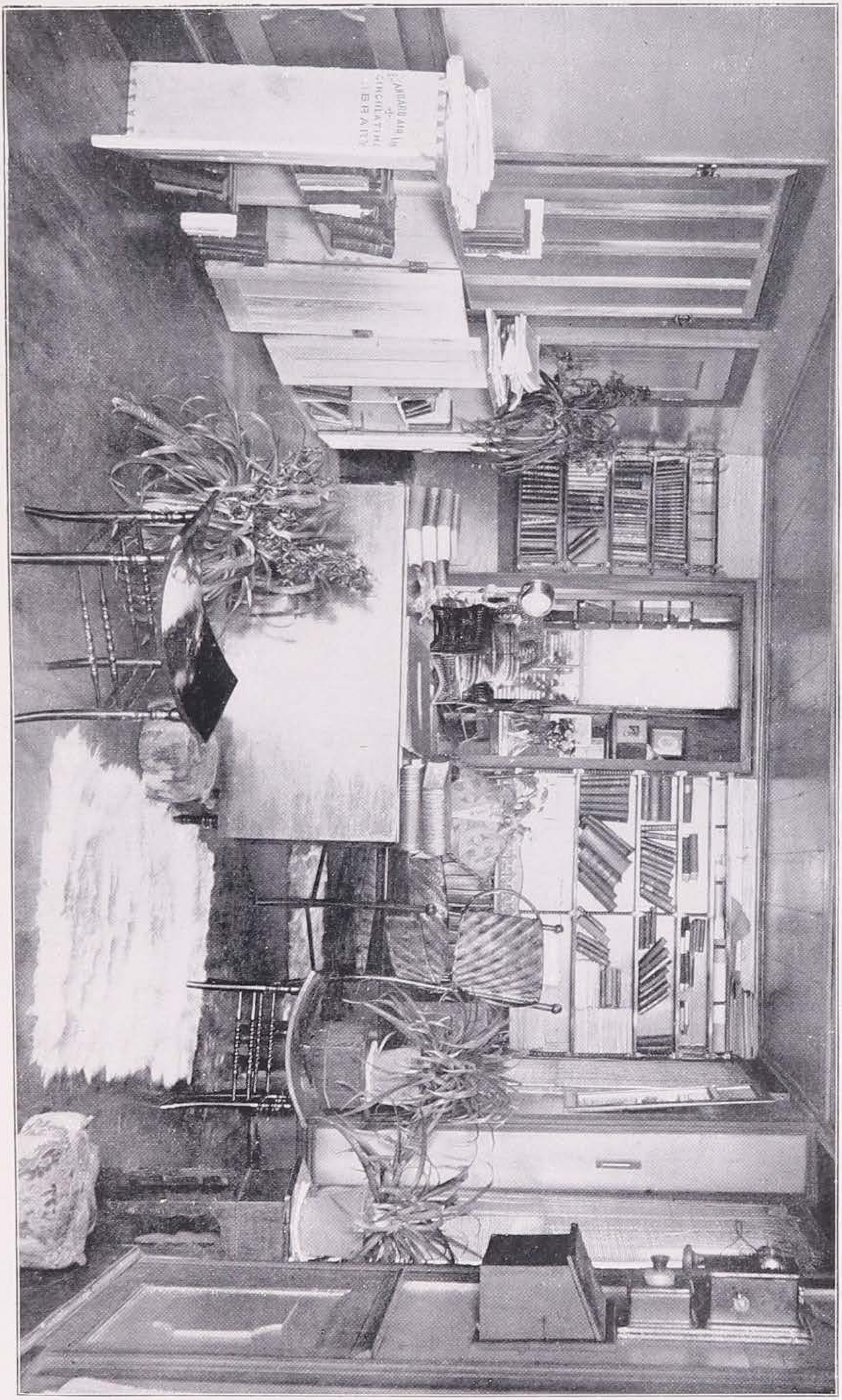
The Pennsylvania library commission, established under a law passed in 1899, will give careful attention to the claims of agricultural books to a place in its lists.

Under the Michigan law passed in 1895 the State librarian sends traveling libraries to every library in the State having over 1,000 volumes which chooses to associate itself with the State library for the purpose, and some of the books furnished are agricultural; but the chief opportunity for farmers to obtain libraries of agricultural works is in connection with the farmers' institutes, reading courses, and similar work conducted by Clinton D. Smith, director of the State experiment station.

In addition to these State-aid agricultural libraries, there is one system of traveling libraries under private management that supplies mainly agricultural reading. It is maintained by the Seaboard Air Line Railway in Virginia, the Carolinas, and Georgia, and

FIG. 1.—JUNIOR NATURALISTS' CLUB AT BERNHARDS BAY, ONEIDA LAKE, CENTRAL NEW YORK.


FIG. 2.—TRAVELING AGRICULTURAL LIBRARY USED IN CONNECTION WITH FARMERS' INSTITUTES IN ILLINOIS.



HEADQUARTERS OF TRAVELING AGRICULTURAL LIBRARIES ON THE SEABOARD RAILROAD IN VIRGINIA, THE CAROLINAS, AND GEORGIA.

managed by Mr. John T. Patrick and Mrs. E. B. Heard. Mrs. Heard's work is entirely philanthropic. The libraries (Pl. XLII) contain from 40 to 60 volumes, largely publications of the Department of Agriculture, and are sent to all important stations along the line of the railroad. After remaining thirty days at a place they are usually exchanged.

*Grange libraries.*

The Patrons of Husbandry throughout the United States have always, since their organization thirty years ago, systematically encouraged the establishment of libraries by the granges, as the subordinate lodges of the order are called. In all there are undoubtedly several hundred such grange libraries, but many of them have given more attention to general reading than to agricultural books. But most of them have received Yearbooks, Farmers' Bulletins, and other popular publications of the Department of Agriculture, and also the bulletins of the State experiment stations and the reports of State agricultural and horticultural societies and breeders and dairy associations. In this way they have proved effective in the promotion of scientific farming.

SUGGESTION FOR PERMANENT LIBRARIES FOR FARMERS.

The Department of Agriculture promotes and stimulates reading on agricultural topics by farmers themselves to a greater extent than any other single agency in the world. It has printed and circulated annually for the past five years on an average 6,000,000 copies of its publications. Nearly all of these have been sent to farmers directly, many of them through the instrumentality of Congressmen, to whom, under the law, two-thirds of the Farmers' Bulletins and 94 per cent of the Yearbooks are supplied for distribution among their constituents. In addition, the experiment stations in all of the States publish bulletins on their work which are valuable to the farmer directly, and these are distributed to applicants. These publications are believed to be well prepared and reliable, and can be furnished at a low cost. This suggests that permanent libraries, largely of State and United States publications, and under the joint management of the State and federal authorities, with a system of lectures on agriculture, might be made a very effective means of agricultural progress.

Such a movement would be received in a different spirit from that which met the efforts of the agricultural societies a hundred years ago. The scientific farmer is no longer ridiculed. He is observed, sometimes envied, often imitated. The problem of furnishing all farmers with the means of becoming scientific in their methods is largely the problem already suggested, of bringing the right book to the right man at the right time. A large percentage of farmers have come to know that it is possible to get help from books. The difficulty is to put the instructions that will help where the farmer can get them on the day that a puzzling question, whether of breeding or cultivation, presents itself. It does the farmer little good to receive a pamphlet covering certain information months before or after the subject has forced itself upon him. Pamphlets are to him much like newspapers—good for a day only. Also it does not meet the need for him to know that a book can be had by application to the State agricultural college or the Department of Agriculture at Washington. It will be too late when it comes, and he can not keep it till another occasion arises, a month, a year, or ten years later. He must have all the information he can carry in his head. The reading circle, farmers' institute, and traveling library will help in this. But also he must have a permanent agricultural library at the nearest practicable point. The State and national authorities may combine to furnish this, using a recent suggestion of Mr. F. A. Hutchins, of the Wisconsin library commission, that town and village libraries should be open to the support and the use of the surrounding farming communities. They might go further, and establish in every district school, under the control of the directors (trustees) and the teacher, a thoroughly good library of standard agricultural books. It would be an important part of the work of the National Government to keep these collections supplied with the results of recent discoveries, so far as available for practical application to farm operations.

Another suggestion for the location and care of such agricultural libraries is that they be put in the post office under the supervision of the postmaster. The books would then be in the hands of a federal official. The convenience of such an arrangement is manifest when it is considered that farmers could send for mail and books at the same time, and that some one capable of attending to calls would always be at hand.

# AGRICULTURAL EXPERIMENT STATIONS IN THE UNITED STATES.

By A. C. TRUE, Ph. D.,
*Director of the Office of Experiment Stations.*

## HISTORICAL.

When the first agricultural societies were formed in this country, near the close of the eighteenth century, we find the beginnings of a recognition of the desirability of experimental inquiries for the advancement of agriculture. The society organized in South Carolina in 1785 had among its objects the establishment of an experiment farm. President Washington, who was a member of the first society for promoting agriculture organized in the United States, which was formed March 1, 1785, at Philadelphia, then the seat of the General Government, in pleading for the establishment of a national board of agriculture in his annual message to Congress in 1796, says that one of the functions of such a board is "to encourage and assist a spirit of discovery and improvement * * * by stimulating to enterprise and experiment." The distribution of seeds and plants, begun in 1839 through a Congressional appropriation secured by Hon. Henry L. Ellsworth, Commissioner of Patents, which afterwards resulted in the establishment of the Department of Agriculture, was primarily an experimental enterprise with a view to testing the adaptation of new varieties of agricultural plants to different parts of the country.

In 1849 the New York Agricultural Society established at Albany a chemical laboratory for the analysis of soils, manures, etc., and an elaborate examination of maize was made there by Dr. Salisbury. In 1855 a special agent was employed by the Patent Office "to investigate and report upon the habits of insects injurious and beneficial to vegetation, especially those infesting the cotton plant." The same office also employed a chemist and botanist, began a propagating garden, and arranged with the Smithsonian Institution for procuring and publishing records of meteorological observations. After the establishment of the Department of Agriculture in 1862, as a branch of the Government distinct from the Patent Office, the land on which its buildings now stand was for several years chiefly used as an experiment farm. As soon as agricultural colleges were established in this country experimental investigations in field and laboratory were undertaken, but for a number of years these were carried on with small means and for the most part by the voluntary labor of professors outside of their regular duties as instructors.

ESTABLISHMENT OF AGRICULTURAL COLLEGES.

The act establishing an agricultural college which was passed by the legislature of Maryland in 1856 made it a duty of the board of trustees of the institution to conduct on the college farm "a series of experiments upon the cultivation of cereal and other plants adapted to the latitude and climate of the State."

The records of the college show that in 1858, immediately after the college was located and before building began, field experiments with corn, oats, and potatoes, "to test the relative value of the different manures offered for sale in the cities of Baltimore and Washington," were commenced on the college farm. This work continued for two or three years, but was interrupted by the financial distress which soon affected the whole country and by the disturbed condition of the State and nation.

In 1870 a school of agriculture and horticulture was established in connection with Harvard College in accordance with the provisions of the will of Mr. Benjamin Bussey, of Roxbury, Mass. This school was named "The Bussey Institution." The same year Harvard College received from the Massachusetts Society for Promoting Agriculture a considerable sum "for the support of a laboratory and for experiments in agricultural chemistry to be conducted on the Bussey estate." Investigations were begun in this laboratory in 1871 by F. H. Storer, the professor of agricultural chemistry in the Bussey Institution, and his assistants, and the first report of their work was made December 3, 1871. The earliest experiments consisted of field tests of fertilizers upon the farm of the institution and chemical analyses of commercial fertilizers. A number of bulletins were published, including reports of field experiments and investigations on hybridizing plants, the composition of feeding stuffs and fertilizers, injurious fungi, and physiology. The great fire in Boston in 1872 and the commercial crisis of 1873 combined to cripple the institution financially, and for a number of years little was done in the way of original investigations. Recently, however, the financial status of the institution has improved, and investigations have been undertaken in several lines. Several bulletins have been published within the past three years, among which are those on the white pine (*Pinus strobus*), basket willow, systematic destruction of marmots and other vermin, and chemical substances in the trunks of trees. An extensive arboretum of indigenous and exotic trees, shrubs, and herbaceous plants has been developed on the grounds of the institution through a bequest made to Harvard University in 1872 by James Arnold, of New Bedford, Mass.

When the College of Agriculture of the University of California was organized it was understood that a part of its work would consist of experimental inquiries. In 1870 Prof. E. S. Carr, in an address at the State fair, stated that "the University proposes to furnish the facilities for all needful experiments; to be the station where tests can be made of whatever claims attention." The university grounds at Berkeley were developed with reference to their use for experimental purposes, and in 1874 a considerable number of varieties of grapes and orchard and small fruits were planted, and a barn and two propagating houses were built. The same year E. W. Hilgard was chosen professor of agriculture. Professor Hilgard had previously been engaged for a number of years in conducting an agricultural and geological survey in Mississippi, in connection with which chemical examinations of soils, field experiments, and other agricultural investigations had been incidentally carried on in accordance with a plan inaugurated as early as 1857 and afterwards made the basis for the highly successful work of the California experiment station, which has been continued under his direction for a quarter of a century. "In the winter of 1875–76 the first field experiments were undertaken to determine the effects of deep culture and of the application of various fertilizers. In 1875 the laboratory branch of the experiment-station work was inaugurated, the regents making provision for the expenses thereof for the first two years, and at the end of this time the legislature opened the way for the continuation and extension of the work by liberal special appropriations from year to year."

After the fund which had been established by the sale of the land scrip donated to Connecticut under the act of Congress of July 2, 1862, had been given to the Sheffield Scientific School of Yale College in 1863, a professor of agriculture was added to the working force of that institution. Samuel W. Johnson, M. A., professor of theoretical and agricultural chemistry, and William H. Brewer, Ph. D., the professor of agriculture, have for many years taken an active interest in all work for the promotion of agricultural science in Connecticut and elsewhere in the United States. Under their direction experimental work for the benefit of agriculture was carried on to a limited extent at New Haven more than thirty years ago, and it is doubtless safe to say that "through the influence of the professors and pupils trained in this school, more than to any other single cause, is due the recognition of the importance of the establishment of agricultural experiment stations, first in Connecticut and subsequently throughout the whole country."

### THE FIRST STATE AGRICULTURAL EXPERIMENT STATION.

In 1872 at a convention of representatives of agricultural colleges held in Washington, D. C., in response to a call issued by the United States Commissioner of Agriculture, the question of the establishment of experiment stations was discussed, and the report of a committee in favor of such institutions was adopted by the convention. On December 17, 1873, at the winter meeting of the State board of agriculture at Meriden, Conn., Professor Johnson, of the Sheffield Scientific School, and Professor Atwater, of Wesleyan University, urged the establishment of an agricultural experiment station in that State after the European pattern. A committee was appointed to consider the expediency of such a movement, and reported two days later that it was their "unanimous opinion that the State of Connecticut ought to have an experiment station as good as can be found anywhere, and that the legislature of the State ought to furnish the means for its establishment." A permanent committee was then appointed by the board to bring this matter to the attention of the public and the legislature. This committee held meetings in different parts of the State, and the following winter secured the introduction of a bill for an experiment station, which, however, was laid over until the next session of the legislature. Another year of agitation of the matter ensued. The project had many warm and enthusiastic friends, but the great mass of the farmers took little interest in the enterprise. When it had become apparent that it could not otherwise succeed, Mr. Orange Judd offered on his own part $1,000 to begin the undertaking, and on the part of the trustees of Wesleyan University, at Middletown, the free use of the chemical laboratory in the Orange Judd Hall of Natural Science.

These offers were made on condition that the legislature should appropriate $2,800 per annum for two years for the work of the station. It was thought that if by these means the work of agricultural experimentation could actually be begun the usefulness of the enterprise would be so clearly demonstrated that it would speedily receive more generous and permanent support. An act making the appropriation thus proposed was unanimously passed, and approved July 2, 1875. Early in October of the same year a chemist was on the ground, and as soon as practicable two assistants were secured. Professor Atwater was made director, and thus the first State agricultural experiment station in America was an accomplished fact. At the end of the two years provided for in the original bill the station was reorganized under the direct control of the State and permanently located in New Haven, where it has since been in successful operation, until 1882 in the chemical laboratory of the Sheffield Scientific School, and thereafter in buildings and on grounds provided by the State in the suburbs of the city.

### ESTABLISHMENT OF EXPERIMENT STATIONS BY STATES AND COLLEGES.

The success which attended this first attempt to establish an experiment station in the United States was sufficient to attract the attention of advanced agriculturists throughout the country, and the example set by Connecticut was soon followed in other States. March 12, 1877, the State of North Carolina established an agricultural experiment and fertilizer control station at Chapel Hill in connection with the State University in accordance with an act of the legislature creating a department of agriculture, immigration, and statistics.

The Cornell University experiment station was organized in February, 1879, by the faculty of agriculture of the university, as a voluntary organization. From that time until the passage of the act of Congress of March 2, 1887, the work was carried on by the different professors in such time as could be spared from other studies. For a part of that time the trustees of the university appropriated money from the university funds to pay for the services of an analyst and for the purchase of supplies. All the other work was done without compensation.

The New Jersey State experiment station at New Brunswick, N. J., was established March 18, 1880, by an act of the State legislature and connected with the scientific school of Rutgers College.

The movement grew in favor with the people with each succeeding year, and in 1886 the Committee on Agriculture in reporting the Hatch bill to the House of Representatives was able to make the following statements:

> Since 1881 the legislatures of several States have either recognized or reorganized the departments of agriculture in the land-grant colleges as "experiment stations," thus following substantially the course adopted by New Jersey. Such stations have been established in Maine, Massachusetts, Ohio, Tennessee, and Wisconsin. In three other States (possibly more), without legislative action, the college authorities have organized their agricultural work as experiment stations. This has been done in California, Missouri, and New York. But in addition to the twelve experiment stations specifically designated by that name a very large number of the colleges established under the act of 1862 are doing important work of a precisely similar kind. Many of them began such work immediately upon their establishment, and have since maintained it continuously; others have entered upon it more recently. The colleges in Colorado, Indiana, Kansas, Michigan, and Pennsylvania are carrying on what is strictly experiment-station work as a part of their ordinary duty.

### ATTEMPT TO ESTABLISH AN EXPERIMENT STATION THROUGH PRIVATE MUNIFICENCE.

The only attempt in America to establish an agricultural experiment station through the munificence of one man, deserves recognition in this article, although it was short lived. In the year 1876, Mr. Lawson Valentine, a philanthropic and public-spirited native of Massachusetts, conducting a prosperous business in New York City, purchased a tract of several hundred acres in the township of Cornwall, Orange County, N. Y., to which he gave the name of Houghton Farm. Soon after, he conceived the idea of establishing at this place a series of systematic agricultural experiments. Mr. Valentine naturally took for his model the work of Lawes and Gilbert at Rothamsted, England, but with modifications suited to American conditions.

In the summer of 1879 Dr. Manly Miles, of Michigan, was engaged as director of experiments, and during the next eighteen months he laid out suitable fields, constructed a system of drainage, and visited the principal stations of Europe for the purpose of studying plans and methods of investigation. Early in 1881 the scheme was reorganized, and Maj. Henry E. Alvord, of Massachusetts, was placed in charge as general manager, with these instructions from the proprietor:

First, conduct the farming operations in accordance with the best known methods and under the best possible organization and management, with a view of educating and enlightening others by furnishing valuable examples and results in practical agriculture. Second, organize and operate a scientific department, devoted to agricultural investigation and experiment, to be of the highest order, and such as to command the respect, interest, and cooperation of leading scientists of this and other countries.

Upon this basis Houghton Farm was conducted for about five years. The experiment department, with its own organization, assignment of real estate, and equipment, was maintained at an expense to the proprietor approaching $20,000 per annum. The experimental work inaugurated was grouped under four heads: (1) Agricultural physics; (2) plant growth; (3) diseases of plants; and, (4) animal growth and production. The scheme included four corresponding series of publications, issued at irregular intervals. Papers were published and distributed during 1882, 1883, and 1884 in the three series first named. The main work consisted of field experiments in growing maize. Thirty-six plats of an area of one-fifth acre each were continuously cultivated for several years, and the records were partly published. Extensive provisions were made for work in breeding and feeding dairy cattle and mutton sheep and in dairy products, but no pamphlet publications were issued on this line. The death of Mr. Valentine in 1888 put an end to this enterprise.

### ESTABLISHMENT OF EXPERIMENT STATIONS BY CONGRESS.

The convention of delegates of agricultural colleges which met at Washington, D. C., in 1883 discussed and indorsed the project for the establishment of stations in connection with the colleges by appropriations from the National Treasury, in accordance with the terms of a bill already introduced into the House of Representatives by C. C. Carpenter, of Iowa. Congress, however, was not yet quite ready to undertake so large a scientific enterprise in this direction, and the bill was not put upon its passage. Meanwhile the number of stations was steadily increasing, and the interest of practical farmers as well as men of science was more and more excited by the reports of the results of the experiments which the stations had completed. On July 8, 1885, a convention of agricultural colleges and experiment stations met at the Department of Agriculture at Washington City, in response to a call issued by Hon. Norman J. Colman, the Commissioner of Agriculture. Almost the first thing which this convention did was to pass a resolution "that the condition and progress of American agriculture require national aid for investigation and experimentation in the several States and Territories; and that therefore this convention approves the principle and general provisions of what is known as the Cullen bill of the last Congress, and urges upon the next Congress the passage of this or a similar act." (The Cullen bill was in its general provisions similar to the bill afterwards passed by Congress and now popularly known as the Hatch Act.) So earnest was the convention in this matter that it appointed a committee on legislation, which was very efficient in securing the passage of the amended bill.

In a later session the convention passed resolutions urging the creation of a branch of the Department of Agriculture at Washington City, which should be a special medium of intercommunication and exchange between the colleges and stations, and which should publish a periodical bulletin of agricultural progress, containing in a popular form the latest results in the progress of agricultural education, investigation, and experimentation in this and in all other countries. Provision was also made for a permanent organization by the appointment of a committee to cooperate with the United States Commissioner of Agriculture in determining the time of meeting and the business of the next convention, and in forming a plan for a permanent organization.

At the next session of Congress the experiment-station enterprise was again called to the attention of the House of Representatives by the bill which was introduced by William H. Hatch, of Missouri, and referred to the Committee on Agriculture. This committee made a favorable report March 3, 1886, and nearly a year later the bill was passed by Congress, and was approved by the President March 2, 1887.

The Hatch Act provides that $15,000 a year shall be given out of the funds proceeding from the sale of public lands to each State and Territory for the establishment of an agricultural experiment station, which must be a department of the land-grant college, except in the case of those States which had established experiment stations as separate institutions prior to the passage of the act.

The duties of the stations are thus defined:

SEC. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories.

In order that the funds from the National Treasury might be for the most part devoted to agricultural investigations, only $3,000 of the first year's appropriation for each station was to be expended for buildings, and thereafter only $750 a year could be so expended.

That the farmers of the country may receive prompt information regarding the work of the stations, it is provided that in addition to "full and detailed" annual reports of their operations and expenditures "bulletins or reports of progress shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the States or Territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same and as far as the means of the station will permit." The franking privilege is also given for the station publications. Financial and other reports of the stations are to be sent to the Secretary of Agriculture and the Secretary of the Treasury, but no provision is made for auditing the accounts by officers of the United States or for any supervision of their work by the federal authorities. It is, however, made the duty of the Secretary of Agriculture "to furnish forms, as far as practicable, for the tabulation of results of investigation or experiments; to indicate from time to time such lines of inquiry as to him shall seem most important; and, in general, to furnish such advice and assistance as will best promote the purpose of this act."

Owing to the failure of Congress to make a specific appropriation to meet expenditures under the Hatch Act during the fiscal year in which it was passed, the Treasury Department ruled that no money could be paid to the stations during that year. It was therefore necessary to wait until the following session of Congress before active operations could be begun under the act. Meanwhile the State legislatures, one after another, gave their assent to the provisions of the act and designated the institutions which were to receive its benefits. Boards of management were organized, working staffs were appointed, buildings were located and planned, land was selected for field experiments, and in general the equipment of the stations was provided for. When the appropriation was made by Congress in 1888, it was included in the general appropriation act of the Department of Agriculture, though the head of that Department was at that time in no way responsible for the expenditure of this fund, and this precedent has uniformly been followed in succeeding years.

In 1894 Congress adopted the recommendation of the Secretary of Agriculture and gave this Department authority to examine the expenditures of the stations under the Hatch Act and report on their legality. This led to much closer relations between the Department and the stations than had hitherto existed. As soon as practicable after the passage of this act the required schedules were prepared on the basis of those already in use at the stations and distributed. In order that the Department might have accurate and complete information regarding the work and expenditures of the stations as the basis for the required reports to Congress, it was decided that the stations should be regularly visited by representatives of the Office of Experiment Stations, and this has been done each year since. In connection with these visits inquiries are made regarding the management and work of the stations and their relations to the land-grant colleges. Their methods of keeping accounts are also examined. Conferences are held with the station officers and members of the governing boards, in which not only financial policy, but also lines and methods of work are discussed. On the basis of this visitation of the stations, together with their financial statements and published reports and bulletins, a report on the work and expenditures of the stations is annually made to Congress.

In connection with the examination of the expenditures of the stations it became necessary for the Department of Agriculture to define its views regarding the limitations of the Hatch Act, and this was accordingly done in a series of rulings issued March 10, 1896. The most important of these were to the effect: (1) That permanent substations were contrary to the spirit and intent of that act; (2) that land could not be purchased or rented with the Hatch fund; (3) that farm operations were permissible only so far as they definitely constituted a part of agricultural investigations or experiments; (4) that funds arising from the sale of farm products or other property in the possession of a station, as the result of expenditures of the Hatch fund, rightfully belonged to the station, and therefore should be expended for station purposes.

## GROWTH OF THE EXPERIMENT STATIONS.

In 1893 the stations for the first time united in making a collective exhibit of the methods and results of their work. This exhibit was made in connection with the World's Columbian Exposition at Chicago. The Office of Experiment Stations and the Association of American Agricultural Colleges and Experiment Stations acted in cooperation in the general management of the exhibit. The then Director of the Office of Experiment Stations, Prof. A. W. Harris, represented the Office, and the association was represented by a committee, of which Dr. H. P. Armsby, director of the Pennsylvania State College Experiment Station, was chairman. The station work was exhibited in nine sections—botany, soils, fertilizers, crops, horticulture, entomology, feeding stuffs, animal nutrition, and dairying. There were also botanical, biological, and chemical laboratories, in which some of the simpler station operations were carried on by way of illustration. The publications of the stations and of the Office of Experiment Stations were shown, together with a large number of photographs and charts illustrating the buildings, equipment, and work of the stations. The exhibit was in general of a popular character, and was installed in the Agricultural Building. In connection with this exhibit a popular digest of the publications of the stations was made by this Office and published as Bulletin No. 15, entitled "Handbook of experiment-station work." At the same exposition a very extensive test of the different breeds of dairy cows was made under direction of a committee of station officers. In this test a daily record was kept of the food, milk, fat in the milk, and butter or cheese yield of each cow. A copy of this record, which comprises about 1,000 large sheets of tabulated matter, has been filed at the Department of Agriculture, where it is accessible to students and investigators.

The growth of the stations as regards their number, resources, personnel, and publications is shown by the following general statistics for the earlier years of their operations under the Hatch Act as compared with those for the year 1899. In 1888 the 46 stations in 38 States and one Territory received the national funds, making a total appropriation of $585,000, to which must be added about $125,000 derived from State appropriations, fees for fertilizer analyses, sales of farm products, etc., and $10,000 appropriated by Congress for the Office of Experiment Stations. The whole amount used for experiment-station purposes in the United States in 1888 was therefore about $720,000. In 1889 these stations published 45 annual reports and 237 bulletins.

In 1890, when more complete statistics of the stations were published by the Office of Experiment Stations for the first time, it was stated that the "stations employ 429 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 66; chemists, 101; agriculturists, 63; horticulturists, 47; botanists, 42; entomologists, 33; veterinarians, 19; meteorologists, 11; biologists, 4; viticulturists, 2; physicists, 3; geologist, 1; mycologists, 2; microscopists, 4; irrigation engineer, 1; in charge of substations, 16; secretaries and treasurers, 21; librarians, 5; clerks, 18. There are also 42 persons classified under the head of miscellaneous, including superintendents of gardens, grounds, and buildings; foremen of farms and gardens; apiarists; herdsmen, etc. During 1890 the stations have published 36 annual reports and 225 bulletins. The mailing list of the stations now aggregates about 340,000 names."

In 1899 agricultural experiment stations were in operation in all the States and Territories and in Alaska and Hawaii. In each of the States of Alabama, Connecticut, New Jersey, and New York a separate station was maintained wholly or in part by State funds, and in Louisiana there were three stations receiving joint support from national and State funds. Excluding the branch stations established in several States, the total number of stations in the United States in 1899 was 56. Of these, 52 received the appropriation provided for in the act of Congress above mentioned. The total income of the stations during 1899 was $1,143,334.93, of which $720,000 was received from the National Government, the remainder, $423,334.93, coming from the following sources: State governments, $240,300.20; individuals and communities, $12,100; fees for analyses of fertilizers, etc., $75,294.42; sales of farm products, $69,312.60; miscellaneous, $26,327.71. In addition to this the Office of Experiment Stations had an appropriation of $40,000, including $10,000 for the Alaskan investigation. The value of additions to equipment of the stations in 1899 is estimated as follows: Buildings, $27,218.64; libraries, $10,796.15; apparatus, $16,917.07; farm implements, $10,784.88; live stock, $16,265.95; miscellaneous, $22,521.93. Total, $104,504.62. The stations employed 678 persons in the work of administration and inquiry The number of officers engaged in the different lines of work was as follows: Directors, 71; chemists, 148; agriculturists, 68; experts in animal husbandry, 9; horticulturists, 77; farm foremen, 21; dairymen, 23; botanists, 52; entomologists, 48; veterinarians, 26; meteorologists, 17; biologists, 7; physicists, 7; geologists, 5; mycologists and bacteriologists, 20; irrigation engineers, 5; in charge of substations, 16; secretaries and treasurers, 24; librarians, 9; and clerks, 43. There were also 48 persons classified under the head of "miscellaneous," including superintendents of gardens, grounds, and buildings; apiarists; herdsmen, etc. Three hundred and eight station officers do more or less teaching in the colleges with which the stations are connected.

During 1899 the stations published 445 annual reports and bulletins. Besides regular reports and bulletins, a number of the stations issued press bulletins, which were widely reproduced in the agricultural and county papers. The mailing list of the stations now aggregates 523,970 names. Correspondence with farmers and calls upon station officers for public addresses at institutes and other meetings of farmers are more numerous than ever. The station officers continue to contribute many articles on special topics to agricultural and scientific journals.

The number of stations has increased from 46 in 1888 to 56 in 1899. The annual income of the stations, including the appropriation for the Office of Experiment Stations, has risen from about $720,000 in 1888 to $1,183,000 in 1899. Of this amount, about $125,000 was derived from State appropriations, fees for fertilizer analyses, sales of farm products, etc., in 1888, and $423,000 in 1899. In 1889, 393 officers were employed at the stations, while in 1899 their number had increased to 678. The stations published 282 annual reports and bulletins in 1889, and 445 in 1899.

The stations are at present conducting a wide range of scientific research in the laboratory and plant house and an equally large amount of practical experimenting in the field, the orchard, stable, and dairy. Practically all the stations are keeping a record of meteorological data, while 10 are making special studies of problems relating to meteorological phenomena and climatic conditions.

Thirty-six stations are at work investigating soils, their geology, physics, and chemistry, or conducting soil tests with fertilizers or in other ways. Twenty-one stations are studying questions relating to drainage and seepage or to irrigation in the field or greenhouse, and with orchard, garden, or farm crops. Thirty-three stations are making analyses of commercial and homemade fertilizers or are conducting field experiments with fertilizers. At least fifteen stations either exercise a fertilizer control in their respective States or make analyses on which the control is based. All the stations are studying the more important crops, either with regard to their composition, nutritive value, methods of manuring and cultivation, and the best varieties adapted to individual localities, or with reference to systems of rotation.

Forty-seven stations are investigating the composition of feeding stuffs, making digestion experiments, conducting feeding experiments for milk, beef, mutton, or pork, or studying different methods of feeding. Twenty-nine stations are investigating subjects relating to dairying, including the chemistry and bacteriology of milk, creaming, butter making, or the construction and management of creameries. Studies on the food and nutrition of man, including the composition and digestibility of foods and metabolism, are being conducted at 14 stations. Fifty-two stations are doing chemical work and often are studying methods of analysis. Botanical studies occupy more or less of the attention of 47 stations, including investigations in systematic and physiological botany, with special reference to the diseases of plants, testing of seeds with reference to their vitality and purity, classification of weeds, and methods for their eradication. Fifty-three stations work to a greater or less extent in horticulture, testing varieties of vegetables, and large and small fruits, and making studies in varietal improvement and synonomy. Several stations have undertaken operations in forestry. Thirty-six stations investigate injurious insects with reference to their restriction or destruction. Twenty-four stations study animal diseases and the methods for their prevention or cure. At least 5 stations are engaged in bee culture and 8 in experiments with poultry. One or more stations have made investigations on miscellaneous subjects, such as the following: Technology of wine, olive oil, and vinegar, preservation of fruits and vegetables, the draft of farm implements, road making, the manufacture of beet, cane, sorghum, and maple sugar, oyster culture, etc.

At first there was a disposition, especially in the region west of the Mississippi River, where the area of the States and Territories is large and the population scattered, to divide the Hatch fund and maintain substations in different localities. This greatly weakened the effectiveness of the station work and in some cases prevented the establishment of the stations on a firm basis. During the past few years, largely through the efforts of the Office of Experiment Stations, these substations have been generally abolished. In California, Minnesota, Texas, Michigan, Ohio, and New Mexico one or more substations are maintained with the aid of State funds, which are used to supplement the national fund, and thus make the extension of the station work feasible and successful.

## RELATION OF THE FEDERAL GOVERNMENT TO THE STATIONS.

The agricultural experiment stations in the United States are State institutions, supported in part by funds given by the National Government to the States to be used for their maintenance. They have also received the franking privilege under federal authority. The direct management of the stations is wholly in the hands of State officers. The stations, however, sustain certain definite relations to different branches of the Federal Government. The appropriations called for by the Hatch Act are made by Congress from year to year. They come under the head of annual, rather than permanent, appropriations, Congress having the right to refuse to make them at any time. The Congressional appropriations for the stations have thus far been included in the appropriation acts for the Department of Agriculture. After a State or Territory has given its assent to the provisions of the Hatch Act and designated the college which is to receive its benefits, the money is paid directly from the United States Treasury to the treasurer or other officer of the institution with which the station is connected, who has been certified to the Treasury as the proper person to receive this fund. The payments are made quarterly in advance, as provided by law.

Regulations governing the use of the franking privilege by the stations are made by the Post-Office Department.

As departments of the colleges receiving the benefits of the land-grant act of 1862, reports of the stations are annually sent to the Secretary of the Interior, who is represented in his relations with these institutions by the Bureau of Education.

The stations have much more intimate relations with the Department of Agriculture than with any other branch of the Federal Government. In its general relations with the stations, as well as in the supervision of their expenditures under the Hatch Act, the Department is represented by the Office of Experiment Stations, an account of which is given below.

From time to time Congress has given the Department of Agriculture funds for special investigations, with the provision that the Department shall, as far as practicable, cooperate with the experiment stations in carrying on these investigations. Notable instances of such appropriations are those for nutrition and irrigation investigations, which have been in charge of the Office of Experiment Stations, the inquiries conducted by the Office of Public Road Inquiries, and investigations with forage plants, in charge of the Division of

Agrostology. There has been an increasing amount of cooperation beween the Department and the stations in other ways, including all the general lines of work in which the scientific Divisions of the Department are engaged. The Department has also afforded to station officers the privileges of its laboratories, collections, and Library to an increasing extent from year to year.

### THE OFFICE OF EXPERIMENT STATIONS.

The Office of Experiment Stations was established as a branch of the Department to represent the Secretary of Agriculture in his relations with the experiment stations as provided for by the Hatch Act. After the passage of the Morrill Act of 1890 for the further endowment of the agricultural colleges, this Office was made the depository of the financial and statistical reports of these institutions, which are annually sent to the Secretary of Agriculture. The Office was thus furnished with considerable material upon which to base publications regarding the development of education in agriculture in this country. This work has since been broadened to include a survey of the institutions for agricultural education in foreign countries. More recently the Office has been charged with the supervision of experimental investigations in agriculture in Alaska and of special investigations on human nutrition and on irrigation, which are carried on largely in cooperation with the agricultural colleges and experiment stations.

#### RELATIONS OF THE OFFICE WITH EXPERIMENT STATIONS.

In its general advisory relations with the experiment stations in the different States and Territories, the Office of Experiment Stations endeavors to help the stations in a variety of ways. This work is performed partly by personal conferences with station officers and partly by correspondence. It includes such things as advice regarding the organization and management of the stations, the choice of officers, the lines of work to be undertaken, the planning, recording, and execution of special lines of work, the nature and form of publications, the plans for station buildings, the materials, apparatus, and literature required for use in connection with different kinds of agricultural investigation. By its work in this direction, the Office has been enabled to offset, to a certain extent, the difficulties in station management and work, especially those arising from frequent changes in the governing boards and staffs of the stations, and has secured an increasing amount of uniformity in the general policy of station management throughout the country. It has, at the same time, been clearly recognized that each station is an independent State institution, for the conduct of which the United States does not assume responsibility further than is involved in the requirements of the national law under which the stations are organized and the terms on which appropriations toward their maintenance are made by Congress year by year.

The Office has endeavored to maintain a broad and consistent policy regarding the general principles on which experiment-station management and work should be based, and to aid the individual stations in their attempts to adjust these principles to the varying needs and conditions of the different States and Territories. It has also sought to promote their cooperation with each other, with the different branches of the Department of Agriculture, and with the farmers; and as a central agency established for their benefit, it has helped to bring them into relations with similar institutions abroad and to promote their interests in matters involving transactions with different branches of the United States Government.

As previously stated, the Office also has supervision of the expenditures of the stations under the Hatch Act, and annually prepares a report of the work and expenditures of the stations, which is made to the Secretary of Agriculture for transmission to Congress. This report briefly describes the work, income, and expenditures of each station, with such criticisms as are deemed desirable, and also includes a general statement regarding the condition and progress of the station enterprise as a whole during the year.

The Office collects and catalogues all the publications of the stations. This is done partly that it may have the material for its own publications and partly to make a permanent library of the station publications.

### PUBLICATIONS OF THE OFFICE.

The Office of Experiment Stations prepares a large number of publications which are largely based on those of the experiment stations in this country and abroad, or are reports of the special investigations in charge of the Office. One of the most important of these publications is the Experiment Station Record, which is issued in volumes of twelve numbers each, and is now in its eleventh volume. It comprises abstracts of the bulletins and annual reports of the stations, the publications of the Department of Agriculture, books, journals, and miscellaneous publications containing reports of investigations in agricultural science in different countries of the world; special articles by American and foreign experts in agricultural science; editorials on important matters regarding the progress of agricultural education and science, with suggestions of lines of inquiry for the stations, and notes on the organization, equipment, and development of institutions for agricultural education and research at home and abroad.

Detailed author and subject indexes accompany each volume. This journal is sent without charge to institutions for agricultural education and research in this country and the officers of such institutions, to similar institutions in foreign countries, important libraries, and to a select list of scientists and specialists who cooperate with the Department by furnishing information, by exchanging publications, or otherwise. It is also sold by the Superintendent of Documents at 10 cents a number, or $1 per volume.

The technical bulletins of the Office include special reports to Congress as required by law, reports of the investigations in charge of this Office on the nutrition of man and on irrigation, monographs on special subjects based on the work of the experiment stations, bulletins containing statistics and general information regarding institutions for agricultural education and research, and the proceedings of the Association of American Agricultural Colleges and Experiment Stations.

In 1889 a series of Farmers' Bulletins was begun in this Office with a view to making a popular record of the results of work at the experiment stations for general distribution among the farmers of the country. After the scope of this series was enlarged and it was made a general series for the Department, the Office continued to prepare, or to obtain from officers of the experiment stations, articles of a popular character on different subjects which might properly be included in this series. Latterly the Office has restricted these articles to subjects connected with the special investigations in its charge and résumés of the publications of the experiment stations. The latter are grouped together in a subseries entitled "Experiment station work." This title has been given to Farmers' Bulletins prepared in this Office, in which a number of short articles on different subjects based on the publications of the experiment stations are grouped together to form single bulletins. As stated in a note inserted in each number of this series, "The chief object of these publications is to disseminate throughout the country information regarding experiments at the different experiment stations, and thus to acquaint our farmers in a general way with the progress of agricultural investigation on its practical side."

Each article included in the "Experiment station work" is signed by the person who prepares it. The meaning of technical terms necessarily used in these articles is explained in an appendix. Illustrations are used as far as seems desirable. Whenever the number of these bulletins is sufficiently large to make a volume of convenient size an index will be prepared covering the numbers to be included in the volume. In this way, as time goes on, it is expected that there will be in libraries and in the homes of many farmers a series of volumes containing a popular record of the practical results of the work of the stations. Through this series the farmer in any part of the country is enabled to ascertain the most important practical things the stations are accomplishing wherever they may be located.

The Office also publishes a "Card index of experiment-station literature." This is a subject index arranged on a decimal system. Each card contains the title of the article, the name of the author, a bibliographical reference to the experiment-station publication containing the article, and also to the Experiment Station Record, and a brief abstract showing the nature and scope of the article. The number of cards thus far prepared is 19,000, covering the publications of the stations from 1888 to 1897. A set of the index is furnished to each agricultural college and experiment station in this country and to the boards or commissioners of agriculture in the several States. The index is also sold to subscribers at the rate of $2 per thousand cards, and $1.25 for a set of division cards. Three hundred sets are printed.

The Office also prepares a variety of brief documents in the form of circulars, schedules, articles for the Yearbook of the Department, etc.

From its organization in 1888 up to January 1, 1900, this Office issued 311 documents, which may be classified as follows: Experiment Station Record, 11½ volumes, 119 numbers; technical bulletins, 72; Farmers' Bulletins, 46; circulars, 43; schedules, separates, etc., 31. In 1899 the total number of copies of publications of this Office printed was 1,200,000, of which 1,000,000 were Farmers' Bulletins.

ALASKA EXPERIMENT STATIONS.

Beginning with 1897, agricultural investigations have been carried on in Alaska under the direction of the Office of Experiment Stations. These investigations have thus far consisted very largely of an agricultural survey, with a view to determining the agricultural capabilities of this region. Definite experiments in growing cereals, flax, and vegetables have been conducted at several points along the coast. During the past year this work has been organized on a more permanent basis with a view to the establishment of regular experiment stations in Alaska. The erection of a headquarters building to contain offices and laboratories has been begun at Sitka, and land has been cleared for experimental purposes at Sitka and Kenai in Cook Inlet. Oats, barley, and wheat have been successfully grown to maturity at both these places, and rye and flax have also been matured at Sitka. Definite information has been collated showing that a considerable variety of vegetables, such as potatoes, cabbages, cauliflower, turnips, lettuce, and spinach may be successfully grown in different parts of Alaska, including interior localities. Grasses and forage plants grow luxuriantly over large areas in Alaska, and live stock has already been kept there to a sufficient extent to warrant the belief that a large animal industry may be developed. Three reports on the investigations in Alaska have been published. The work in Alaska is in immediate charge of Prof. C. C. Georgeson.

## NUTRITION INVESTIGATIONS.[1]

In 1894 Congress made a special appropriation of $10,000 "to enable the Secretary of Agriculture to investigate and report upon the nutritive value of the various articles and commodities used for human food." General supervision of this inquiry was assigned to the Office of Experiment Stations, and Prof. W. O. Atwater was appointed special agent in charge of nutrition investigations, with headquarters at Middletown, Conn. At the same time Congress authorized the experiment stations to conduct investigations on the food of man, and they were directed to report progress in their work in this line to the Secretary of Agriculture. The investigations, in charge of this Office, have been carried on in connection with colleges, experiment stations, and philanthropic organizations in different parts of the country. Technical bulletins containing accounts of investigations on food and nutrition of man have been published, as well as Farmers' Bulletins based on such investigations.

## IRRIGATION INVESTIGATIONS.[1]

In the appropriation act for the Department of Agriculture for the fiscal year ending June 30, 1899, $10,000 was appropriated by Congress for irrigation investigations by the Department of Agriculture, and this was increased to $35,000 for the current fiscal year. By order of the Secretary of Agriculture supervision of this work was assigned to the Director of the Office of Experiment Stations. It was decided to undertake work in two general lines: (1) The collation and publication of information regarding the laws and institutions of the irrigated region in their relation to agriculture, and (2) the publication of information regarding the use of irrigation waters in agriculture as determined by actual experience of farmers and experimental investigations. A headquarters for these investigations has been established at Cheyenne, Wyo. They are carried on under the immediate direction of Prof. Elwood Mead, and as far as practicable are made in cooperation with the experiment stations in different States. Work in this line has now been undertaken in fifteen States and Territories.

## RELATIONS OF THE STATIONS WITH ASSOCIATIONS.

The experiment stations, as well as the colleges with which they are connected, are brought together so as to form a national system of agricultural education and research through the Association of American Agricultural Colleges and Experiment Stations. The work of this association is carried on by means of conventions composed of one delegate appointed by each of the land-grant colleges and agricultural experiment stations in the United States, together with

[1] More detailed account of these investigations are given in a separate article in this Yearbook.—Ed.

delegates representing the Department of Agriculture, the Office of Experiment Stations, and the Bureau of Education of the Department of the Interior. Annual meetings are held in different parts of the country, at which questions relating to the management and work of the stations, as well as of the colleges, are discussed in the general assembly and in a number of sections.

The proceedings of the association are edited by the chairman of its executive committee and the Director of the Office of Experiment Stations and are published by the Department of Agriculture as bulletins of this Office. In the interval between meetings of the association much useful work for the promotion of the general interests of the agricultural colleges and experiment stations is performed by the executive committee and standing and special committees of the association. The association has done much to establish and strengthen the stations and to aid in their administration on a permanent and substantial basis.

The stations are also largely represented in the associations of Official Agricultural Chemists, Economic Entomologists, and Experiment Station Veterinarians, through which the uniformity and efficiency of the station work in chemistry, entomology, and veterinary science, with special reference to the methods employed, are greatly promoted.

## ORGANIZATION OF THE STATIONS.

The stations organized under the Hatch Act are by law departments of the colleges receiving the benefit of the land-grant act of July 2, 1862, and of supplementary acts relating to similar colleges established in the States which have been admitted to the Union since the passage of that act, as well as to those in the Territories. The Hatch Act, however, made an exception in favor of State agricultural experiment stations which had been established separate from the land-grant colleges prior to the passage of the act. In this way State stations are maintained in Connecticut, New York, and Ohio, which are not connected with colleges and yet receive, in whole or in part, the benefits of the Hatch Act. In New Jersey there is a station which is supported by State funds as distinct from the station which receives the Hatch funds, but both stations are located at the land-grant college and have the same director.

The stations, which are departments of the colleges, are, as a rule, under the general management of the governing boards of these institutions. The separate State stations have their own governing boards. The governing boards of the stations are quite commonly appointed by the governor of the State, but in a few cases are elected by the people. In a few instances the State board of agriculture is the governing board of the college and station. The more immediate supervision of station affairs is often intrusted to a standing committee of the governing board.

As a rule, the duties of the governing board are confined to determining in a general way the policy and lines of work, appointing the members of the staff and fixing their terms of office and compensation, deciding on the character and extent of expenditures, and approving and auditing the accounts. In some cases, however, the governing boards determine and supervise the work and expenditures of the station in considerable detail. This was more generally true in former years than at present. As the stations have developed, it has been found desirable to intrust the planning and execution of their work more fully to the director and other expert officers.

The president of the college with which the station is connected, as a rule, holds the same relation to the station that he does to other departments of the college, that is, he is the chief executive officer of the institution, including the experiment station, and represents the institution before the governing board, of which he is often an ex-officio member. In a few instances the president has been relieved of all responsibility for the station, its director reporting directly to the governing board. In fourteen States and Territories the president of the college is at present also director of the station.

Elsewhere the director is a separate officer, who, in addition to general executive duties connected with the station, carries on investigations in some special lines, or combines teaching in the college with his work for the station. Thus, the station director may at the same time be the chemist or agriculturist of the station and the professor of chemistry or agriculture in the college. In some stations the director has large powers and responsibilities in the management of the station. In other States the planning of the work and even details of administration are largely committed to a council composed of the heads of the different divisions of the station, or these officers and some members of the governing board.

Besides the president of the college and the director, the station staff usually comprises several scientific experts in charge of special lines of work (as dairying, horticulture, chemistry, entomology, or diseases of plants and animals) and scientific assistants. The members of the staff may be employed exclusively for experiment-station work, but in a large number of instances they combine this with instruction in the college. In addition to the scientific force there are usually persons of practical experience employed as foremen of farms, dairymen, feeders of cattle, etc., and clerical assistants, including accountants, stenographers, and typewriters. Women are often employed in these clerical positions. Laborers are employed regularly by the year or month, or work as occasion may demand by the day or hour.

A considerable number of students of the colleges are employed as assistants and laborers at the stations. Special experts, scientific assistants, and other workers are from time to time employed by the stations for the conduct of particular investigations.

FIG. 1.—ADMINISTRATION AND LABORATORY BUILDING OF OHIO STATION.

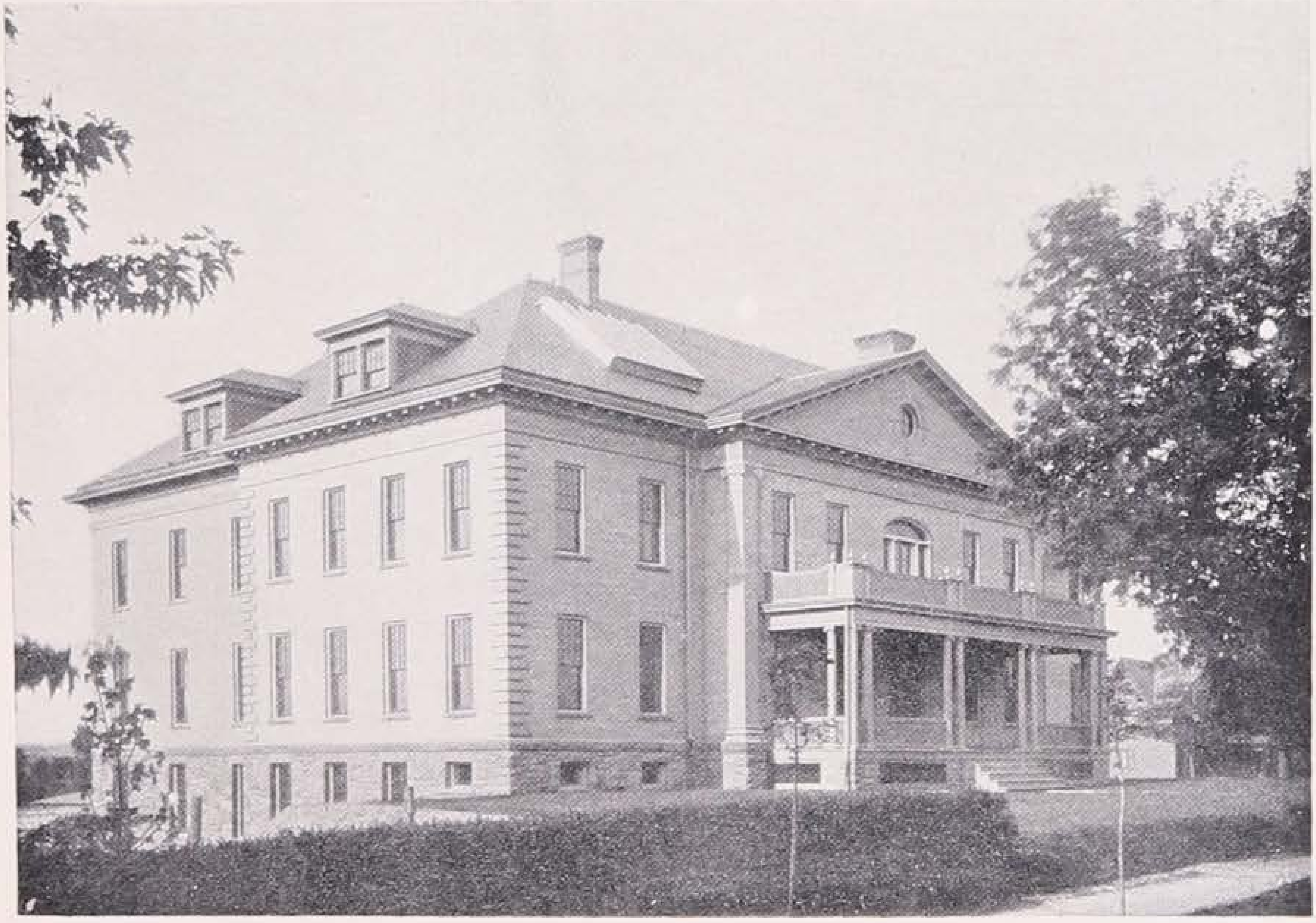


FIG. 2.—DAIRY AND BIOLOGICAL BUILDING OF NEW YORK STATE STATION.

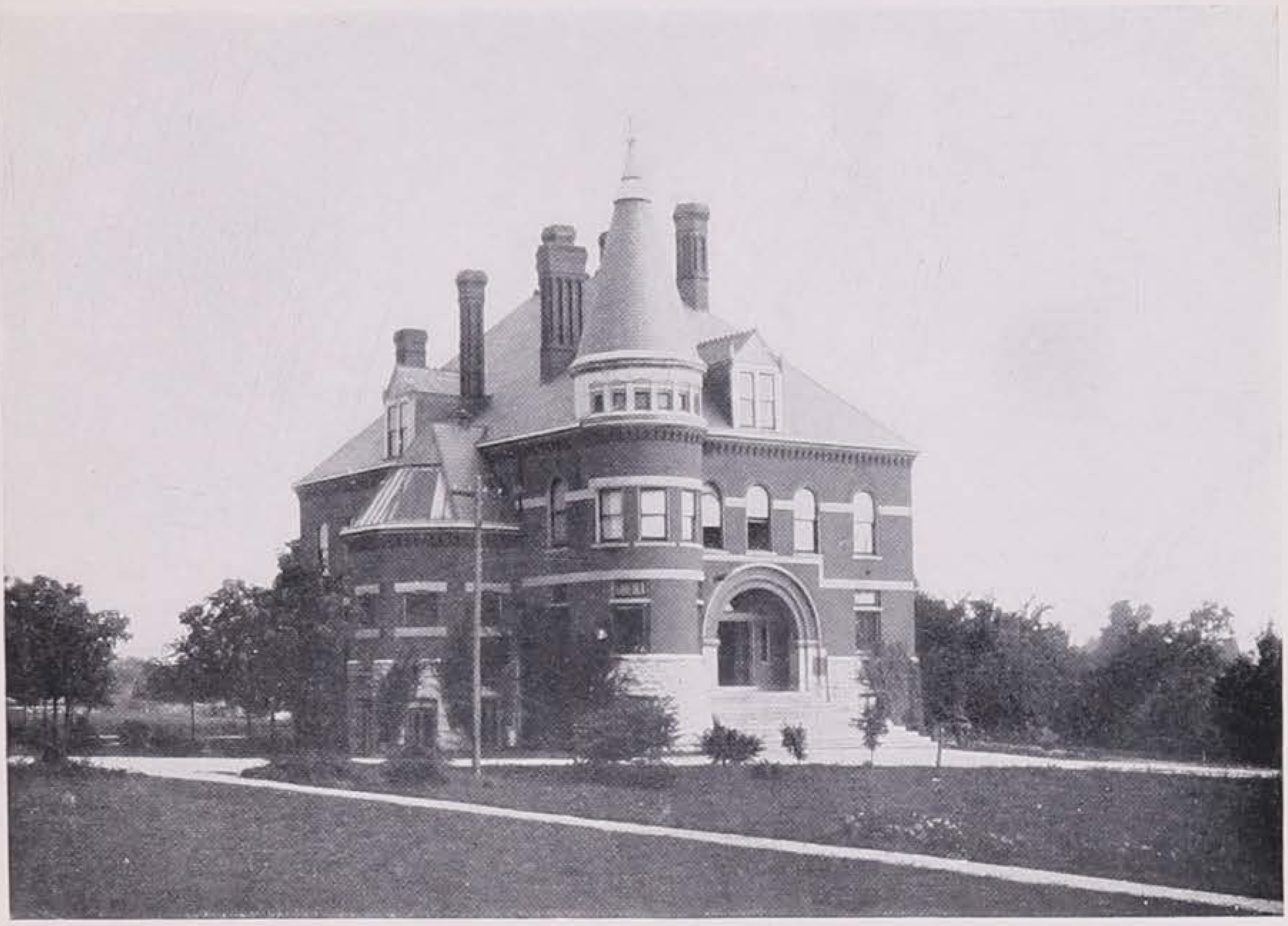


FIG. 1.—CHEMICAL AND BIOLOGICAL LABORATORY OF KENTUCKY STATION.

FIG. 2.—DAIRY BUILDING OF WISCONSIN STATION.

FIG. 1.—BARN OF MINNESOTA STATION.

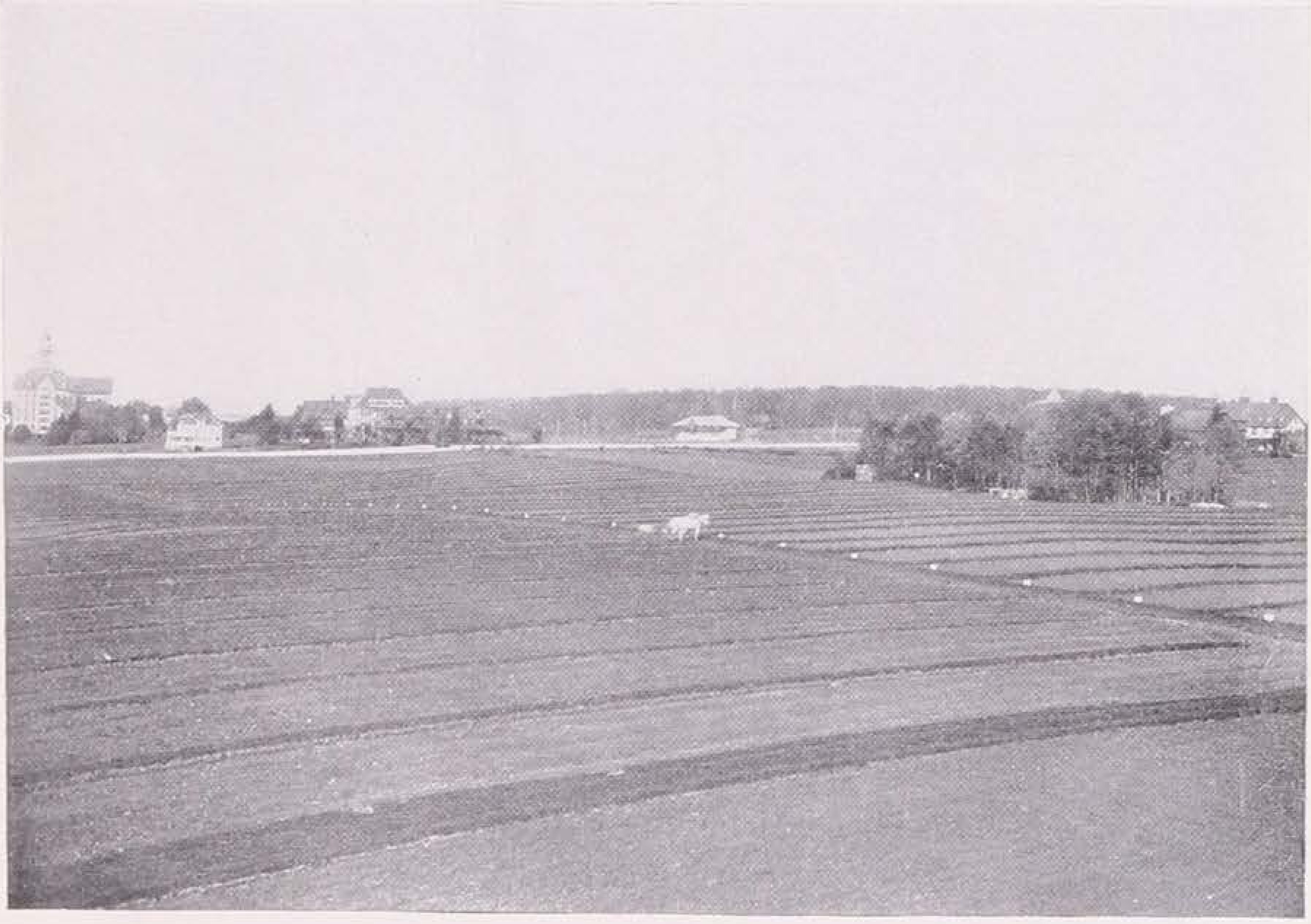


FIG. 2.—EXPERIMENT PLATS OF PENNSYLVANIA STATION.

In cooperative experiments with farmers, the station usually furnishes the plans of work and the seeds, fertilizers, fungicides, or other materials required by the experiment, and makes the chemical or other examinations of the soils, fertilizers, or crops necessary to determine the data or results sought in the experiment. The farmer on his part furnishes the land, orchards, labor, etc., most commonly without charge to the station.

### EQUIPMENT OF THE STATIONS.

The stations very generally make use of buildings and land supplied by the colleges or by the States. Many of these buildings and farms are used jointly by the college and station. The buildings include administration buildings (Pl. XLIII, fig. 1), libraries, chemical, botanical, bacteriological, and other laboratories (Pl. XLIII, fig. 2, and Pl. XLIV, fig. 1); vegetation houses, insectaries, dairy buildings (Pl. XLIV, fig. 2), barns (Pl. XLV, fig. 1), silos, piggeries, and poultry houses, together with special buildings for particular experiments, such as those in sugar making, tobacco curing, and the treatment of animal diseases. The stations are generally well equipped with scientific apparatus, farm implements, and live stock. A portion of the station land is commonly laid out in permanent plats for experimental purposes (Pl. XLV, fig. 2).

### LINES OF WORK OF THE STATIONS.

Speaking broadly, the work of the experiment stations in the United States corresponds in scope and extent with the complexity of their organization. It is therefore difficult to make general statements regarding their work which will apply to the actual operations of any one of the stations. A strict interpretation of the Hatch Act would require that the funds received from the National Government under this act should be devoted solely to original investigations and demonstration experiments and the publication of their results. In many States, however, the stations have funds, derived from the State government or other sources, which may be used for inspection work in various lines, the compiling of information useful to farmers, and miscellaneous purposes connected with the promotion of agriculture.

In a general way the work of the stations in the United States may be grouped under the following heads: (1) Scientific and practical investigations involving original features; (2) experiments for the verification or demonstration of the results of original investigations made at the stations or elsewhere; (3) studies of natural agricultural resources and conditions; (4) inspection and other control duties performed on behalf of agriculture; (5) the dissemination of original and compiled information.

It will, however, readily be understood that most of the enterprises of the stations are of a mixed character. Originality will, as a rule, be found only in some particular features of an investigation or in the adaptation of well-known facts or principles to special conditions. In the following outline the investigations of the stations which on the whole have most generally contained original features are grouped together, though in many cases they might with equal propriety be classified as demonstration experiments.

### INVESTIGATIONS INVOLVING ORIGINAL FEATURES.

The investigations of the stations may be classified in a general way on the basis of the different divisions found in their organization. Thus, it may be said that the investigations of the stations comprise studies in physics, chemistry, botany, zoology and especially entomology, geology, meteorology, agronomy (plant production), horticulture, forestry, physiology (of man and domestic animals), zootechny (animal industry), veterinary science, agrotechny (agricultural technology), including especially dairying, and rural engineering.

In most of these lines the investigations have included studies with reference to the improvement of methods of research, devising of new apparatus and appliances, the relation of scientific principles to the science and practice of agriculture, the working out of new practical applications on the basis of well-known facts and principles, or the solution of special problems. The statements following may serve to indicate in what directions the investigations have chiefly been pursued.

Under the head of physics, considerable attention has been given in recent years to studies on soils, especially as regards the methods for the physical examination of soils, the movement of soil water, and the apparatus required for such investigations.

In chemistry, studies with a view to the improvement of methods of analysis have occupied the attention of a considerable number of stations. This work has been done quite largely in connection with the Association of Official Agricultural Chemists. It has related chiefly to methods of analysis of soils, fertilizers, plants, foods, and feeding stuffs. They have also cooperated with this association in determining food standards as a basis for the determination of adulteration. A number of pieces of special chemical apparatus have been devised at the stations. These have included apparatus adapted to particular kinds of investigations or intended to increase the speed or multiply the operations of laboratory processes for scientific or practical purposes and devices for making the chemical examinations required in agricultural industries. A very large number of analyses of economic plants, foods and feeding stuffs, dairy products, fertilizers, and other agricultural materials, especially those distinctively American, have been made for the first time in the chemical laboratories of the stations. A considerable number of purely chemical investigations have been conducted. Chemistry has usually been an adjunct to the investigations in the fertilizer requirements of plants, human and animal nutrition, and dairying.

In botany, considerable systematic work has been done, especially in the newer States. New species of useful and injurious plants have been discovered and described. Herbaria, showing with more or less completeness the economic flora of individual States, have been collected. New light has been thrown on the botanical relations of species of economic plants. The botanical work of the stations has, however, been most largely along the lines of vegetable physiology and pathology and bacteriology. The studies in vegetable physiology have included investigations of special problems and the devising of methods and apparatus for such studies. In vegetable pathology much has been done in working out the life histories of fungi injurious to cultivated plants and in devising methods and apparatus for the repression of diseases of plants. The bacteriological work of the stations has included the isolation, culture, and description of many species of useful and pathogenic bacteria in air, soil, fertilizers, plants, foods, feeding stuffs, and other agricultural products, and those affecting useful and injurious animals. Methods and apparatus for bacteriological investigations have been devised and means for the repression of pathogenic bacteria have been worked out. The distribution and repression of weeds have been studied by numerous station botanists.

In zoology, by far the most important work of the stations has been along the lines of economic entomology. This has included the collection of large numbers of specimens of insects with a view to the determination of their economic importance in different regions; the description of many new species and the working out of their life histories in whole or in part; additions to our knowledge of many beneficial and injurious insects, including in many cases the completion of their life histories; studies in the breeding of insects, especially as a means for their investigation; the discovery or invention of methods and appliances for the repression of injurious insects; and the devising of methods and appliances for the study of insects.

In other lines of zoological investigation systematic and other studies have been made of injurious mammals (especially gophers and rabbits) and useful and injurious birds. There have also been special investigations relating to the life history and culture of oysters and the life history of nematodes.

Under the head of agronomy (plant production) a large amount of work has been done in the introduction of new varieties of crops adapted to special regions or particular economic purposes. Investigations in the improvement of varieties by selection and by plant breeding have been undertaken. Fertilizer and tillage experiments have been conducted, drainage and irrigation problems investigated, and methods of harvesting and storage studied. Some work has also been done in studying methods of investigation.

In horticulture, the stations have given most attention to testing the adaptability of varieties to different regions. In addition to this there have been studies of the selection and breeding of horticultural plants and the methods of culture, grafting, and pruning. Considerable attention has been given to questions relating to the growing of horticultural plants under glass. Valuable introductions of new and hardy fruits have been made. Native fruits have been studied and improved and wild species brought under cultivation.

Combinations of forcing-house and field methods of culture of a number of American garden crops have been introduced. Irrigation as a feature of truck gardening and fruit growing in regions of considerable rainfall has formed a feature of horticultural work at several of the experiment stations, and the value of subirrigation in greenhouses with certain forcing crops thoroughly demonstrated. Fertilizer experiments with numerous horticultural crops have thrown much new light on the subject of intensive manuring. The utilization of fruits (more especially the unmerchantable fruits) in the making of jelly, preserves, fruit sirups, and cider has been investigated. Some of the stations have given considerable attention to the beautifying of home and school grounds by the introduction of ornamental trees, shrubs, flowers, etc., not previously grown in their localities.

In forestry, the work of the stations has been principally confined to the testing of different varieties of trees with reference to their adaptability to particular regions and problems connected with the reforesting of treeless regions.

In the physiology of man and the domestic animals, the work of the stations has been largely along the line of nutrition. The most important piece of work in this line has been the devising of a special form of respiration calorimeter at the Storrs experiment station, in Connecticut, as described elsewhere. The experiments with this respiration calorimeter already made with men have added important data to the knowledge of the laws of nutrition.

Other studies have had to do with the substituting value of different nutrients and the proper combination of nutrients in the diet. Many dietary studies have been made with men and animals under different conditions and performing different amounts of work in various regions of the United States. A number of stations have made digestion experiments with men and animals, and the coefficients of digestibility for a considerable number of American foods and feeding stuffs have been worked out as the result of these experiments. Studies of the effect of different feeding stuffs on production of lean and fat meat have been made. In connection with nutrition investigations the composition of many American foods and feeding stuffs has been learned. The effect of cooking on different foods and the losses during cooking have also received attention. Much time has been devoted to the elaboration of experimental methods, the testing of methods already known, and the devising of new methods.

In zootechny (in the restricted sense of animal production), the work of the American stations has principally consisted of feeding experiments with different kinds of farm animals, in which various combinations of feeding stuffs have been tested with reference to the maintenance, growth, or the production of meat or milk. In this way the nutritive value of a large number of different kinds of American feeding stuffs has been worked out, largely on a practical basis. Important studies have been made on the nutritive value of crops of recent introduction, or crops which have recently assumed importance.

Digestion experiments have been conducted with horses, cattle, sheep, goats, and pigs. Attempts have been made at several of the stations to formulate feeding standards more suitable for American conditions than the German standards commonly in use. Tests of breeds of different kinds of animals have also been made, sometimes on a relatively large scale, and studies of types of animals best adapted to particular purposes have in some cases been made. The studies in zootechny have, to a considerable extent, been connected with the investigations in animal physiology.

In veterinary science, besides studies in bacteriology above referred to, investigations regarding the causes, nature, and treatment of various diseases of domestic animals have been made at the stations.

In agrotechny (agricultural technology), the most important work of the American stations has related to dairying. Besides the chemical and bacteriological studies of milk and dairy products referred to under the head of chemistry and bacteriology, the stations have made many studies relating to the methods of manufacture of dairy products.

Various kinds of dairy and creamery apparatus have been tested to a considerable extent, and in some cases demonstrations have been made of the method of conducting a hygienic dairy and milk route. Nearly every step in the handling of milk and in the manufacture of butter and different kinds of cheese has been investigated. In this connection they have done considerable work in studying methods of investigation and devising special apparatus and appliances for such work.

Other important investigations in agricultural technology have been those in sugar making by the Louisiana station, in the manufacture of wine and olive oil by the California station, and of vinegar and fruit sirups by the Virginia station. In these investigations the devising of new methods of manufacture and special apparatus and appliances have received large attention.

The American stations have as yet given comparatively little attention to problems in rural engineering. Studies of the form and construction of barns, silos, and other farm buildings have been made, as well as of the construction and heating of greenhouses and the construction of cheese-curing rooms cooled by natural means. Questions relating to methods of drainage and irrigation have been studied. The draft of farm vehicles, especially as related to the comparative merits of broad and narrow tires, has been tested. A considerable number of practical tests of implements and machinery used on farms or in dairying have been made.

### VERIFICATION AND DEMONSTRATION INVESTIGATIONS.

A considerable share of the work of the American stations has thus far consisted of the verification of the results obtained at the stations or elsewhere and the demonstration of the practical usefulness of these results. This work has been partly carried on at the stations, more especially on the farms under their control, and partly by experiments in different localities, largely with the cooperation of farmers. This demonstration work has included a wide range of subjects along most of the lines in which the stations have attempted more original investigations. Attention can be called in this general statement only to some of the larger enterprises of this kind in which the stations have engaged. Of this character, have been very many of the experiments with fertilizers, thousands of which have been carried on in the States east of the Mississippi River.

A very large number of practical tests of different field crops and horticultural plants have also been made by the stations in cooperation with the farmers after the stations had determined on a small scale the adaptability of these varieties to the regions in which they are located. Many of the experiments in the feeding of animals and in dairying have been made by the stations for the purpose of confirming the results obtained through previous investigations in this country or abroad. Often the chief purpose of these investigations has been to convince the farmers that the results which have been obtained elsewhere were equally applicable to their local requirements. In a similar way, many investigations along the lines of chemistry, botany, entomology, and veterinary science have been repeated at the stations, either for the purpose of more firmly establishing the correctness of the results previously obtained or of showing the farmers that these results could be successfully applied in practice. Thus, many means for the repression of insect pests and the diseases of plants or animals have been tried over and over again by the stations and among the farmers until they have become a part of regular agricultural practice, at least among the more progressive portion of the agricultural community. For purposes of verification or demonstration, thousands of cooperative experiments are now annually carried on in the United States, in which the farmers take part under the direction of the stations.

### STUDIES OF NATURAL AGRICULTURAL CONDITIONS AND RESOURCES.

Closely united with the demonstration experiments of the stations have been those studies which have primarily had for their object the gaining of definite information regarding the natural agricultural conditions and resources of the different States. While the stations were not established for the making of agricultural surveys or the collection of agricultural statistics, yet in many cases, especially in the newer States and Territories, in the absence of accurate information acquired through other agencies, it has been necessary for the stations to do more or less work of this character as a preliminary to the scientific investigations and practical experiments which it is their real business to make.

In this way the stations have in the past done considerable work in the collection of general meteorological data, sometimes in cooperation with State weather services and the United States Weather Bureau. This work has, however, now been given up for the most part, and the stations are confining their meteorological observations to those taken on their own grounds. In a number of States data regarding the geologic formations and soils in different localities have been obtained, and in a few States this has been done with sufficient thoroughness to enable the station to make a soil map of the whole State, or of particular agricultural regions. Studies of the nature of the water supply available for household use, for live stock, or for irrigation, have engaged the attention of a number of stations. There has been a considerable number of botanical surveys for the purpose of obtaining information regarding the native forage plants and fruits of different States, which might be utilized for economic purposes.

Several stations have done some work on the study of life zones of their States and the suitability of varieties of crops to these zones. The largest enterprise of the stations which may be said to have been essentially a study of the natural agricultural conditions has been the determination of the regions in which sugar beets may be grown with a sufficiently high percentage of sugar to make it probable that they might be utilized in sugar making, provided the economic conditions were favorable. This investigation was carried on by the stations very largely in cooperation with the Department of Agriculture and farmers. Thousands of experiments were made for several years, covering the entire country, and in this way the capabilities of the United States with reference to the growing of sugar beets were quite definitely established.

The marl and phosphate deposits have been investigated in a number of States, with reference to their use for fertilizers where conveniently located.

In several States, legislatures have made special appropriations to the stations for studies of the agricultural resources of particular sections as yet undeveloped or for overcoming natural obstacles to cultivation.

### INSPECTION WORK OF THE STATIONS.

The experiment stations in thirty-six States and Territories are doing more or less work of inspection, either under special State laws or as a voluntary enterprise. The nature and amount of this service varies very greatly in different States. Sometimes the station conducts a complete inspection and control, sometimes it makes the chemical or other examinations on which control is based, and sometimes it simply makes the examinations and publishes the results for the information of the public, no system of control being provided by law. The fertilizer inspection and control was the first established in this country, is most extensively and thoroughly organized, and is most intimately connected with the work of the stations. More recently inspection of dairy products and other foods for man has been undertaken in a number of States, and the stations have been called upon in various ways to promote this work. In some of the Eastern States where concentrated feeding stuffs are largely used, laws for their inspection by the stations have been enacted within the past few years. Inspection for the prevention of diseases of animals and plants and the repression of injurious insects (especially the diseases and insect pests affecting nursery stock) and weeds has been begun in a number of States. Dairy apparatus and Paris green are required to be inspected in a few States, and there has been considerable voluntary inspection of seeds by the stations in different parts of the country.

The Hatch Act makes no provision for regular inspection work by the stations. The stations supported exclusively by this fund have therefore undertaken such work only incidentally with a view to showing its usefulness. Wherever it has assumed importance and the necessity for its regular performance has been made apparent, the States have made provision for its maintenance. Naturally the laws and regulations regarding this kind of inspection have varied with local requirements and opinions. In recent years there has been an increasing tendency toward greater uniformity in the general features of inspection laws and regulations.

### DISSEMINATION OF INFORMATION BY THE STATIONS.

The Hatch Act requires that each station shall publish bulletins or reports of progress at least once in three months, and a full and detailed report of its operations, including a statement of receipts and expenditures, once a year. Most of the publications of the stations may therefore be divided into two general classes—annual reports and bulletins.

The annual reports of the stations vary greatly as regards the character of their contents, their size, and the number of copies printed. In a number of States the annual report is a large document containing a detailed account of the investigations of the station, as well as statements regarding its administration and finances. In some States it is a brief document containing only short statements regarding administrative matters, finances, investigations, and publications.

The bulletins of the stations are of different descriptions and can not be definitely separated into classes. Each of the stations has, however, a regular series of bulletins, usually numbered consecutively, which comprises the greatest part of its publications. These bulletins contain a great variety of information. Some of them consist wholly of compiled matter, some are popular accounts of station investigations, and others contain quite technical and elaborate descriptions of their investigations. Some stations have attempted to separate their technical and popular bulletins into different series and in some cases new series have been begun after the station has been in operation a number of years. As a rule, however, the stations issue their regular bulletins in a single series. Illustrations are quite generally used in bulletins, and more attention has been given from year to year to improving the general appearance of the bulletins.

Many of the stations annually issue more than the four bulletins required by the Hatch Act. The bulletins are sent out to mailing lists containing from 3,000 to 35,000 addresses in different States, the aggregate number of addresses being about half a million. The stations endeavor to send their bulletins to all applicants within their own States and to satisfy outside demands for them as far as their means will allow. This outside demand has, however, grown to be so large as already to cause embarrassment. Each station has a considerable number of foreign correspondents to whom the bulletins are regularly sent.

In a number of the States the stations prepare press bulletins, which are either résumés regarding the station work or contain information of more general character. In cases in which the station receives a large number of requests for information on any topic it has been often found convenient to have answers distributed through the press rather than by correspondence.

Some of the stations have issued charts and posters illustrating special features of their work.

Station officers participate to a considerable extent in the meetings of farmers known as farmers' institutes, which are now regularly held in forty-three States and Territories, principally during the winter months. It is estimated that there are now annually held in the United States some two thousand institutes, which are attended by about half a million farmers. Through the institutes the stations are therefore able to largely supplement their publications by oral explanation of their work to large numbers of farmers. Station officers also make a large number of addresses each year before State and local agricultural, horticultural, and dairy associations and miscellaneous meetings of farmers. The correspondence carried on by station officers is very large, aggregating hundreds of thousands of letters annually. A large part of these are replies to inquiries by farmers, which cover almost every topic relating to the theory and practice of agriculture. A considerable number of stations make exhibits of their work at State and other agricultural fairs.

### GENERAL RESULTS OF THE WORK OF THE STATIONS.

During the past ten years more than $10,000,000 have been expended for the maintenance of agricultural experiment stations in the United States. Of this sum, about $7,000,000 came from the Federal Government and $3,000,000 from State sources. During that time the United States produced agricultural products valued at thirty thousand million dollars. The maintenance of the stations therefore involved the expenditure of $1 for every $3,000 worth of agricultural products. Considered in this light the funds used to improve the quality and increase the yield of our agricultural products do not seem disproportionately large. They are, however, sufficiently large to make it very important that the results shall clearly justify the continued expenditure of such great sums for the support of the stations.

Many of the results obtained in experimental inquiries in agriculture are of course of such a character that it is difficult, if not impossible, to give any exact measure of their value, especially on a financial basis. A large share of the work must necessarily give negative results, the practical value of which consists in showing the farmer the things which he ought not to do. Obviously many of the results which have a limited or local value, and which in the aggregate would go far toward justifying the maintenance of the stations, can not even be referred to in a summary statement like this. We shall, however, attempt to call attention very briefly to some of the more prominent results which the stations have obtained and on which their claims of usefulness to our agriculture must depend.

### INTRODUCTION AND DEVELOPMENT OF AGRICULTURAL METHODS, CROPS, OR INDUSTRIES.

Beginning with the work of the stations in which the attempt has been made to introduce or develop new methods, crops, or industries, we may with good reason assert that the most important general result of experiment-station work has been along the line of dairying. The working out of practical methods and apparatus for the rapid determination of the fat content of milk, most perfectly accomplished by the Wisconsin station; the researches regarding the chemistry and bacteriology of milk and dairy products, the elaborate investigations on cheese making at the New York station, and on the ripening of cheese at the Wisconsin station; the more practical experiments in butter making at the Iowa station—these and other investigations at the stations, combined with the dissemination of information regarding the results of work in similar lines abroad, have brought about a widespread revolution in the business of dairying in this country.

Closely connected with the improvement of dairying have been the investigations on nutrition, many of which have been directly made with dairy cattle. These have had to do with the effects of feeding stuffs on the quality of milk and the character of butter or have dealt with the economical production of dairy products. The highest point in the work on nutrition has been reached in the perfecting of methods and apparatus by the Connecticut Storrs station in cooperation with this Department. The respiration calorimeter devised at that station, having proved its usefulness in investigations on some of the fundamental problems of the nutrition of man, is now being adopted by the Pennsylvania station and the Department to use in similar investigations with farm animals. Two European governments have made liberal appropriations for the construction of respiration calorimeters after the plan of the Connecticut apparatus.

The Iowa, Maine, Massachusetts, Michigan, Minnesota, New York, Pennsylvania, Vermont, Wisconsin, and other stations have also made important investigations on the nutrition of dairy and other farm animals, which have widely changed the practice of feeding such animals. Among such investigations are those relating to the effect of the character of the food on the quality of the product and on the proportion of fat and lean meat in steers and pigs; the suitability of breeds of animals of different conformation to various purposes; effect of shelter and treatment on growth and gain, and the economy of a large number of different feeding stuffs, representing those generally at the disposal of the farmers; the effect of cooking and other methods of preparation. One very important result, on account of the enormous supply, has been the demonstration of the feeding value of corn stover when properly cared for, and the intrinsic feeding value of different by-products of wheat.

Notable instances of the successful introduction of new crops are the Manshury barley by the Wisconsin station, which has materially increased the yield of barley over a wide region, with results worth millions of dollars, and the Kafir corn brought in by this Department, but introduced to practical use on a large scale by the stations in California, Kansas, and Oklahoma, the crop being valued at about $6,000,000 in Kansas alone in 1898. The Minnesota and Wisconsin stations were instrumental in the introduction of rape as a forage plant for sheep, and it is now grown on thousands of farms in the Northwest to the great advantage of the farmer. The hairy vetch, introduced by the Mississippi station, has proved of great value to that State.

Important studies on the nutritive value and practical usefulness of alfalfa (lucern) by the Colorado, Utah, and other Western stations have done much to extend the area and enhance the value of that crop in the irrigated region, while recent experiments by the New York and New Jersey stations and a number of stations in the Gulf States seem to indicate that it has a wider usefulness in the East than has hitherto been supposed. The value of crimson clover as a crop for forage and green manuring over a considerable area has been shown by the Delaware and other stations. The investigations on sugar beets conducted throughout the country by the stations and this Department have already had a practical outcome in the successful establishment of sugar factories in several States, and have shown in a very definite way in what regions this industry has the best chance of success. The work of the Louisiana station on methods and apparatus for making cane sugar and on the culture of the sugar cane have been so far successful as to secure for the station the financial support of the State Sugar Planters' Association.

The staple crops of the country, as maize, wheat, cotton, and tobacco, have been the subject of an immense amount of investigation touching nearly every phase of their chemical composition, improvement by breeding and selection, culture, manuring, harvesting and curing or storage. Many of the results have been of direct practical value and have materially influenced the methods followed by farmers. These investigations have also led to a greater diversification of agriculture in many regions.

The investigations which a number of our stations have made regarding the storage of forage crops in silos and the use of silage for feeding purposes have been of great importance in connection with the development of dairying in this country. These have related to the methods of constructing and filling silos, the best time for cutting the crops to secure the maximum amount of nutrients, increasing the richness of the silage by adding leguminous crops, and the feeding of the product. The results of the investigations on silage have done much to promote economy of production in dairying. The investigations of the Illinois, Ohio, Indiana, and other stations, which demonstrated the superiority of shallow over deep cultivation of maize, have produced widespread changes in the culture of that crop.

The stations have performed a very extensive and useful work relating to the use of commercial fertilizers. This is a subject of great economic importance in almost all the States east of the Mississippi River. The investigations of the stations have shown the fertilizer requirements of different soils and crops and have led farmers quite generally to recognize the desirability of a discriminating use of fertilizers. More recently the stations have shown the feasibility and general advantages of the home mixing of fertilizers by the farmers themselves.

In the States west of the Mississippi River the conservation of moisture in the soil is an important factor in successful agriculture, and the stations in that region have done valuable work in showing the conditions under which the moisture is largely conserved, and by introducing methods of tillage especially adapted to this purpose.

The investigations which the California station has made regarding alkali lands have led to the reclamation of large tracts of land in that State, which before were thought to contain alkali in such amounts as to make them useless for agricultural purposes.

Among the horticultural investigations of the stations which have given the most important practical results are those relating to the introduction of new kinds and varieties of fruits in different localities; the increase of hardness and resistance to disease by grafting; the culture and management of orchards; the storage of fruits, and the heating and subirrigation of greenhouses. Those investigations which have related especially to the forcing of vegetables in the field and under glass have been a considerable factor in the rapid development of the business of supplying markets in the United States with a large amount of green food at all seasons of the year, even in the States farthest North.

The work of the California station with reference to the culture of grapes and olives and the manufacture of wine and olive oil have proved a great aid to the development of the wine and olive-oil industries in that State.

### REMOVAL OF OBSTACLES TO AGRICULTURAL INDUSTRIES.

The American stations have done a great work in aiding the farmers in their contest with the natural enemies to successful agriculture and in removing, in whole or in part, obstacles which hinder the progress of various agricultural industries. Under this head, the most important investigations of the stations have been those relating to insect pests and diseases of plants and animals.

The following examples of work in entomology conducted by the stations, which have been of great economic importance, may be cited. Much has been done in the development of effective means for the repression of such insects as the codling moth, plum curculio, chinch bug, Rocky Mountain locust, woolly aphis, cottonworm, cotton boll weevil, San Jose scale, forest insects, and insects affecting stored grain. Experiments with such insecticides as bisulphid of carbon, hydrocyanic-acid gas, petroleum, kerosene emulsion, Paris green, London purple, pyrethrum, and hellebore have brought out many useful facts regarding the best ways in which to use these materials in combating injurious insects. Much attention has been devoted to the study of spraying apparatus, and various improvements in spraying devices have been suggested by the stations, which have come into general use. Among the most successful investigations of the stations on plant diseases and their treatment have been those relating to diseases of potatoes, cotton, cereals, sweet potatoes, beans, asparagus, celery, pears, and grapes.

Among animal diseases, the work of numerous stations on tuberculosis has had widespread practical results. The methods of application and the limitations of the tuberculin test have been thoroughly and widely studied. Much attention has been given to the prevention of hog cholera, using the serum made by the Department of Agriculture, and also a somewhat different one worked out at the Nebraska station, which is believed to reduce the percentage of infection very materially.

Many experiments have been made in rendering animals immune to Texas fever when taken into the region where it prevails, for breeding purposes or for grazing, and in preventing the spread of the disease to new regions through the movement of cattle. The source of infection of anthrax in Delaware has been traced to the pollution of streams with the wash water from morocco tanneries, and much effective work has been done in the repression of this disease in that State.

### DEFENSE OF THE FARMER AGAINST FRAUD.

As stated elsewhere, the stations east of the Mississippi River have been largely engaged in the control of commercial fertilizers. The fertilizer business in this country involves millions of dollars, and the stations have largely prevented the sale of fraudulent goods. The stations have also done much to expose extravagant claims made for commercial fertilizers as compared with farm manures. More recently the stations in a number of States have been engaged in the inspection of feeding stuffs, dairy products, and nursery stock for fungous diseases and insect pests. Besides the prevention of fraud by a regular system of inspection, the stations have also done much useful work in this line in other directions. For example, their tests of varieties of grain, vegetables, fruits, etc., have often shown farmers how extravagant were the claims made for new varieties of plants. Their tests of the purity and vitality of seeds, while not systematically conducted, have yet done much toward making the farmer more careful in his purchases of seeds. From time to time the stations have exposed frauds relating to the sale of quack medicine for stock, creamery construction and equipment, dairy products, butter increasers and preservatives, adulterated foods and feedings stuffs, etc.

### AID TO THE PASSAGE OR ADMINISTRATION OF LAWS FOR THE BENEFIT OF AGRICULTURE.

The experiment stations, as well as the agricultural colleges, have been largely instrumental in securing and administering State laws for the inspection of fertilizers, nursery stock, dairy products, foods and feeding stuffs, creamery glassware, and Paris green; and for the suppression of plant diseases and injurious insects. They have also aided in the passage of laws establishing farmers' institutes, organizing associations for the promotion of agriculture, fixing a milk standard, quarantining animals for contagious diseases, regulating the sale of oleomargarine and kindred products, determining the apportionment and measurement of water for irrigation, securing the improvement of roads, etc.

### EDUCATIONAL RESULTS OF STATION WORK.

Broadly speaking, the most important results of the work of the American stations during the past quarter of a century, and especially during the past decade, have been educational. As we have seen, they have distributed very widely in their own publications a vast amount of accurate and valuable information regarding the theory and practice of agriculture, and have thus directly contributed on a large scale to the technical education of farmers. As the result of the investigations and publications of the stations, the agricultural books and the agricultural journals published in this country have been largely revolutionized. Instead of depending as formerly almost entirely on foreign agricultural literature as the standard for agricultural theory and practice, we have now a considerable body of distinctively American agricultural literature. If we contrast the meager amount of up-to-date information on matters connected with his art which was available to the American farmer ten years ago with what we now possess, we will without doubt be convinced that as educating agencies the experiment stations have been a great success. No nation has ever attempted the free dissemination of agricultural information in so wide and thorough a way as has the United States, and it is believed that the results have justified the large expenditures which have been made for this purpose.

One large result of the educational work of the stations has been the general breaking down of the popular conception that agriculture is not capable of improvement through systematic and progressive researches in its behalf conducted on scientific principles. A widespread belief has been awakened that with the aid of science agriculture may be so lifted out of the ruts of a dead past that it will be able to hold its own amid the growing competitions and complexities of modern civilization. Some of the consequences of this new belief are likely to be very important and far-reaching. Already the farmer in this country is much inclined to demand that theories and assertions regarding the practice of his art shall be brought to the test of rigid and accurate investigation. Those who have in recent years followed up the agricultural press or the farmers' institutes, testify that articles or speeches which simply declare individual opinions or individual experience no longer satisfy the farmer.

Whenever new ideas or theories are brought to the attention of the farmer he is very apt to inquire if the experiment stations have looked into this matter, or he will at least demand that some sort of positive proof shall be presented that it is wise for him to accept the new proposition. While there has been at times widespread discontent among the farmers with regard to their economic condition, it may also be said that the experiment stations have done much toward inspiring a feeling of hopefulness. The stations are not only giving the farmer much information which will enable him to improve his practice of agriculture, but they are also leading him to a more intelligent conception of the problems with which he has to deal and of the methods he must pursue to successfully perform his share in the work of the community and hold his rightful place in the Commonwealth.

As regards the stations themselves, we may confidently assert that their past history gives great assurance of increasing strength and efficiency in the future. While they have encountered many difficulties in their development, and there has necessarily been much crudity in their work thus far, they have every year secured a better equipment and more thoroughly trained officers. With increasing resources they have been able to specialize their work more thoroughly and to increase its scope. They have succeeded in securing to a remarkable extent the confidence of the people for whose benefit they were primarily established, and have thus had no difficulty in obtaining financial support from Congress and the State legislatures. The people generally have come to regard the stations as permanent institutions and are convinced of the usefulness of their work. They will therefore enter upon the twentieth century with bright prospects for the development of their researches in scientific thoroughness and accuracy and for the securing of larger practical results.

# SEED SELLING, SEED GROWING, AND SEED TESTING.

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## INTRODUCTION.

The history of the development of the seed business of the country is one of the most interesting chapters in American horticulture. From small beginnings in the later colonial period the business has grown so that to-day its value is measured by the tens of millions. Carried on at first in small shops, where a few boxes of seeds shared a corner with codfish or a shelf with calicoes or books, it has come to claim for itself immense warehouses and business establishments whose interests extend to every portion of the globe. The trade has grown with the growth of the country; and its leaders have influenced popular taste for good vegetables and fine flowers, creating and stimulating a demand which only their enterprise could suffice to meet.

When the Pilgrims landed on the rocky shores of Massachusetts they brought with them seeds of the plants they had cultivated in their English and Dutch homes. Their first care was to secure the necessaries of life; corn, barley, and peas were planted and fruit trees set out. The early records of horticulture are almost entirely devoted to the discussion of fruits, the introduction of improved varieties of apples, pears, and plums occupying a much larger share of attention than the improvement of vegetables. The latter were, however, only second in importance to indian corn. William Wood gives a list of vegetables grown in New England before 1633, and adds "whatever grows well in England grows as well there, many things being better and larger." A century later there is a distinct reference to saving garden seeds. Justice Dudley, of Massachusetts, writing in 1733, says "an onion set out for seed would rise to 4 feet 9 inches, and a parsnip would reach 8 feet." Some agricultural seeds were certainly raised, and they formed an article of commerce as early as 1747. In his interesting book on "Farm husbandry" the Rev. Jared Eliot has much to say about clover, and in the first essay published, 1748, he urges the liberal use of seed because an acre of clover will produce 2 bushels of seed worth 35 pounds, "Old Tenor."[1] That clover seed was

[1] The colonial currency was of three values, and was known as "Old Tenor," "Middle Tenor," and "New Tenor;" the "Old Tenor" was below par, but the rates varied in different colonies.

not abundant, however, is shown by the high price and the fact that in 1773 James Vaux, of Pennsylvania, imported some from England, because it was difficult to get in America. In 1787 Vaux, in a paper before the Philadelphia Society for the Promotion of Agriculture, advocated a bounty on clover seed in order to encourage its use by reducing the price.

## SEED SELLING.

### DEALERS PREVIOUS TO THE COMMENCEMENT OF THE PRESENT CENTURY.

The first record of seeds for sale that the writer has been able to find is in the Newport, R. I., Mercury of 1763, where Nathaniel Bird, a book dealer, advertised garden seeds just arrived from London. Connecticut-grown onion seeds early acquired more than a local reputation. In 1764 Gideon Welles, "on the Point," announced in the Newport Mercury that he had some choice Connecticut onion seed for sale. Other advertisements ran through the following years, among them one by Charles Dunbar, gardener. We get some idea of the prices of seeds from Dunbar's advertisement of 1767, where the following are given: Peas and beans, 30 shillings[1] per quart; Strasburgh onions and orange carrots, 25 shillings per ounce; early cabbage, 40 shillings per ounce, and "colliflower," 6 pounds per ounce. An N. B. informs us that "said Dunbar has to sell a great variety of flower seeds."

In New York City hemp and flax seeds were advertised for sale at least as early as 1765 and garden seeds in 1776. In that year Samuel Deall, a dealer in general merchandise on Broad street, opposite the end of Weaver street, kept "a general assortment of seeds," many of which he names, including red clover, grass, and "Saintfoine" for improvement of land.

In the New Hampshire Gazette field seeds were advertised as early as 1766 and garden seeds in 1770. But Boston was the chief city for the sale of garden seeds, as it was the commercial center of the time. In the Boston Gazette of 1767 six out of twenty-six advertisers were dealers in seeds. Some of these did not advertise other goods, but it is doubtful whether they were seed dealers exclusively. In the spring, when these advertisements appeared, the trade in seeds was probably more important than any other branch of their business. Some of these dropped out and others appeared in later years, but several advertised regularly each year until 1773.[2] William Davidson, the gardener in Seven Star Lane, offered in 1768 seeds of 56 varieties of vegetables and herbs, and of one flower, the carnation. Some of

[1] The value of the currency had fallen so low that in 1759 it required 2,300 pounds in currency to equal 100 pounds sterling; these conditions were only beginning to improve in 1767.

[2] In the file accessible to the writer there is a break here, the next number being in 1777.

his prices were as follows: Lettuce, 3 to 4 pence per ounce; cabbage, 9 pence to a shilling per ounce; cauliflower, 3 shillings per ounce; carnation, 4 shillings per ounce. Most of the other vegetable and herb seeds ranged from 2 pence to a shilling per ounce; peas, Early Golden Hotspur and Early Charlton, were worth 24 shillings the bushel or 10 pence per quart. Davidson dealt in seeds wholesale and retail for cash.

The war of independence, interrupting as it did the regular channels of trade, interfered with the importation of seeds, and the few garden seeds offered during this time were either imported from Holland or were taken from prize ships. Immediately after the war there was a revival of the trade in seeds, and in 1784 John Adams, Susanna Renkin, and Susanna Martin all advertised seeds just imported from London. These advertisements, however, soon after ceased, and in 1790 John Adams advertised for the last time in the Boston Gazette. It is not to be supposed that the absence of advertisements indicates the total cessation of the trade in seeds. This either flowed in other channels or the traders lost enterprise. But with the advertising habit well formed as it was prior to 1770, the total absence of advertisements of seeds for sale certainly indicates an unhealthy condition of the trade.

In Philadelphia and New York seeds were but little advertised, whatever the trade may have been. In Philadelphia in 1772 Peteliah Webster sold clover and duck grass seed, and in 1775 James Longhead made known to the public that he kept "a quantity of the largest kind of colly-flower seed, found on trial to be extraordinary good." In 1775 David Reid, who styled himself "Gardener and seedsman," advertised seeds for sale at his stall at the courthouse, and in 1781 purchasers were advised that flower seeds and seeds for the kitchen garden, "imported from Holland, can be procured next door to General Philip de Haas, in Third street, near Race street."

During the remaining years of the eighteenth century the papers contained few advertisements of seeds, and we can trace no connection between dealers of pre-Revolutionary times and those of the opening years of the nineteenth century. It is not probable, however, that there was a time when seeds could not be bought in any of the large towns. The people were fond of gardening, the population was rapidly increasing, and there is no reason to suppose that the demand for garden seeds was less than before the war. This demand was doubtless partly supplied by the market gardeners, one of whom, David Landreth, established himself in Philadelphia in 1784, and engaged in the market gardening, nursery, and seed-growing business. The last was at first of small importance, and for many years the nursery occupied most of his attention. Seeds were almost entirely imported, and American gardeners had yet to learn that seeds could be as well grown here as in England. In spite of this, however, the seed business seems to have increased in importance until, in 1848, David Landreth, jr., sold the nursery and became exclusively a seed grower and merchant.

### THE TRADE DURING THE FIRST HALF OF THE CENTURY.

One of the first seedsmen of the present century was Bernard M'Mahon, gardener, seedsman, and author, who in 1800 opened a seed store in Philadelphia. Fortunately, we have a description of his store, which throws light on the condition of the trade at that time:

His store was in Second street, below Market, on the east side. Many must still be alive who recollect its bulk window, ornamented with tulip-glasses, a large pumpkin, and a basket or two of bulbous roots. Behind the counter officiated Mrs. M'Mahon, with some considerable Irish accent, but a most amiable and excellent disposition, and withal an able saleswoman.

Mr. M'Mahon was also much in the store, putting up seeds for transmission to all parts of this country and Europe, writing his book, or attending to his correspondence, and in one corner was a shelf containing a few botanical or gardening books, for which there was then a very small demand; another contained a few garden implements, such as knives and trimming scissors, a barrel of pease, and a bag of seedling potatoes, an onion receptacle, and a few chairs, and the room partly lined with drawers containing seeds, constituted the apparent stock in trade of what was one of the greatest seed stores then known in the Union, and where was transacted a considerable business for that day.[1]

In the fall of 1805, Grant Thorburn began to sell seeds in New York, and subsequently built up a substantial business. During the next quarter century seed stores were opened in Baltimore, Boston, and Charleston, S. C., as well as in Philadelphia and New York, and there was a considerable trade in Shakers' seeds. These Shakers' seeds were popular as early as 1818. They were sold by regular dealers, and were peddled about the country in the Shakers' wagons. The population of the United States had increased from a little more than three millions of whites in 1790 to ten and a half millions in 1830. In 1790 this population was practically confined to a narrow strip along the Atlantic seaboard. Forty years later it had overflowed into the rich valleys beyond the mountains.

To meet the growing demand for vegetables and flowers, these ten and a half millions required more than three and a half times as many seeds as were used in 1790. Dealers established themselves in the principal cities and crossed the Alleghenies in the rear of the wave of settlement that swept into the Ohio Valley. The large cities became centers of distribution for the surrounding country, but the trade remained essentially local, though the larger houses did a wholesale business and supplied country dealers with their stocks, put up in packets for the retail trade. But transportation was slow and expensive, and the modern development of the postal service was as yet undreamed of. The amount of seed sold in Ohio at this time was insignificant. Mr. Parsons Gorham, a grocer and seed dealer in

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[1] The American Gardener's Calendar, eleventh edition.

Cincinnati between 1827 and 1831, seldom carried a stock of more than 50 bushels of grass seed; and when, in 1831, S. C. Parkhurst opened a seed store, he sold in one year not more than 600 bushels of timothy and clover seed, while before the end of ten years his trade had increased to 6,000 bushels. Seed houses were opened in Mobile and New Orleans, and in 1844 William W. Plant began the sale of farm tools and seeds in St. Louis.

While most of the trade between 1820 and 1850 was local or wholesale to country dealers, a change took place with the advent of the locomotive. The larger houses reached out for wider fields, made accessible by the railways, and new firms sprang up in every city of considerable size. Locomotives were unknown in the United States before 1829 and were scarcely used before 1832. At the end of 1835 there were 1,098 miles of railway in the United States; in 1850 the total mileage was 9,021, and in 1860 it was 30,635.

This rapid increase in the railways not only opened up a vast and flourishing country, but facilitated transportation in the East and made possible the immense development of the mail trade. The mails brought the seedsman to every door; a letter brought a catalogue, and a few cents paid the postage on an order of seeds. The changes in the rates of postage and the regulations of the post office have at times helped or embarrassed the trade; but, though cheap postage has stimulated, higher rates have never checked the growth of the business.

### DEVELOPMENT OF THE SEED CATALOGUE.

Along with the reaching out for trade beyond the limits of the home city came first the increasing size and prominence of the catalogue, and soon after a more attractive method of advertising. Seed catalogues were offered at least as early as 1805, but these were mere lists and were not intended for general distribution. For forty years most of them remained essentially price lists, and were offered only as an afterthought in an advertisement. Grant Thorburn's catalogue is, so far as the writer knows, the only one issued in pamphlet form as early as 1823. In 1825 his little book of about 4 by 7 inches in size contained 87 pages. Besides the usual retail price list, there was a wholesale list, and catalogues of bulbs, of flowering plants, and of tools. Brief directions for planting were given, and there were some longer articles on the culture of special grasses.

Shortly before the civil war the catalogue became more prominent. It was increased in size and issued in pamphlet form. The varieties offered were more or less carefully described, cultural directions were given, and an almanac and calendar of gardening operations was a frequent and prominent feature. A few illustrations appeared before 1867, but after that date their number steadily increased, and before 1870 colored plates were introduced.

There have been changes in the advertisements in some respects similar to and in others quite different from those which have taken place in the catalogue. The old advertisements contained long lists of varieties, with prices, and differed little in type and style from the body of the paper, though sometimes more striking headlines were used. Gradually the advertisement was decreased in size, but was made more striking to the eye, and the announcement of the new catalogue occupied a prominent place. About 1870 the advertisements began to be more fully illustrated with cuts of those vegetables and flowers to which special attention was called. From this time on the style of advertising changed rapidly, always tending toward larger headlines, more illustrations, and such devices of the printer's art as would most surely catch and hold the reader's attention.

The early garden calendars were designed largely for distribution by the country dealers, who bought the seeds at wholesale. There was as yet but little direct contact with the distant consumer, as the mail trade was in its infancy. But with the increase of the postal facilities dealers began to depend more upon their catalogues. The offer to send catalogues free became a prominent part of a seed advertisement, and every effort was made to render the catalogue attractive. Year by year the illustrations increased in number and quality, and pages of useful information gave it some title to rank as a garden guide.

Novelties were not so numerous twenty years ago, and they did not receive the prominence the modern catalogue accords them. Before 1880 a special place in the seed catalogue was not generally given to novelties. Some firms gave prominence to new varieties, but many of the leading houses either ignored them or simply added to their regular list such as they found worthy. To-day, however, there is not an important catalogue but gives more or less space to novelties, and the descriptions of these are frequently printed on tinted paper or made attractive by devices of the printer's art. Some varieties remain in the novelty pages of one catalogue or another for years, and not infrequently a novelty will reach the age of two or three years in the catalogue of the same firm. Seedsmen are on the alert for novelties; they are the money makers, and, besides, every really good introduction extends the reputation of the introducers. Many of the new varieties drop out after a year or two, being found wanting in some important particular and unable to make head against the old favorites; but others have intrinsic merit, and it is by the addition of these that our horticulture is enriched. The success of a novelty may be said to depend largely upon the introducers, since reputable firms endeavor to place only approved sorts in their novelty list; and, although even they are sometimes mistaken, the varieties thus introduced are more likely to possess merit than those heralded as possessing all sorts of impossible qualities and overburdened with a profusion of adjectives.

The modern catalogue is the seedsman's agent. It tells the prospective customer of the business it represents, setting forth in an attractive manner the superior merits of the seeds it offers. It must not only attract the eye, but must appeal to the judgment and to the imagination of the buyer. But the catalogue is more than the seedsman's agent—it is a text-book of horticulture. Millions of these illustrated catalogues find their way every year into rural homes. They are studied and compared, and much of the amateur gardener's knowledge of varieties is obtained from the seed catalogues. It is highly important, therefore, that the catalogue should be honest; it is perhaps too much to ask that it be conservative. The pictures should be as honest as the text, since the good effects of an accurate description may be ruined by an exaggerated illustration. Nor would honesty in text and figure exclude the proper praise of meritorious varieties; on the contrary, figures that are clearly not overdrawn and descriptions at once terse and complete will do more than the extravagant use of adjectives to inspire confidence, both in the qualities of the variety and in the seedsman's knowledge of them. Fortunately, most of our large houses do not seriously transgress in this matter; but there are some that do, and many irresponsible firms seem to think that they can make up in printer's ink what they lack in experience and reliability.

It would doubtless be difficult to say how many well-edited catalogues are published in the United States. Seedsmen would naturally differ in their judgment. In good catalogues two things are accomplished—the varieties are carefully described and so arranged that the purchaser can readily find what he wants. These catalogues describe in a few words the essential characteristics of the varieties, and in many cases these are grouped, as with cabbages, into first or early, second or summer, and late or autumn sorts; or with lettuce, as heading or not heading, and Cos varieties, for forcing or outdoor culture, and spring and summer varieties. This grouping is of great assistance to purchasers unfamiliar with the varieties described, helping them to select the sorts best suited to their location and needs.

Naturally, many more varieties are offered than are desirable in one garden. Some of these would be better left out, but they are popular in certain places and must be offered to hold that trade. Others, again, do better in one section of the country than in another, while a third class are merely synonyms of other varieties also catalogued. It is the aim of every careful seedsman to weed the synonyms out of his catalogue as much as may be; but with the present total lack of system in horticultural nomenclature it is difficult to arrive at perfection in this matter. So long as anyone can change a name and thus make new varieties from old ones, or can add his name to that of an established variety, a large number of synonyms must be expected, nor can the student of horticulture ever be sure that varieties of the same name are alike. It is also true that seedsmen often feel compelled to list names they know to be synonyms because the variety is known and called for under that name. It would be better, however, to list the variety under its proper name and add the synonym if necessary.

A tendency in modern catalogue making that promises well for the future is the increase in the use of half-tone illustrations. Many of the leading catalogues are adopting this method of illustrating, and in some it has become a feature. The older woodcuts, as well as many of the exaggerated illustrations of to-day, have lost their power to charm and to deceive. The public wishes to know as nearly as possible what the seed will produce under favorable conditions; it is the real, not the ideal, that is wanted. The seedsman may strive for the latter in breeding up his variety, but while this ideal is still unrealized he should hold his imagination in check when deciding on the illustrations for his catalogue.

Summing up catalogue making, a writer a few years ago said:

> The work of compilation on the modern catalogue is thorough and exhaustive, calling for vast knowledge of every branch of trade and an intimate acquaintance with a fluctuating market. The arrangement for a thorough supply of the stock to be advertised, the ability called into play to gauge what all his rivals are going to push and the prices they will charge, marshaling order out of chaos, writing and telegraphing to every corner of the globe, watching the work on the illustrations, and scores of minor matters to be regulated, call into play faculties of superior order, and make many a man old before his time from the tension on the system in the getting out of the great annual catalogue.[1]

THE GROWTH OF SEED HOUSES.

The seed trade has changed quite as much as has the catalogue. The barrel of peas has grown to hundreds of bags, and the few thousand of packets to millions. The large modern seed stores, whether devoted to the local or to the mail trade, are models of convenience and of system. In most of them fanning mills of the monitor or clipper type are constantly employed in cleaning and grading seeds, and from the cellar to the mailing room everything is so arranged that orders may be filled with accuracy and dispatch. During the late summer and early fall the force is employed in addressing envelopes for catalogues and in packeting seeds in readiness for the busy months. In the order books there is an entry for every post office in every State, no matter whether an order has ever been received from that office or not.

Thirty years ago one hundred letters a day was considered a large business; to-day some houses receive over six thousand letters a day during the busy season. Firms that twenty years ago employed only one or two clerks now employ a hundred during the winter months. Throughout the West the seed business has flourished; a Wisconsin firm writes that its business has increased 500 per cent in the last fifteen years; a single warehouse of a Western firm now has between 7 and 8 acres of floor space.

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[1] Florists' Exchange, March, 1895.

### THE EXPORT TRADE.

That the growth of the trade during the century has been great scarcely needs emphasizing, but it is difficult to secure figures showing the rate of increase. Only a few seed houses antedate the civil war, and the great majority are of recent origin; the statistics of exports date from 1855 and no separate records of imports of seeds were kept before 1873. Clover and grass seeds, especially timothy, have always taken the lead in the seed export trade, and until recent years garden seeds have not been a considerable factor in the total values. In 1825 some 10,000 bushels of clover seed were exported to England within a few months. How long this trade had existed we do not know. From 1855 to 1864 there is no record of any seeds exported except clover, but the value of exports increased from $13,570 in 1855 to $2,185,706 in 1863, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggregated $5,393,663. During the decade ending with 1880 clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $20,739,277. The aggregate was increased by more than $3,000,000 before the end of 1890. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad.

### SEED GROWING.

Before the beginning of the century only three seed farms had been established in the United States, though for many years seeds were grown by farmers and market gardeners. Home-grown clover and grass seeds, flax, hemp, and Connecticut onion seeds were on the market during colonial times, but the impression prevailed that garden seeds could not be successfully grown in America, and for the first sixty years of this century almost all the vegetable and flower seeds were imported. It was natural that clover and grass seeds of American origin should be offered earlier than garden seeds. The former grew freely throughout the colonies and produced seed in abundance, while it required special skill and care to raise good garden seeds. Eliot, in 1747, and Spurrier, in 1793, both refer to clover-seed and grass-seed crops, and describe methods of harvesting and cleaning. Nicholson, in the Farmers' Assistant, 1814, describes most of the grasses used to-day, and says that they seed freely. Flaxseed was an article of export at an early day, and a considerable quantity of clover seed was sent to England in the early years of the century.

### ESTABLISHMENT OF SEED FARMS.

The present development of garden-seed growing began when David Landreth established a small seed farm at Philadelphia in 1784. At first but a few acres were cultivated, and these were mostly occupied by the nursery. As the business grew, more land was added, until in 1860, some 600 acres were under cultivation near Philadelphia alone. The Shakers, who came to America in 1774, began growing seeds at Mount Lebanon, N. Y., twenty years later. During the first quarter of the nineteenth century their seeds were more popular than any others, and outside of the large towns they supplied almost the entire demand. The well-known probity of these people and the excellent culture of their farms gave their seeds a wide reputation. Their wagons went from village to village, and they also sold on commission at 25 per cent, taking back the seeds that remained unsold. In 1839 the Shaker colony at Tyringham, Mass., devoted 4 or 5 acres to the cultivation of garden, medicinal, and herb seeds, and their annual sales sometimes amounted to more than $3,000. A seed farm was established at Enfield, N. H., in 1795, one in Connecticut between 1810 and 1820, and three more before 1830. Other seed farms existed for a short time, but were abandoned. The Clairmont seed gardens near Baltimore, Md., supplied some of the dealers of that city about 1851 and probably earlier. At a still earlier day there was a seed garden in New Jersey, on which Grant Thorburn spent his fortune between 1808 and 1813. Thorburn failed and temporarily retired from the seed business. Of the other seed farms in existence in 1890, thirteen were established between 1830 and 1840; fifteen between 1840 and 1850, and nineteen during the following decade.

### RAPID INCREASE IN SEED GROWING DURING THE LAST FORTY YEARS.

The opening of the civil war found the country still largely dependent upon imported garden seeds. The heavy taxes and the premium on gold raised the prices of all imported seeds to such an extent that the dealers began to look anxiously for a home supply. During the first year of the war the trade in seeds fell off, prices were high, and seeds scarce. This condition stimulated home production, and as many seed farms were established between 1860 and 1870 as during the thirty years before the war. It was found that many vegetable seeds could be grown as well in this country as abroad, and that all kinds, for which the climate and soil were suitable, were much more safely grown under the eye of the dealer. Growers also became more expert, and market gardeners found that they could get as good seeds from the seedsman as they could save themselves, and at less than one-half the cost. The seed grower secured a critical and profitable trade, and the market gardener found a reliable source of supply for his seeds. This critical trade and the constant demand for better varieties stimulated the seed grower to do his best work. Seeds of the standard varieties were more carefully grown and new sorts, earlier, larger, or of better quality made their appearance every year. But it was by demanding reliable seeds rather than new varieties that the market-garden trade exercised the best influence upon the seedsman. To a man who expended annually $100 to $300 per acre for labor and fertilizers, it was of the utmost importance that his seed should produce exactly what he expected, and he well knew that it was not economy to buy cheap seeds. His valuable trade, when secured, was retained only by supplying seeds of the highest quality regardless of cost.

Since the close of the war the business of seed growing has rapidly increased. Notwithstanding some importers of seeds declared in 1867 that American seed growing was a myth, there were at that time more than 2,000 acres devoted to raising vegetable and flower seeds. In 1878, Mr. J. J. H. Gregory estimated the total area devoted to growing garden seeds at about 7,000 acres. Of these, 3,000 in the State of New York produced peas and beans; 250 acres, other vegetable seeds; and 50 acres, flower seeds. The remainder was distributed as follows: Michigan and northern Illinois, 1,600 acres; Pennsylvania and New Jersey, 1,000 acres; Massachusetts, Rhode Island, and Connecticut, 1,000 acres. The acreage for California is not given, but seed growing in that State was then practically confined to lettuce and onion seed, and the industry had been established for only about three years. Of the kinds of seeds which were sold in the United States, Mr. Gregory said:

> More or less of half the varieties are imported. Of mangel-wurzel, about all; ruta-baga, about nine-tenths; spinach, about nine-tenths; cauliflower, nearly all; lettuce, about half; carrots, about half; eggplant, about half; parsnip, about one-third; radish, about all. * * * It is the general belief of American seedsmen that foreign-grown radish seed is larger and better than home-grown. Parsley seed is largely imported. Brussels sprouts, broccoli, chicory, endive, kohlrabi, and Swiss chard are almost wholly imported, as is salsify, to a large extent. Of celery, the finest varieties are grown in this country in the vicinity of our large cities. Of cucumbers, but a few, and those of the fancy-frame sorts, are imported. Of peas, most of the hard sorts are home-grown, and probably rather more than half of what are called the softer or wrinkled varieties. The Dutch or rough-leaved turnip seeds are all home-grown. Of cabbage seed, but few varieties are imported, and these are confined almost wholly to a few early sorts. Onion seed is almost entirely an American crop.[1]

Besides the above, the seeds of beans, corn, squashes, tomatoes, and melons of all kinds were home-grown.

In 1878 seed growing was in its infancy in California. Seeds had been raised here and there since 1851, but the systematic development of the industry began in 1875, when R. W. Wilson planted 50 acres to beets, onions, lettuce, and carrots for seed purposes. From this beginning the business has grown to enormous proportions. A single firm of growers devotes annually some 2,000 acres to seed crops, and many other growers in California, Oregon, and Washington have built up a creditable business. "Onion and lettuce are staple seed

[1] Gregory, J. J. H.: Culture of Vegetable Seeds, in the Report of the Connecticut Board of Agriculture, 1878, p. 110.

crops, while carrot, celery, leek, endive, kale, kohl-rabi, parsnip, and parsley are all grown by California seed growers." In Washington cabbage and cauliflower seed is grown, and, although Puget Sound cauliflower seed does not yet enjoy the reputation of the Danish, further work may demonstrate that good seed can be produced in that region. Pl. XLVI shows a field of onions in California, and the method of thrashing the seed.

The census of 1890 showed that there were in the United States 596 seed farms, containing 169,850 acres, of which 96,567¼ were actually producing seed crops. Of these farms, 200 were established between 1880 and 1890, and it is safe to say that a large proportion of the 189 farms unaccounted for were also established during that decade. If this is true, about one-half of the seed farms existing in 1890 had originated since Mr. Gregory estimated, twelve years before, that in the United States 7,000 acres were devoted to garden seeds. But the census returns do not show the total number of acres actually devoted to growing seeds.

Seedsmen have for years grown most of their seeds on the contract system, contracting with farmers in different parts of the country to grow the seeds to which their soil and climate are best suited. Many of these men grow only one or two varieties, and in 1890 they made no returns to the Census Office. It is impossible to say how many acres are thus used for seed production, but many firms secure almost their entire supply in this way. In 1892 a grower stated that one firm had that year contracted for the product of 13,000 acres of vegetable seeds.

It is probable that Gregory's estimate in 1878 is too low; but even if it is doubled, it is still evident that during the ten years following 1880 seed growing increased out of all proportion to the increase in population. This overproduction was severely felt by growers everywhere. Before 1883 seed growing was very profitable, but since that date competition has been so keen and the demand for cheap seed so great that the profits have been much reduced. The financial panic of 1893 was felt by seedsmen as well as by those in other lines of business, but the trade is now rapidly recovering from that crisis.

The production of seed is, however, still increasing. Mr. C. L. Allen, a good authority, estimates that 100,000 acres are now annually devoted to peas and half as many to beans. In 1878 we imported half our wrinkled sorts; now we supply shortages abroad and import only in case of failure of the crop.

### THE GROWING OF FLOWER SEEDS.

Flower seeds are extensively grown in California Edward J. Wickson in 1897 said:

Various flowers have been grown for seed; in fact, a great assortment of varieties, and while nearly all kinds flourish, there is so much hand work and close application necessary that we have not been able to successfully compete with Europe

FIG. 1.—FIELD OF RED WETHERSFIELD ONIONS IN CALIFORNIA.

FIG. 2.—THRASHING ONION SEED IN CALIFORNIA.

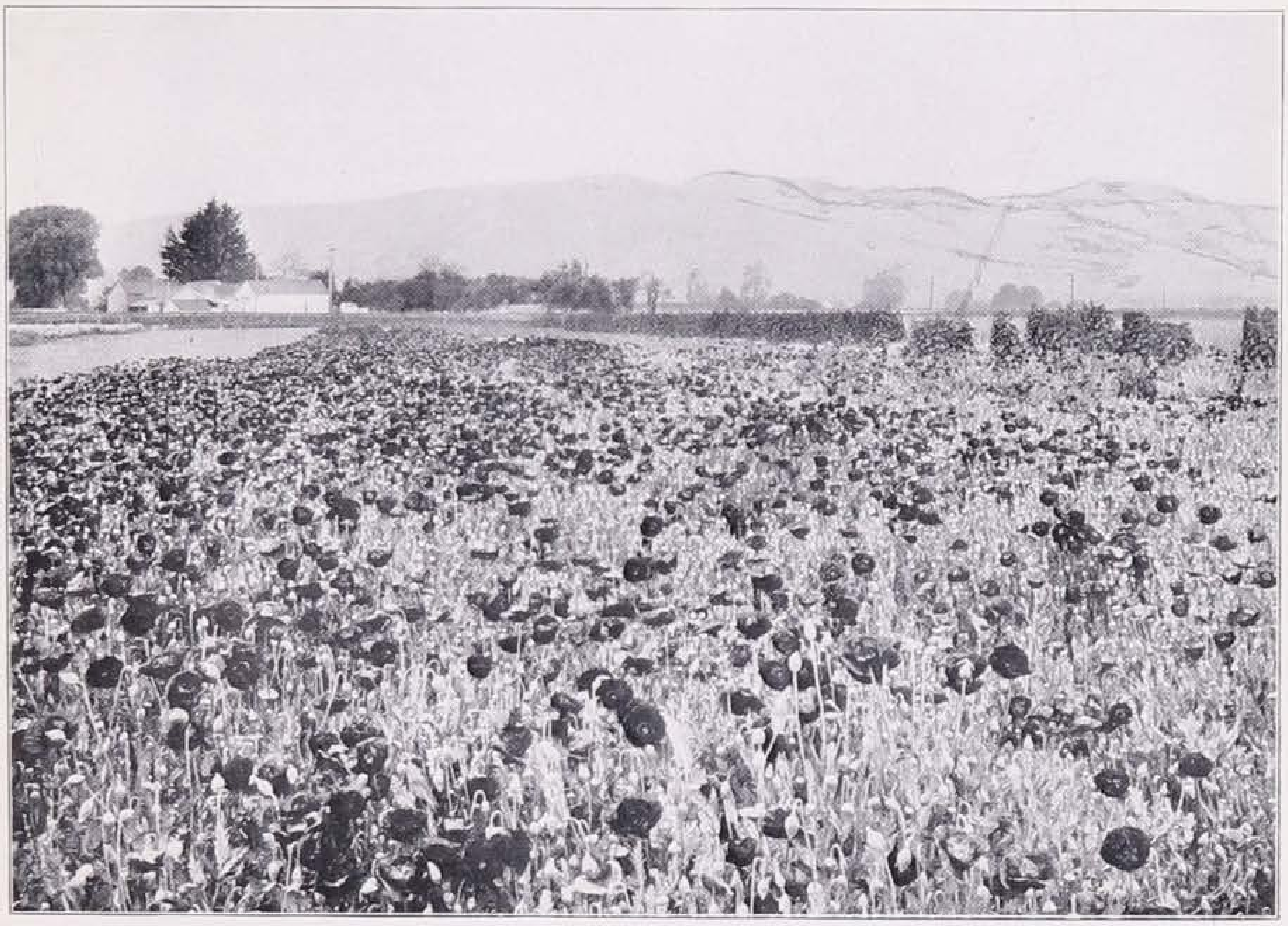

FIG. 1.—FIELD OF TULIP-FLOWERED POPPIES IN CALIFORNIA.

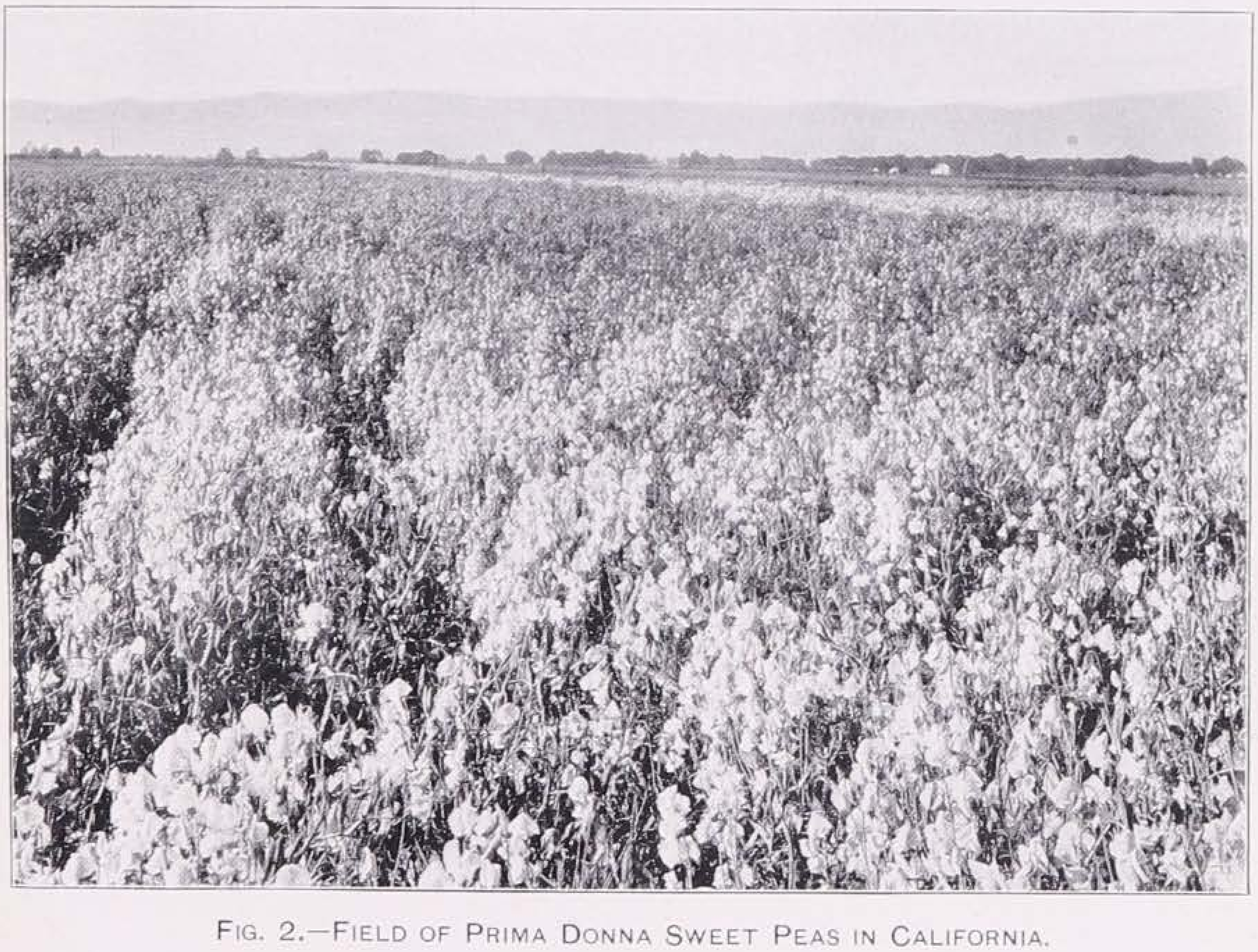

FIG. 2.—FIELD OF PRIMA DONNA SWEET PEAS IN CALIFORNIA.

on most things. Sweet peas, nasturtiums, cosmos, verbenas, petunias, and asters are quite successfully grown, and the seed trade now looks to California for most of the sweet peas and a great many nasturtiums.

Southern California has several very prominent growers of fine double petunias and other plants. The rapid advance of the California sweet-pea seed in popularity is most marvelous. A beginning was made in this line in a moderate way about 1885, when there were not over a dozen varieties listed. At first about a quarter of an acre was grown; now one grower alone has grown from 150 to 200 acres of them each year for the past five years, and there are no less than 125 varieties in his complete list. This grower has introduced more than 20 varieties of great merit in the last three years, among them the famous race of "Cupids." So important a factor have the California sweet-pea growers become to the seed trade that some dealers come from the East annually to inspect the growing crops and to hunt for novelties in the sweet-pea line.[1]

Some flower-seed growers devote themselves largely to the production of new varieties. The seeds of these bring a better profit than those of the common sorts, which can be more cheaply grown in Europe.

In the Eastern United States flower seeds have been grown to some extent for at least fifty years. In 1849 James Vick began to grow flower seeds in New York State, and during the sixties flower seeds were grown in New Jersey, Pennsylvania, New York, and in New England. The amount raised was, however, never more than a small portion of that needed for the trade, and the greater part of the flower seeds sold was imported from Europe. This condition exists to-day. Flower seeds are grown in a number of places throughout the United States, but only a small portion of the trade is supplied with home-grown seed. Outside of California, limited amounts of flower seeds are grown, the principal kinds being asters, phlox, petunia, verbena, portulaca, zinnia, balsam, hollyhock, pansies, sweet peas, begonias, coleus, and some greenhouse plants. Pl. XLVII shows fields of poppies and sweet peas grown for seed in Santa Clara County, Cal.

### SECTIONS AND CONDITIONS FOR PROFITABLE SEED GROWING.

The United States raises practically all its beans, and most of its cabbage, the best being grown on Long Island, while the cheaper trade is supplied from abroad, or from sections of this country where the seed can be grown cheaply. Carrot seed is largely grown, some of it in California, but the best is imported or grown in New England. The latter costs the most, though many dealers claim there is no difference in quality; but Mr. Allen thinks otherwise. He says: "Tests frequently made show conclusively that a larger yield of carrots can be obtained from Rhode Island and Connecticut grown seed than from the best imported." All corn, celery, lettuce, onion, melon, tomato, pepper, squash, and pumpkin seeds used in the United States are home-grown. All the cucumber seed except that of the French

[1] California Vegetables, 1897.

varieties is produced here, as is nearly all the eggplant and kale and a great deal of the beet seed. Sugar-beet seed is grown to a limited extent, and, with the further development of the manufacture of beet sugar, it will become an important industry. The best Brussels sprouts seed is grown here, most of the okra, and a great deal of the parsley, mustard, and spinach. Radish is grown to some extent, especially about Philadelphia, but many dealers do not consider American seed, at least of the small early sorts, equal to the best imported. Many other kinds are raised in a small way, but growers can not compete with the cheaper imported seed. There is, unfortunately, a great demand for cheap seeds, and low grades of many sorts can be imported more profitably than they can be produced by the American grower. Garden seeds are grown in most of the Northern and Western States and a few in the South. Many kinds are largely produced in certain favorable sections, as beans in New York State; cabbage on Long Island; peas in Canada, Michigan, and Wisconsin; vine seeds in Nebraska; and onion, lettuce, and sweet peas in California.

The value of a locality for seed growing depends upon favorable soil and climatic conditions and upon the supply of cheap labor at harvest time. Lack of labor often prevents the profitable culture of seed in places where conditions of soil and climate are favorable. The best onion seed is produced in Michigan and Connecticut, but for the general trade these seeds can not compete in price with the California product.

In general it is the practice of the seed trade to grow plants for seed purposes where the product attains the greatest degree of perfection. Seedsmen know where to look for their best seed as well as for the cheap grades, and when they have a discriminating trade they do not handle seed of questionable pedigree. Certain localities are specially adapted to certain varieties; onion seed grown in Southport, Conn., tends to produce round bulbs, while that grown at Wethersfield, in the same State, produces flat ones. A seedsman, besides being a thorough agriculturist, must know the character and wants of every variety.

Fifty years ago there were few seedsmen who understood varieties. To-day the seedsmen are variety experts, and note with accuracy differences so minute as to escape those not trained in their school. A shade of color in a sweet pea, the crumpling of a lettuce leaf, a slight difference in the shape of a bean or pea pod, all these are noted in the field and the plants saved or discarded as they conform to or depart from the type.

If anything is wanted, it is a greater fixedness of type. The tendency is toward the production of new varieties rather than the fixation and improvement of existing types. This results in unstable characters and in the speedy "running out" of varieties, whether by improvement or deterioration.

FIG. 1.—FIELD OF SILVERSKIN ONIONS ON BLOOMSDALE FARM, PHILADELPHIA, PA.

FIG. 2.—PRIZE HEAD LETTUCE, GROWN ON DEPARTMENT OF AGRICULTURE TRIAL GROUNDS: THE PLANT AT THE LEFT FROM CARELESSLY GROWN SEED, THE ONE AT THE RIGHT FROM PROPERLY GROWN SEED.

GROUPS OF SEED PLANTS.

To the seed grower plants fall into two groups—annuals and biennials; the former being such as produce a seed crop the same season that the seed is planted, while the biennials must be kept over winter and produce a crop about fifteen months after sowing. To the latter class belong cabbage, onion, turnip, carrot, parsnip, beet, winter radish, etc. In many respects these present greater difficulty to the grower, because the chances of failure are much increased. The crop may succumb the first season to any of the dangers always besetting plants; the plants or roots may spoil in the trenches or cellars during the winter, while if these dangers are safely passed it is still possible for the seed crop to be blighted at the eleventh hour. Onions may promise a bountiful crop till within a few days of harvest and then suddenly fail. Cabbage may be carried safely through the winter only to be finally ruined by an insect attack. Even in annuals the chance of loss is greater than any the market gardener encounters, the plants being longer on the ground and exposed to attack from more points than when the crop is marketed in the green state.

An additional source of loss is the destruction of plants not true to type. When seeds are carefully grown the fields are rogued so that only plants showing the characteristics of the variety are left; the remainder, no matter how good they may otherwise be, are discarded. This is a source of loss, and when seeds are grown cheaply it is avoided by permitting every plant to produce seed. The poorest plants, as they come nearest the wild type, will usually yield the most seed, but these seeds will in turn produce plants that will disappoint the most careless gardener. Plate XLVIII, fig. 2, shows at the left a lettuce plant raised from carelessly grown seed, and at the right the same variety, Prize Head, from properly grown seed. Such illustrations could be shown for nearly all vegetables, and the finer the strain the greater the deterioration when the seed is improperly grown.

All good seedsmen grow a special grade called "stock seed." This is kept solely for their own use and is sent out to their different growers to plant for the regular crop. This "stock seed" is grown and saved with unusual care. Every precaution is taken to keep the variety pure, and the selections are made with extreme rigidity. Only the best plants are used and the destruction of so large a portion of the crop makes the stock seed too expensive for general sale. To absolutely prevent mixture the plants for stock seed are often grown in the middle of a large field of the same variety intended for crop purposes. This prevents the bees from bringing foreign pollen to the selected plants, and insures purity of stock. The mixing of varieties is something the seed grower has always to guard against. To prevent this only one variety is commonly grown on a farm, and care is taken to see that a near neighbor is not growing another variety of the same species. When only small quantities of seed are raised, a block of the variety is frequently planted in the midst of a cornfield.

## HARVESTING.

Harvesting operations must be carried on with great skill and care. Seed crops are usually cut when about two-thirds of the seed is ripe. If left longer there is great loss from the rattling out of the ripest seed. The seed stalks are cut with a sickle and laid on large canvas sheets. The four corners of these are then drawn together and the bundles carted to the barns. Here the seed stalks are laid on scaffolds to dry, after which the seed is thrashed out. The flail is the implement still most largely used in this work, though there are various special machines in use. On the large farms of one California firm all seeds except onion are thrashed with a flail. Seeds surrounded with pulpy flesh need special treatment. Tomatoes, cucumbers, and melons are first crushed in a press, or the seeds and pulp removed with a scraper. The entire mass, consisting of seeds and pulp, is then allowed to ferment until the pulp is rotten. The mass is then washed, the pulp rises, and is thrown out, while the seeds sink and are drawn off and the light seeds removed with a fan. The casks of fermenting pulp must be carefully watched, for if the process goes too far serious injury to the seed may result.

## AGRICULTURAL SEEDS.

Many years before the growing of garden seeds had become important the farmers of this country had ceased to depend upon Europe for their supply of farm seeds. Some of the staples even became articles of export at an early day, and enough was grown of nearly all sorts to meet the home demand. As agriculture advanced the use of clover and grasses became more common, and the home supply of seed from being unequal to the home demand, not only met the increase, but began to be exported to England, and in 1841 a few bushels of clover seed were sent from Cleveland, Ohio, to Canada.

For many years the United States has produced enormous quantities of clover and grass seeds, and exports have in some years amounted to millions of dollars. The imports of grass seeds are confined to the so-called fancy grasses, which can be more cheaply gathered in Europe than here, and to cheap clover and grass-seed screenings. The latter are imported to mix with higher grades, and thus lower the cost to the seller. During the last few years a great deal of awnless brome-grass seed has also been imported, but this is now grown in the Northwest, and before long we shall be independent of the foreign supply. There is scarcely a region in the United States in which some of our agricultural seeds can not be grown, but their profitable production is generally confined to more or less well-defined localities, depending upon favorable climatic and soil conditions.

Red clover is grown throughout the Northern and Central States, but mainly in the country tributary to Toledo, Ohio, which is the great clover-seed market. The culture of the seed is, however, extending westward, and the time may be not far distant when Chicago will take first rank as a clover-seed center. Timothy seed can be grown wherever red clover flourishes, but its principal area lies farther west, some counties in Iowa being the largest timothy-producing sections in the world. Orchard grass, redtop, Kentucky blue grass, meadow fescue, and the millets are grown in several of the Middle and Western States, but the areas of production frequently shift. Hundreds of tons of alfalfa seed are raised in Utah, and the teosinte grown in Florida more than supplies the home demand. With few exceptions these seeds are raised by the general farmer as a part of his regular crop. Their production on regular seed farms has been attempted, but did not prove profitable, the prices that were satisfactory when the seed was raised as a secondary crop not proving sufficient to meet the expenses of special production.

Unfortunately, clover and the standard grass seeds have become objects of speculation on the produce exchanges of the great cities. This causes fluctuations in price entirely independent of the legitimate supply and demand and frequently interferes with sales abroad, buyers not being willing to invest while the market remains unsteady.

IMPROVEMENT IN HARVESTING AND CLEANING GRASS AND CLOVER SEEDS.

In harvesting and cleaning grass and clover seeds there has been great improvement. Not only have the harvester and the horserake taken the place of hand labor, but the machinery for cleaning the seed has attained a much greater degree of perfection than was thought possible even twenty-five years ago. The evolution of the clover huller has been gradual, and has progressed step by step toward its present condition. In the early years of the century the seed was separated from the heads with a flail or by treading the straw with horses. Later, milling machines were invented or sometimes regular flour mills were slightly modified and used for hulling the clover seed. In the American Farmer of 1821 Caleb Kirk described a mill for cleaning clover seed. This was made somewhat like a flour mill, but the stones were not allowed to touch. The miller received a toll of one-tenth for his work, and the mills could turn out under the most favorable conditions about 10 or 12 bushels of seed in a day. Several of these mills were established about the country, but many farmers still preferred to tread out the seed with horses, partly to save the toll and partly because the milled seed, not being so clean, brought a slightly lower price.

Another machine, invented by John Bolton, of Warren, Herkimer County, N. Y., would clean 1 bushel per hour when run by water power. It could be built for $30 or $40. Some time before 1831

Thomas D. Burrall, of Geneva, N. Y., invented a machine that was a long step toward the present huller. It was constructed with a cylinder armed with thin triangular iron teeth, revolving over a bed of perforated sheet tin. Below the cylinder was a fan, which blew out the chaff and light seed. The clover heads were first freed from the straw and were then fed on to the cylinder. This machine when run by water power cleaned from 2 to 3 bushels of seed per hour. A full description was published in the American Farmer of 1831.

Other machines were also in use up to 1855, but they did not have huller and fan combined. In 1855 a combined clover huller was exhibited at the New York State fair in Buffalo. The present combined clover thrasher, huller, and cleaner is too well known to need any description. There has been a steady advance toward perfection, until to-day the clover is put in at one end of the machine and clean seed runs out at the other. There are several makes differing more in detail than in principle, and all aiming at the same result—to clean the most seed in the shortest time and at the least expense.

The mills in use during the twenties hulled from 10 to 12 bushels a day under the most favorable conditions, and the seed had to be recleaned before marketing. To-day a good machine will clean as many bushels in an hour.

There has been even a greater change in the methods of cleaning Kentucky blue-grass seed than in the case of clover. In 1814 John Nicolson, in the Farmers' Assistant, said of this grass: "It yields plenty of seed, but this is difficult to sow on account of their filaments causing them to adhere to each other. To remedy this, it is recommended to put them in newly slacked lime, to separate them, and then to be rubbed in dry sand." In antebellum days slaves were employed to rub the grass between their hands, which were protected with old boot legs, and as late as twenty-five years ago the seed was rubbed by hand through wire cloth. It was possible by this means for one man to clean from 15 to 20 bushels per day. Now, with the improved patented machinery, one man can clean 100 bushels a day, and the machinery when run by a 60-horse power engine has a capacity of 600 bushels per day.

### THE PROGRESS IN VARIETIES.

#### *Vegetable seeds.*

Anyone studying the modern seed catalogue with its bewildering number of varieties may almost wish for the simplicity of the early days of this century, when a dozen varieties of any one kind was a long list. Davidson in 1768 offered 57 varieties of vegetable and herb seeds. Thorburn in 1805 had a list of 70 varieties, all vegetable seeds, and among these were neither squash, tomatoes, nor sweet corn. As the years went by the number of varieties increased, at first slowly, since only those markedly distinct were noted, but with the great development of the seed trade after 1860 the number of varieties catalogued increased with almost incredible rapidity. Every year witnesses the advent of novelties, real and imaginary, many of them without permanent value, but a few are genuine additions to our horticulture. Professor Bailey said in 1892:

> This increase is in part simply an accumulation of the varieties of many years, so that our manuals are apt to contain descriptions of more varieties than are actually cultivated at the time. But much of this increase is a natural multiplication of varieties, that is, there are more varieties of nearly all plants in cultivation now than at any previous time. M'Mahon mentioned 6 beets as grown at his time; in 1889 there were 42 kinds. Then there were 14 cabbages, now there are over 100. Then there were 16 lettuces against about 120 now. [1]

It may be added that last year more than 300 varieties of lettuce were catalogued, of which 292 were grown on the trial grounds of the Department of Agriculture and 82 of them were considered distinct.

Twenty years ago the large and small lima beans were the only representatives of that class; to-day there are several better pole limas, besides the whole race of dwarf limas that were entirely unknown to our grandmothers. These acquisitions to the vegetable garden all arose as chance sports, and some of them were cultivated for several years before they were given to the trade. The story of the production of these purely American types is thus told by Professor Bailey:

> They appeared in the same way that nearly all new varieties of plants originate; they were found growing amongst plants of common and well-known varieties. A single plant, a "sport," was first observed in some cases and in others several original plants were discovered. The Kumerle, or Thorburn, Dwarf Lima originated from occasional dwarf forms of the Challenger Pole Lima, which J. W. Kumerle, of Newark, N. J., found growing in his field. The Henderson, as we have seen, was a chance dwarf picked up in Virginia. The Burpee came from a single plant of the large white lima. Mr. Palmer, with whom it originated, had his entire crop of limas destroyed by cutworms in 1883. He went over his field to remove the poles before fitting the land for other uses, but he found one little plant, about 10 inches high, which had been cut off an inch above the ground, but which had rerooted. It bore three pods, each containing one seed. These three seeds were planted in 1884, and two of the plants were dwarf, like the parent. By discarding all plants which had a tendency to climb in succeeding crops the Burpee Bush Lima, as we now have it, was developed. [2]

Besides the above, Wood's Prolific Bush Lima and Burpee's bush form of the willow-leaved lima have been more recently introduced.

Of bush beans, there were half a score in 1834 and about the same number in 1860. There are now 370 varieties catalogued, only a few of which were known thirty years ago, and of these probably one-fourth are distinct. The best varieties of cauliflower grown in the United States to-day have been introduced by American seedsmen. Sweet corn was not catalogued in the early days of the century, and

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[1] Bailey, L. H.: Survival of the Unlike, p. 203.

[2] Bailey, L. H.: The Dwarf Lima Bean, in Bulletin No. 87, Cornell experiment station, p. 86.

there were only 4 varieties in 1869; now there are more than four times as many. Twenty years ago there were no distinctively forcing varieties of lettuce in general use, while to-day we have several that can not be fairly tested out of doors. Out of the 40 varieties of peas known in 1879, only 6 were of American origin. The next year the American Wonder appeared, and since then American seedsmen have introduced many of the best varieties. Our valuable squashes are all of American origin, and of the long list of large tomatoes there is not one that was known thirty years ago.

It is interesting to note the history of the tomato, its gradual rise in popularity, and the rapidity with which new varieties appeared when once its position was assured. Originally an American contribution to horticulture, it was first used as food by the Latin races of Europe. Philip Miller in his Gardener's Dictionary, 1731, says: "The Italians and Spaniards eat these Apples (Love Apples) as we do Cucumbers—with Pepper, Oil, and Salt—and Some eat them stewed in Sauces, etc., but, considering their great moisture and Coldness, the Nourishment they afford must be bad." In New Orleans they were used in catsup as early as 1779, but in the English colonies tomatoes were planted only as ornaments, under the name of "Love apples." In 1836, however, they had begun to be popular as food. Thomas Bridgman, in the Kitchen Gardener's Instructor, tells us that at this time the tomato was used in sauces, as dessert, as a substitute for peaches, and that it also made excellent pies and tarts. There were only two varieties, however, the large red and the cherry. Their use gradually increased, and in 1841 they had "become almost an indispensable dish through the summer months on every table." In 1847 there were six or seven varieties, but there was not much difference among them. By 1860 hundreds of acres were planted with this fruit in the vicinity of Philadelphia alone, and some efforts had been made to secure improved sorts, a smooth kind being especially desired. Shortly before 1860 a large, smooth red variety became popular. At this time there were, besides the yellow and the cherry kinds, but four varieties, and only two of these were widely known.

In 1865 the tomato was a universal favorite. It had become a commercial staple, and 1,000 acres are said to have been devoted to its cultivation in the neighborhood of Philadelphia. During that year the Tilden appeared, and at once took first rank. In the next five years the Maupay, Foard, Eureka, Cook's Favorite, Boston Market, Dixey, Crimson Cluster, and General Grant were introduced, the General Grant being the best of the number and a really good tomato. In these five years more varieties were brought forward than had been known during the preceding fifty. The canning industry consumed thousands of bushels, and the interest in the tomato was widespread. For many years lovers of the tomato had been selecting seed in order to improve the existing sorts, and the new varieties were the outcome of this work. The best of these varieties was the Trophy, introduced in 1870 by George Waring, farmer and sanitary engineer. "The time was ripe for a tomato of a new type, one which should be large and early, and, above all, with a regular, apple-like form, or 'smooth.' The Trophy came at the right time, and it was the right thing. Its success was unbounded. It was almost the making of modern tomato culture. It marks an epoch in tomato growing in this country which has yet scarcely been reached in any other country."[1] The Trophy was the result of twenty-three years' careful selection, and was a great success. In spite of the high price ($5 for twenty seeds) it was soon widely distributed, and if sometimes it received a word of condemnation, its increase in popularity was a guaranty of its value. New varieties, some of them selections from the Trophy, now appeared in rapid succession, and were eagerly taken up, introduced, and advertised by the seedsmen. From 6 varieties in 1860 the number increased to 30 in 1880, and in 1899 American seedsmen catalogued 242 varieties of tomato. Of these, possibly 50 may be distinct and better than the Trophy.

*Flowers.*

The development in the varieties of flowers grown from seed, if not so conspicuous, has been not less remarkable. Indeed, it may be said that in the entire history of the seed trade there has been nothing to equal the phenomenal improvement in the sweet pea. The old Painted Lady was a favorite in our grandmothers' gardens, and until the beginning of the eighties was easily first among the half dozen known varieties. In 1882 one of the first retail seed firms to take up the sweet pea catalogued eight varieties; last year its list numbered 258. Although the modern sweet pea owes more to Mr. Eckford, of England, than to anyone else, there is probably no country where it has attained greater popularity than in America. American seedsmen have also introduced many valuable varieties, beginning in 1891 with the introduction of the Blanche Ferry, a descendant of the Painted Lady. The Blanche Ferry was found in a garden in northern New York, where it made a rapid growth, took on a dwarf habit and "became a 'cropper,' that is, all the flowers, which in other climates would have a much longer period in which to develop, here appeared nearly all at the same time if not cut."[2] Since then 35 varieties, mostly of the grandiflora class, have been introduced by our seedsmen. Two distinct types—the dwarf, or Cupid, and the Bush sweet pea—have also been developed on American soil.

The White Cupid was first discovered as a chance sport on the seed farms of C. C. Morse & Co., in California, in 1894. Since then they "have developed nearly 100 different tints and colors" in Cupids

[1] Bailey, L. H.: Survival of the Unlike, p. 480.
[2] Allen, C. L.: American Agriculturist, September 7, 1895.

alone. Most of these have not yet been introduced, but every year adds to the number of established varieties. Burpee's Bush sweet pea, also a chance seedling, was first introduced in a limited way in 1899, and already a new variety, the New Monarch Bush, has appeared in the list for 1900. There has been a great improvement in the varieties of flowers all along the line, and although most of the new varie-

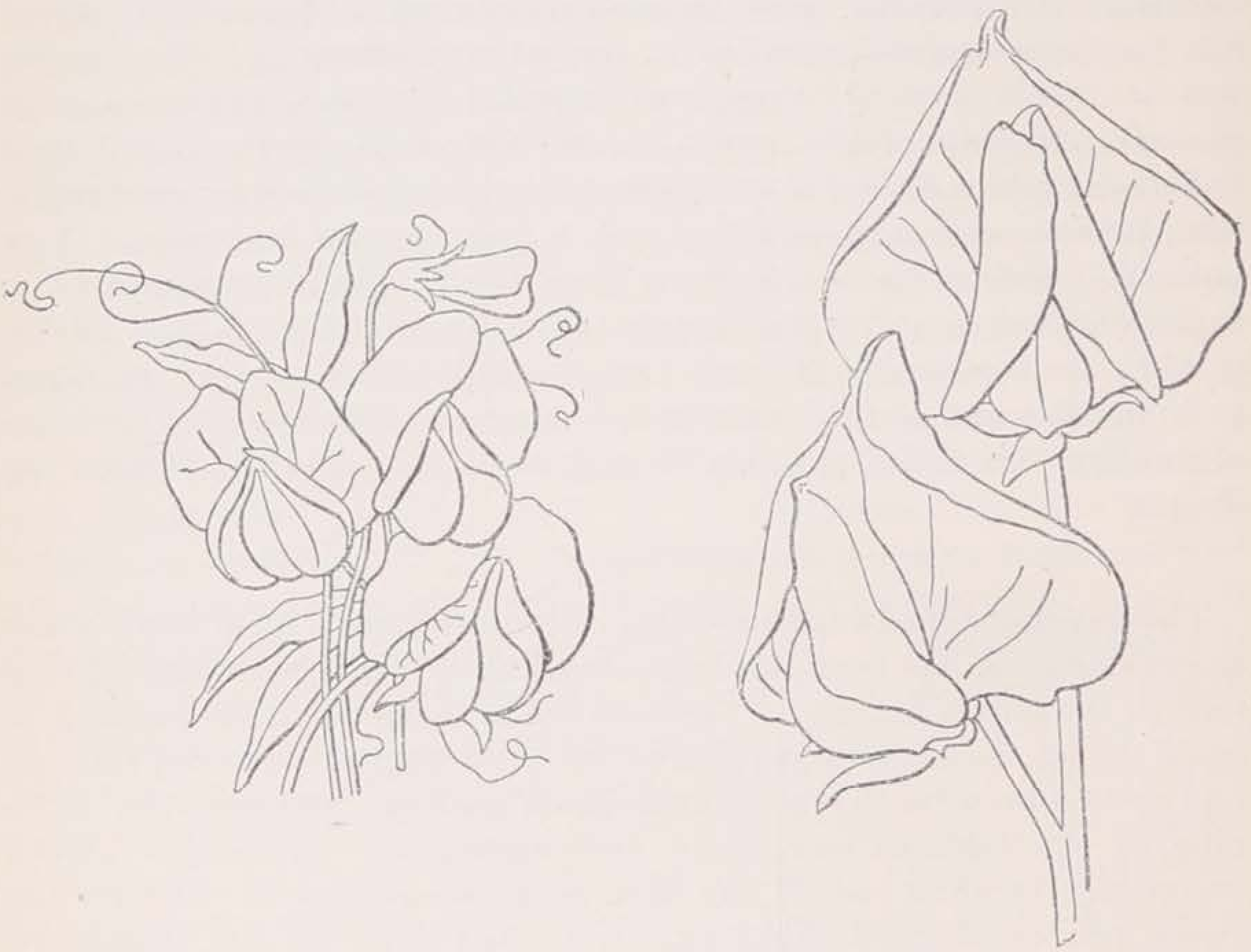

FIG. 25.—Sweet peas, old and new: *a*, from Vick's Magazine, 1886; *b*, the Aurora sweet pea.

ties are of European origin, we owe not a few of them to our own growers. (For old and new sweet peas, see fig. 25.)

Mr. Darlington writes of the asters as follows:

> Asters, twenty years ago, were nearly all of a similar type of flowers, and the range of coloring was much less varied than at present. Now we have the beautiful flowers of the late branching varieties, which rival the chrysanthemums as a fine florist's flower. This year a strain of tall branching comets is introduced, which will be of great value as cut flowers during the early fall, combining size and graceful feathery form with stems of good length. In the late branching varieties we have a distinct type of purely American origin; these now exist in pure white, lavender, flesh pink, and deep pink, with ample promise of other shades to come.[1]

## SEED TESTING.

Since the days of tradition there have been various and sundry ways of finding out the quality of seeds. They have been floated or have

[1] Darlington, E.: Growth and Development of the Business in Flower Seeds During the Past Twenty Years, in Seventeenth Annual Report American Seed Trade Association, 1899, p. 49.

been heated until they popped; they have been broken and the fracture noted; they have been cut and judged by the appearance of the inside. Besides these superficial and inaccurate methods, germination tests have been resorted to more or less commonly for over a hundred years.

Our own agricultural literature is full of advice about this matter, and the older seedsmen not only urged customers to test their seeds, but set them the example by sprouting a few in pots of soil which they kept in their seed stores. Unfortunately, this good advice was not generally followed; seeds were planted, and if disappointment came the seedsman was blamed, often unjustly. In 1827 Grant Thorburn wrote, "besides good seeds, good gardeners are necessary in making a garden flourish." While many of the failures with seeds have been caused by improper planting, due either to ignorance or carelessness, farmers and gardeners have often been deceived by unscrupulous dealers. They have bought seeds in good faith and have found them worthless; they have thought they were sowing clover, but have reaped thistles.

### SEED TESTING WORK IN EUROPE.

Fortunately for American agriculture, the poor-seed evil never attained the proportions here that it did in Europe. There matters became so bad that factories were openly established to crush and color quartz to mix with clover. In England a large capital was invested in the business of killing weed seeds to adulterate valuable kinds, but the practice was finally prohibited by Parliament. In 1869 Dr. F. Nobbe began testing seeds at his laboratory in Tharand, Saxony; this was the beginning of the extensive seed-control work in European countries. Naturally, Dr. Nobbe met with much opposition at first from both dealers and consumers, but he made out his case so clearly that the German farmers were convinced of the value of seed testing. To-day there are many stations in Europe, and some of them have control contracts with the leading seed merchants. The work is appreciated, and the workers take an honored place among the practical and scientific men of the day.

### SEED TESTING IN THE UNITED STATES.

In the United States reputable seedsmen have tested their seeds for germination, probably since the first seed firm was started. The State experiment stations have for a long time done something in practical seed testing. In Connecticut Prof. E. H. Jenkins began testing seeds in 1877, and this station has done some of the best work in this country. In the same year Dr. Beal, of Michigan, tested some seeds, and two years later Professor Ledoux began seed testing at the North Carolina station. At the Geneva station Professor Goff first used what is now known as the "Geneva tester." Among other stations that have contributed to the work are Arkansas, Cornell, N. Y., Delaware, Illinois, Indiana, Iowa, Maine, Massachusetts, Minnesota, North Dakota, New Mexico, Pennsylvania, Rhode Island, South Carolina, South Dakota, Vermont, and Wisconsin. In 1893 the Botanist of the Department of Agriculture recommended that seed testing be undertaken systematically and scientifically, and in 1894 Gilbert H. Hicks was appointed and placed in charge of the laboratory. Mr. Hicks's untimely death in December, 1898, deprived American seed testing of one of its ablest and most devoted exponents.

During the last few years there has been an increase of interest in seed testing; several stations have published the results of tests and others are preparing to begin this work.

The Association of Agricultural Colleges and Experiment Stations, at its meeting in Washington City in 1897, appointed a committee consisting of Professors Jenkins, Card, Lazenby, McCarthy, and Mr. Hicks to draw up rules and regulations for seed testing. The report of this committee was adopted, and the stations are now working under uniform rules, several stations having procured the official apparatus.

*Methods of testing by seedsmen.*

Most reputable seedsmen make germination tests, and by some these tests are conducted with great care. There is no uniform method of testing, however. In 1887 the American Seed Trade Association appointed a committee to adopt some uniform system, but the writer has been unable to learn that a report was ever made.

To the seed tester all seeds belong to one of two classes—those of which the botanical purity can be determined from the seed and those of whose purity one can judge only by the plants they produce. Roughly speaking, the first class includes most agricultural seeds, especially those of grasses and forage plants; while to the second class belong the garden seeds, more particularly those of vegetables and flowers, the varieties of which can not be distinguished by the seed. The seeds of the first class are much more easily tested than those of the second, and their value for seed can be accurately determined long before planting. Not so with garden seeds. The thing of most importance with them is that they be true to name and of good stock. It is, of course, essential that the seeds germinate, but a gardener would rather have cabbage seed of low vitality and of good stock than of poor stock and good vitality. In the first case he may not get more than 25 per cent of plants, but almost every one of these will make a head, while of the other seed he may get 90 per cent of plants and but few marketable heads. So important is this matter of genuineness that most good seedsmen conduct trial grounds where the different stocks are grown and observed.

The trial ground is the seedsman's testing station, and its importance can not be overestimated. Here he plants not only samples from his

FIG. 1.—PORTION OF THE TRIAL GROUNDS OF FORDHOOK FARM, PHILADELPHIA, PA.

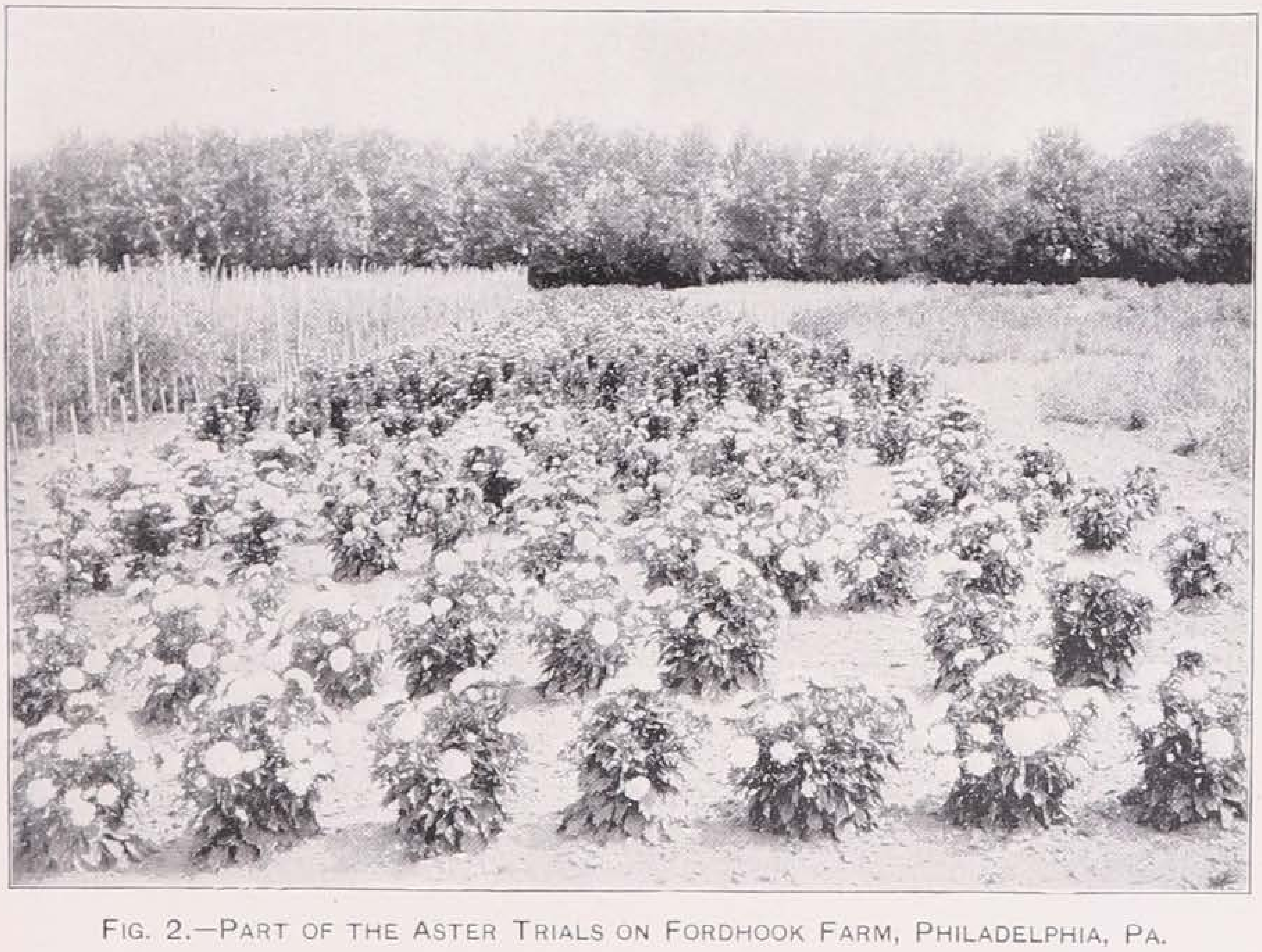

FIG. 2.—PART OF THE ASTER TRIALS ON FORDHOOK FARM, PHILADELPHIA, PA.

FIG. 1.—PORTION OF TRIAL GROUNDS OF THE DEPARTMENT OF AGRICULTURE, SHOWING LETTUCE TRIALS IN FOREGROUND.

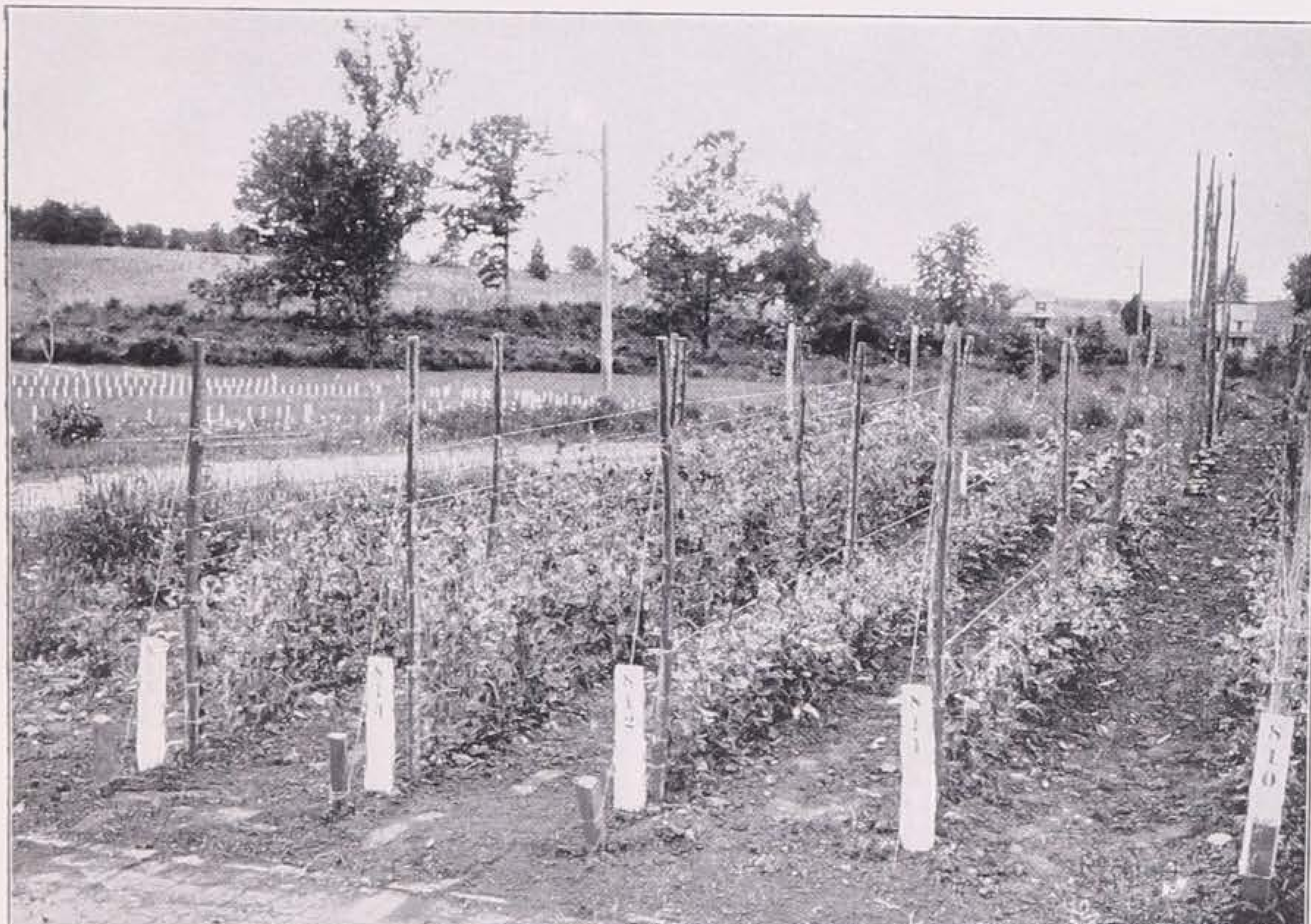

FIG. 2.—PORTION OF THE PEA TRIALS ON THE GROUNDS OF THE DEPARTMENT OF AGRICULTURE.

own stocks, but also from those of his competitors. As the season advances he reads the field like an open book. He may be surprised to find that one stock has proved untrue and must be discarded next year. Of course, the knowledge comes too late to prevent trouble that year, but the same mistake can be avoided in the future. Without the trial grounds a seedsman might sell poor stocks for several years without learning, except from the complaints of his customers, that they were unfit to use.

The tests on a well-regulated trial ground are made in good but not highly enriched loam. The seeds are planted in rows from 5 to 60 feet long, according to the kind and variety, and a white label bearing a number is placed at the head of the row. This number refers to a record book in which is kept a careful entry of everything relating to that seed, where and by whom grown, in what year, the date planted, when the sprouts first appeared, and the vigor of germination. As the plants grow they are carefully observed, notes being made of growth and character. These notes are continued throughout the season, and from this record the experts decide on the value of the stock. A vast amount of detail work is necessary in caring for these trial grounds, but they are essential to a thorough knowledge of varieties. Pl. XLIX shows portions of the trial grounds on Fordhook farms near Philadelphia, Pa.

So far as the writer knows, but one commercial seed-testing laboratory exists in the United States. This was established by Mr. Frank Sempers at Blythedale, Md., in 1897, and is known as the Blythedale Seed Laboratory. The work is confined to germination tests, and the laboratory represents the trade only. The number of tests made has increased rapidly since its establishment, and at present it has a capacity of 36,000 continuous tests.

*Seed testing by the Department of Agriculture.*

The Department of Agriculture has conducted a small trial ground for the last three years in connection with the seed laboratory. Here studies of varieties are made, all the obtainable varieties of one kind being grown for one or more seasons and careful notes and photographs taken. When completed these records make up accurate descriptions of all the standard sorts, with the synonomy. Experiments in growing special crops are carried on, and many new or little-known economic plants are cultivated. Undetermined weed seeds found in imported grasses and forage plants are also planted and the plants grown to maturity. Many of these prove to be weeds unknown in the United States, and the Department can thus to some extent keep informed of the character of the weeds now being introduced into this country. Samples are also planted of all seeds sent out for Congressional distribution. Portions of the trial grounds of the Department of Agriculture at Kensington, Md., are shown in Pl. L.

For the testing of grass, clover, and other forage-plant seeds the trial grounds are not as much used as the laboratory and greenhouse. In both of these respects the Department of Agriculture is well provided. The laboratory is equipped with balances, lenses, reading glasses, a seed collection, and all the other apparatus necessary for making purity tests. There are also germinating chambers, with all the necessary accessories, and abundant greenhouse facilities.

The method of making tests is essentially similar to that in use in all seed-testing stations. When a purity test is to be made, the sample is first poured into a bowl and thoroughly mixed. A small sample, varying in weight from 1 to 25 grams, according to the size of the seed, is then weighed and spread upon a sheet of white paper. Here it is examined with a hand glass, if necessary, and all foreign matter removed. The inert matter, as sticks, stones, dirt, broken seeds, and chaff, is placed on one side and weighed; also, all seeds not of the kind under examination are removed and weighed. The percentage f each kind of impurity is then determined and recorded. The weed seeds are identified, and their names are recorded with the number found in the weighed sample.

Sieves, mirror boxes, and other special pieces of apparatus are constantly used in the course of the test, which is completed as expeditiously as is consistent with absolute accuracy. The germination tests are made either in the chamber or greenhouse, or both, as is best suited to the particular variety. The chambers used are of the kind approved by the Association of Agricultural Colleges and Experiment Stations. Blue blotters and canton-flannel folds are used to hold the seeds, and the moisture and temperature are regulated according to the needs of the variety. Many grass seeds are tested in sand in the greenhouse, experience showing that such a test is most reliable. Special methods have also been found advantageous for some seeds. These methods have already been described in the publications of the Department, and need not be dwelt upon here. Nor is testing the only work undertaken by the laboratory. Studies are being constantly made with a view to devising better apparatus, such as will aid in facilitating tests, and experiments are conducted in order to clear up difficult points in the germination or preservation of seeds.

### INDICATIONS OF GROWING INTEREST IN SEED TESTING.

Seed testing is still but little developed in America, and there is a wide field for faithful and persistent effort. To a certain extent, the work is hampered by the apathy of the buyers—more by this than by the hostility of the sellers of seeds; but there are indications of a growing interest in better seeds and a clearer understanding of the value of having seeds tested before planting. This interest and this understanding it is the duty of the station to foster and increase, and its work will grow with the growth of a sentiment in favor of high grade, guaranteed, and tested seeds.

# PROGRESS OF COMMERCIAL GROWING OF PLANTS UNDER GLASS.

By B. T. Galloway,

*Chief of Division of Vegetable Physiology and Pathology.*

## EARLY HISTORY.

The special branch of horticulture which has for its object the production of plants under more or less artificial conditions of light, heat, and moisture has come to be generally known as the growing of plants under glass. In this country the business includes all plants grown in specially constructed glasshouses and in hotbeds and cold frames. The growing of plants under bell jars, as practiced in Europe, is not followed here.

Probably nowhere in the world has the growing of plants in greenhouses attained such importance as in the United States. Other countries may have more imposing structures and larger individual areas of glass, but, taking the business as a whole, it may be fairly claimed that in up-to-date methods in almost everything pertaining to this special field of horticulture this country leads.

It is difficult to say when and where the practice of forcing plants originated, but it is certain that the Romans were able to supply the tables of the wealthy with choice vegetables at almost any time of the year. The gardeners of the Roman Emperor Tiberius were familiar with this kind of work, and forced cucumbers and other vegetables during the winter and early spring months. The crops were forced in pits heated with manure and protected from cold by thin sheets of mica and in various other ways. The manure was put into the pits very much as is done in making hotbeds at the present time. Baskets containing fermenting manure were also used in which to force plants. These baskets were moved about to meet the requirements of the weather, and by being properly protected during cold days and at night vegetables were brought to perfection in them. It is even claimed that hot water was used by the Romans for the purpose of heating the pits, and from what we know of practices followed by them this does not seem unlikely.

With the decline of the Roman Empire and the gradual dissipation of wealth and culture which followed, the higher branches of horticulture were neglected and soon passed out of memory. From this period down to the sixteenth century there are few records which indicate any advanced ideas on the subject. The work that was undertaken was confined for the most part to the gardens of rulers and others who had means to carry out elaborate plans in landscape gardening. It is doubtful, however, if anything of consequence was done at this time in the way of forcing plants, as such a practice would require a knowledge which the gardeners of the time did not possess.

Passing over this long period and coming down to modern times, we find that even at the beginning of the present century but little was being done in this country in the special field of horticulture treated of in this paper. It must be remembered, however, that in the year 1800 the United States was young and every available man was needed in the work of conquering the wilderness and overcoming the great natural obstacles that are always found in a new country.

A study of history shows that countries, like individuals, are busied

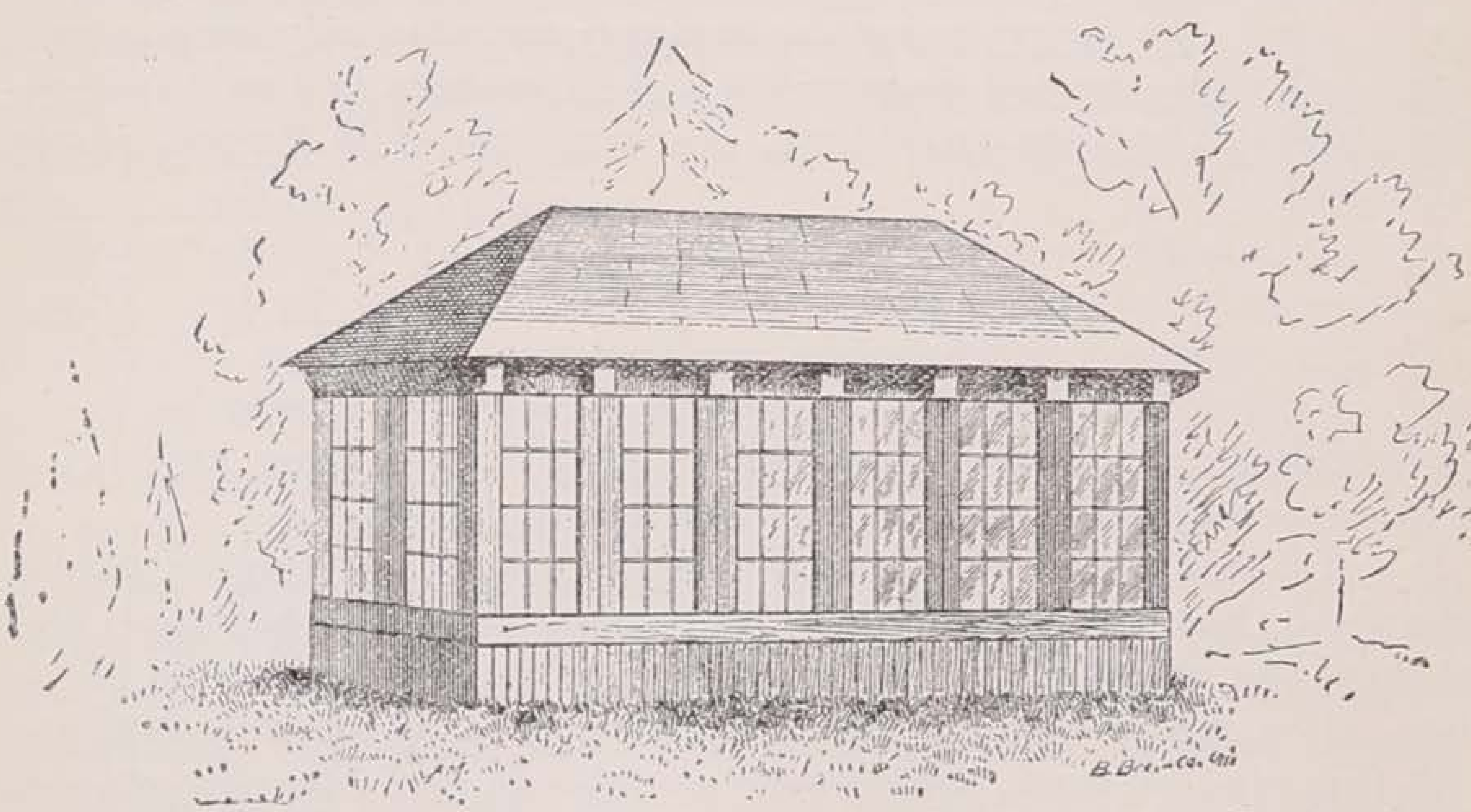

FIG. 26.—First greenhouse in America, constructed in 1764 (American Florist).

first with a mere struggle for existence, and that so long as it is necessary to put forth every effort to live little attention is given to luxuries like flowers. Here and there men are led aside by pure love for this kind of work, but they resemble the pioneers in literature and art, in whom sheer devotion overcomes all obstacles.

With the exception of some establishments of a semiprivate nature, there was little, so far as can be determined from the records, in the way of commercial plant growing under glass up to 1810. Greenhouses were scarce, and those in existence were not designed for much in the way of commercial work. The greenhouse generally believed to be the first erected in America (fig. 26) was built in New York in the year 1764. During the succeeding twenty-five or thirty years comparatively little was done in greenhouse construction. The house referred to was for many years a landmark, but was finally torn down to give place to advancing business. It is interesting to notice the construction of this greenhouse, as showing from what a small beginning the immense business of the present time sprang.

The early structures were crude affairs (fig. 27) when looked at from the present view point. The roofs were for the most part of wood, glass being used only for the sides and ends. In one of the books on gardening of that period the greenhouse was described as being built preferably 16 feet wide and of any length desired. The front, it was said, should be of sash 12 to 15 feet high, and should be provided with outside wooden shutters so as to protect the glass in extreme cold weather. The roof, the book goes on to state, should be of shingles, and the back wall of brick, 6 to 9 feet high, with flues through it, and there should be a shed to shelter this wall and a furnace under the shed connecting with the flues in the wall for the purpose of heating the house in cold weather. In many instances these houses were constructed in such a way that the gardener lived in the second story, the lower part being given up to the growing of plants.

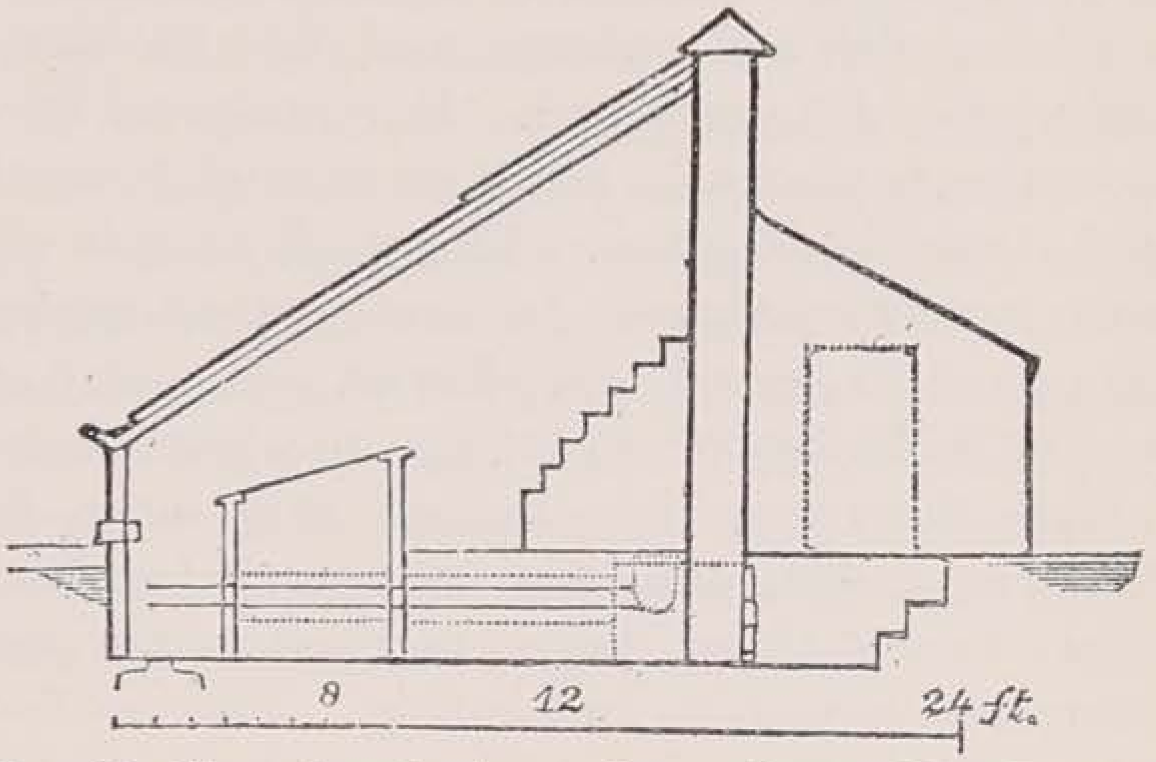

FIG. 27.—Plan of early form of greenhouse, 1836 (Hovey's Magazine).

BEGINNING OF AN ERA OF PROGRESS.

It was not until about 1825 that real progress in growing plants under glass began. The reason for this may be assigned to a number of causes. The country had been through several wars and had now settled down to growth and prosperity. The Eastern States were rapidly increasing in population and wealth, this being especially the case in the vicinity of the cities of Boston, New York, and Philadelphia. It was natural, therefore, that with the accumulation of wealth in such places and the relaxing of the strain necessary in the struggle for existence, money should be turned into other channels than those of necessity.

In these early days Philadelphia took the lead as a market for plants, flowers, and vegetables. The wealth and culture of the times were centered here, and besides much had been accomplished in the way of creating a taste for such things by the active work of a few individuals in whom there was an inherent love for all that is beautiful in the plant world. It was to Philadelphia, therefore, that gardeners from the Old World were attracted, and it was not long before several societies were organized that had a marked influence in developing an interest in the business. Philadelphia, furthermore, possessed advantages in other ways over her more northern sister cities. The mild winters there made it possible to carry on many lines of work with greater ease than in New York or Boston. The latter city, however, was not content to remain long in the second place in such work, and for a time in these early days her gardens and greenhouses were second to none in the country. New York was behind in this respect, for the time of her people at this period was so fully occupied with commercial interests that little attention could be given to anything else. Baltimore, Washington, Charleston, and other cities soon became centers of wealth and culture, and thus the demand for both plants and flowers rapidly increased. Horticultural societies were formed in all the cities named and did a great deal toward awakening an interest in their fields of labor. The work at this time, however, was of the most general nature. In fact, all commercial establishments were compelled to grow trees, shrubs, and many other things which would now be looked upon as foreign to a gardener's establishment.

With the increasing demand for plants, flowers, and vegetables at this time (1830) came the necessity for better methods of growing them; hence, there was a marked improvement in greenhouse construction, especially in heating. The method of heating by means of hot-air flues, then generally prevalent, practically confined the work within certain bounds, but with the advent of hot-water heating the possibilities of the gardener were greatly increased, as he was thereby enabled to keep his plants in better health and could therefore greatly increase their productiveness. He was furthermore enabled to heat his house with far less attention to this particular item than ever before, and this left him freer to pay more attention to other phases of the work.

Although water had been used in heating buildings for many years prior to this time, its application to greenhouses was limited. The systems first in use here were borrowed mainly from England, and were expensive, owing to the fact that both the boilers and the pipes were made of copper. Americans, however, soon commenced to improve the systems and to put forth efforts which would bring them into greater harmony with the conditions existing in this country. One of the pioneers in this work was Mr. Thomas Hogg, of New York, who devised a system which represents the important principles in use to-day (fig. 28). Mr. Hogg made the heater in such a way that the fire was completely surrounded by water, the latter circulating through the boiler and thence through cast-iron pipes to an expansion tank, and thence back to the boiler. The part of the boiler containing the water was a wooden vessel, and inside of this was placed an iron shell containing a grate, in which the fire was made. Fuel was added through a hole in the top of this iron shell, the shell projecting above the water in the vessel. Soon other heaters, made on the same plan, but more perfect, were devised, most of them consisting of tin or copper boilers made in the shape of a double cone. The inside cone was used as a furnace, while the space between the cones was filled with water. Openings for outflow and inflow were arranged at the top and bottom, in much the same way as is done at the present time in some of the conical boilers.

The introduction of hot water marked an epoch in greenhouse work, and for the next ten or fifteen years progress was rapid. In 1835 there were extensive greenhouses in the vicinity of New York, Boston, Philadelphia, and other cities, the houses of one establishment on Long Island aggregating over 400 feet in length. According to one of the prominent writers of the period, there were similar establishments which devoted much of their space to the growing of flowers for winter bouquets, camellias, roses, peonies, etc., being generally used for this purpose. Considerable attention was also given to the forcing of vegetables in hotbeds, especially lettuce. In this period the latter crop was quoted during midwinter at from 6 to 10 cents per head, practically the same price as is received for it at the present time. Vegetables were grown exclusively in hotbeds at that time, lettuce, radishes, and cucumbers being the principal crops.

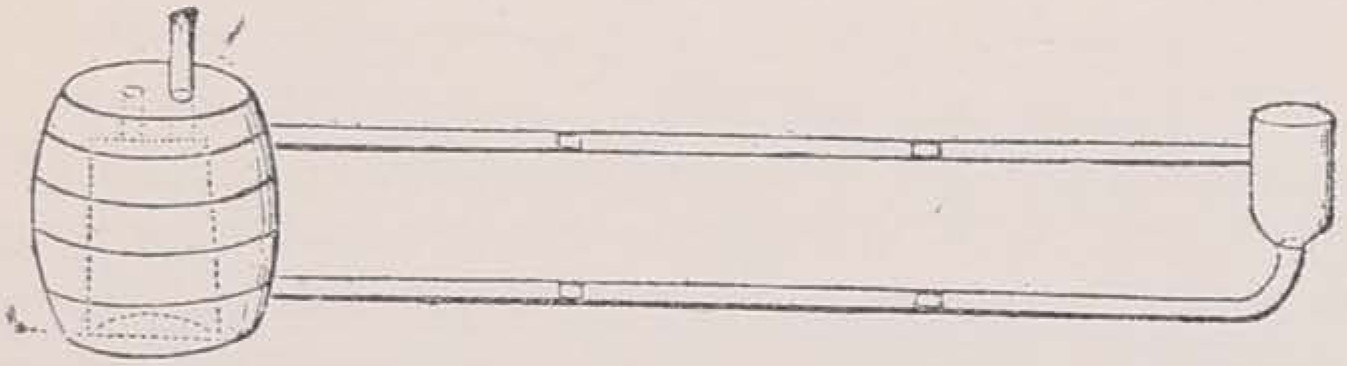

FIG. 28.—Hogg's hot-water heating apparatus, 1832 (Hogg's Magazine).

It is unnecessary to dwell at length on the changes wrought during the period between 1840 and 1850. Suffice it to say that with the rapid growth of the country the industry developed in a most remarkable way. Many improvements were introduced into greenhouse construction, and these, with the introduction of new plants and the improvement of others by selection and breeding, broadened the scope of the work. It was at this time that roses began to attract general attention, and a great deal of space was devoted to their culture, especially to the hybrid perpetuals and teas. Important advances were made in the introduction of fuchsias, gladioluses, and many other plants of this kind. Japan lilies also began to attract attention, and as soon as it was found that they were in a measure hardy the demand for them rapidly increased.

An important change in the construction of greenhouses was the abolishment of the sash roof and the substitution of the fixed roof. The great majority of greenhouses were of sash, and a fixed roof offered opportunities for diminishing the cost of construction and making marked improvements in ventilation and light, as well as in other particulars. Bedding the glass in putty instead of placing the putty on the outside was another innovation introduced quite generally about this time. This simple change added years to the life of the house and made it much better for the work in every way.

It is difficult to say when and where these improved methods of construction were first introduced. Fixed roofs were used in England as early as 1818, and there are descriptions of curvilinear grape houses erected on this plan during the same year. The method of bedding glass in putty was certainly in use in England as early as 1838, for it was thus described in 1843: "A good bed of prepared putty is laid on the rabbet and the glass is placed upon it, * * * after which a little white paint is run, with a small brush, almost a quarter of an inch wide, down each side of the square of glass."[1] The same writer says that he constructed a house on this plan in 1838. The method is described in this country in the Magazine of Horticulture for 1845. The gardener who erected the houses for the English writer says, in describing them, that the glass was not only bedded in putty, but was butted, the edges being dipped in copal varnish to prevent leaks between the panes.

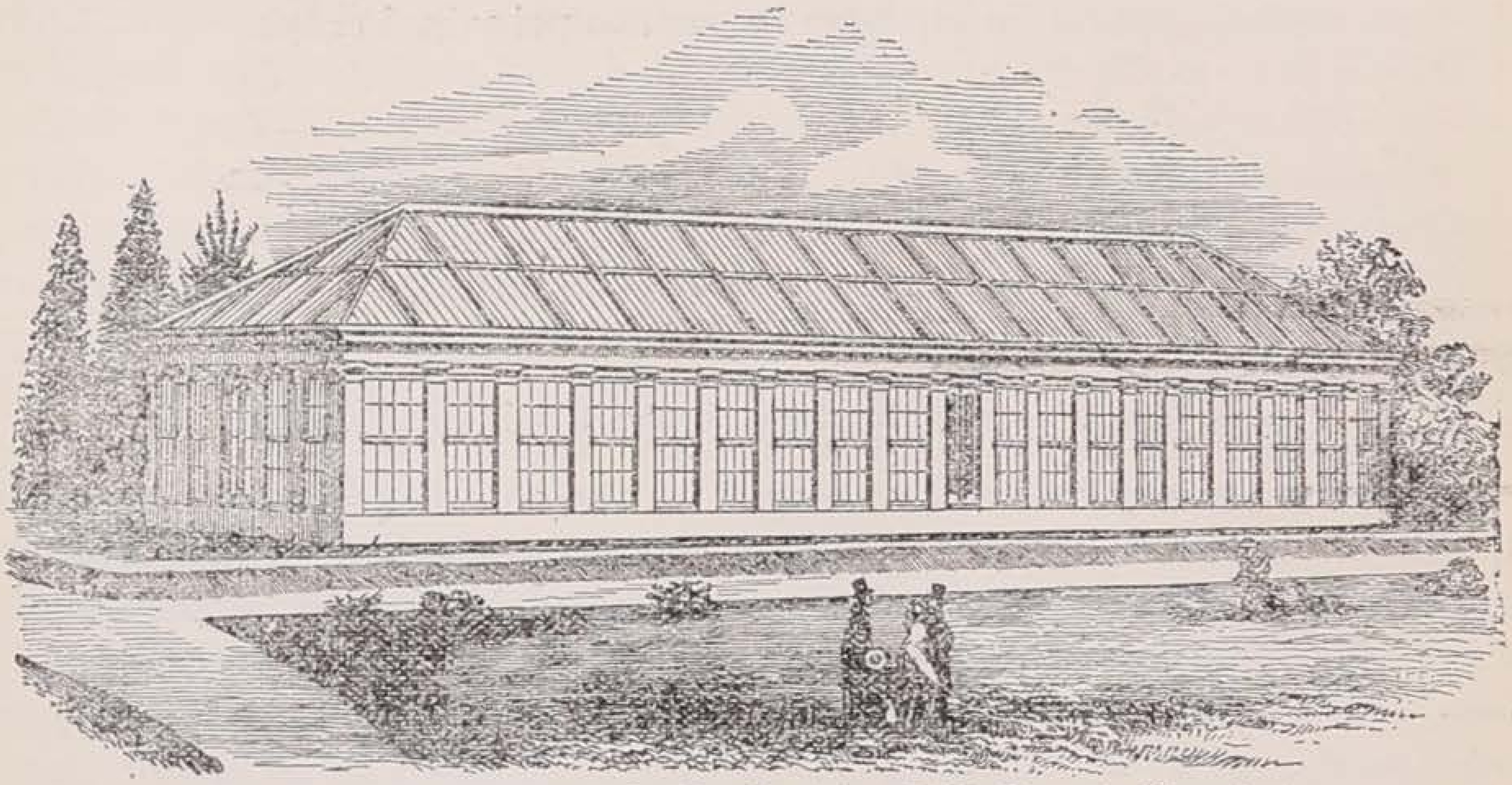

FIG. 29.—Conservatory made of sash, style of 1858 (Hovey's Magazine).

Much attention was attracted to these methods of construction by the animated discussion in various magazines as to whether they were of American or English origin. The editor of the Magazine of Horticulture, Mr. C. M. Hovey, stated that he had been using the system for twelve years prior to 1850, but it is evident from his writings that he was not aware of the publications referred to. Unquestionably, the methods did not originate with any one man or set of men, but were the direct outcome of the progress of the times. Largely through the efforts of Mr. Hovey and Mr. William Saunders, however, they were brought into prominence and soon came to be generally adopted. (See fig. 29.)

[1] Gardeners' Chronicle, 1843, Vol. I, p. 53.

At this time there seems to have been a marked sentiment toward the purely architectural in greenhouse construction, and it is therefore not surprising to find some houses in which utility was sacrificed to architectural effect. Such things, however, were more common among private individuals than in the case of commercial growers.

By 1860 commercial floriculture and the forcing of vegetables had assumed important proportions, the latter as yet being confined almost entirely to hotbeds. The breaking out of the civil war checked the work, however, and but little progress was made for the next six or eight years.

### AN ERA OF PLANT GROWING.

When business had assumed something of its normal condition after the close of the civil war there was a marked interest in plants both for bedding and decorative purposes. Many establishments were

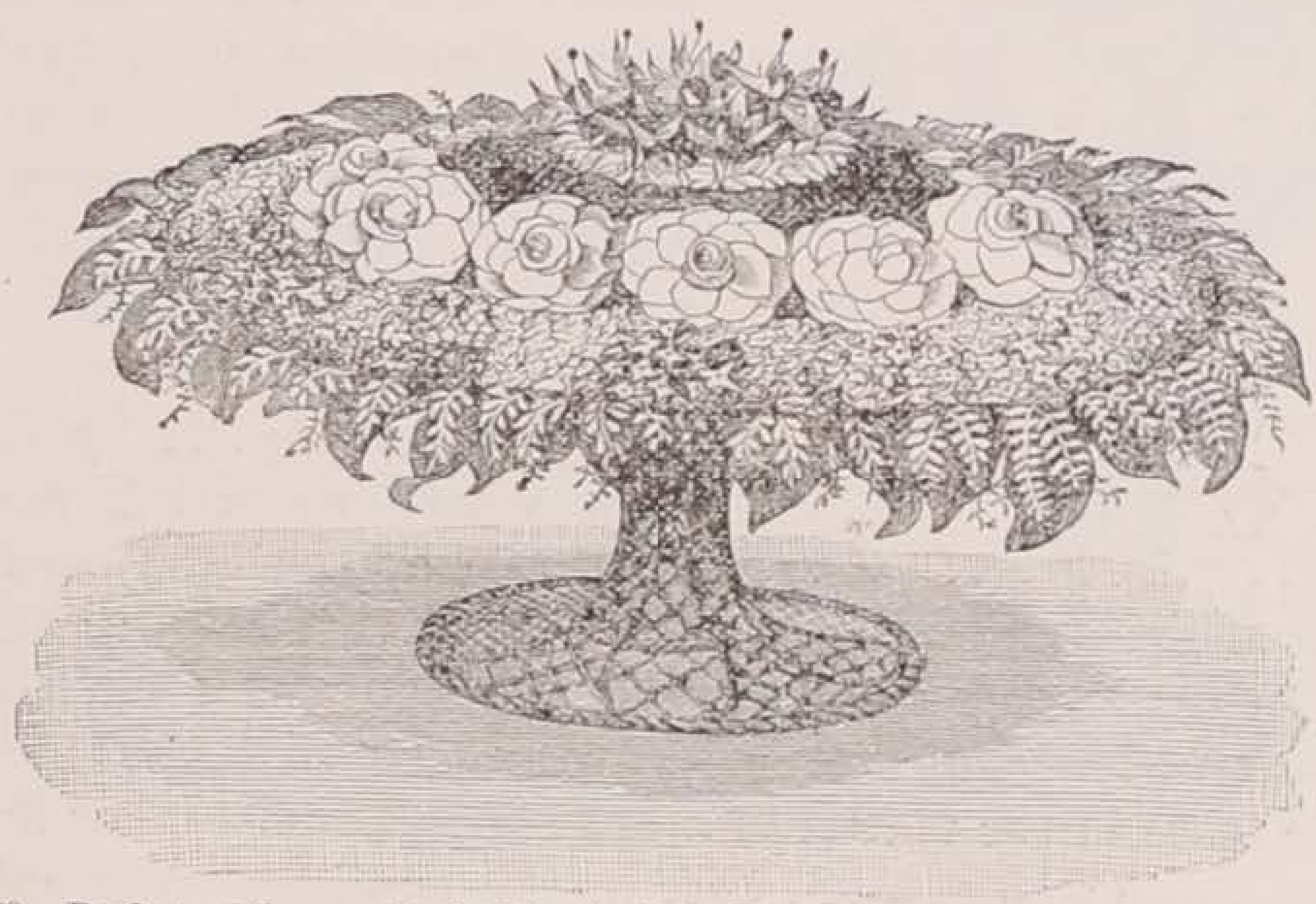

FIG. 30.—Basket of flowers in fashion in 1837 (Henderson's Practical Floriculture).

therefore started for the purpose of growing such plants, and there was a revival of interest all along the line. It was at about this period (1865–1868), furthermore, that vegetable growing under glass began to attract more widespread attention. Boston had long been the center of this important industry, but, as already pointed out, it was confined almost entirely to hotbeds and frames. Recognizing the inadequacy of their methods, however, a few of the more progressive growers in the vicinity of Boston took the sashes used for hotbeds and made houses of them.

It had long been the belief among gardeners that to properly grow lettuce it must be near the glass; hence, the first houses built for this crop were low, flat affairs, with barely sufficient head room to permit a man to walk erect. Another crop which had long been grown in frames was violets, the belief being that they had to be near the glass. The rigor of the climate made this method impracticable in many sections, and pits or low-roofed houses made of sash came into use about the year 1864 or 1865.

The demand for plants in preference to flowers was not lasting; hence, we find many changes, made necessary by the advances of the times. Retail dealers were becoming more numerous, but at this time no one dreamed of the remarkable influence they were to have on the future of the industry. The taste of the time in the matter of flowers ran mostly to bouquets and set pieces of the most formal types (figs. 30 and 31). A collection of the various styles of bouquets in use in 1868 to 1870 if exhibited to-day would probably attract more attention on account of their oddity of form and formal construction than any of the artistic decorations now seen in our florists' show windows. There was a mathematical exactness about the arrangement of each row of flowers which is seen nowhere at the present time in horticultural work, except possibly in the ribbon beds where foliage plants are grown.

FIG. 31—Hand bouquet in fashion in 1867 (Henderson's Practical Floriculture).

Camellias were the principal flowers used, and what with wiring, toothpicking, and trussing up generally the making of bouquets was a very formal business. Notwithstanding this fad, which of necessity had to be catered to by the trade, there were true artists who understood and appreciated the beauty of the flowers themselves and the possibilities in arranging them more in harmony with nature's teachings. The true lovers of flowers have always been the ones to improve the public taste in the matter of arrangement, and we now find everywhere that those who succeed best in the business are people of this kind.

It was at this time (1866) that the first important book on floriculture[1] appeared, and being thoroughly practical, it awakened widespread interest in the growing of plants under glass.

## AWAKENING DEMAND FOR CUT FLOWERS AND WINTER VEGETABLES.

By 1870 there were several thousand commercial establishments in the United States devoting their entire attention to the growth of plants for decorative purposes, for bedding, and for flowers, and to the growth of vegetables for winter use. The growing of vegetables was as yet a comparatively small industry, embracing probably less than one-tenth of the amount of glass devoted to plants and flowers. The increased demand for flowers was marked at this time. Camellias, tuberoses, and such flowers had seen their day, and roses, carnations, violets, and chrysanthemums were superseding them. The rose,

[1] Peter Henderson: Practical Floriculture.

however, was the principal flower, and much attention was given to improved forms and the methods of growing them.

With the ever-increasing demand for better stock, more improved methods of constructing houses naturally followed. The cumbersome structures of heavy timber and small glass gave way to houses better lighted, better heated, and better constructed in every way. Steam, which had its advocates years before, began to attract widespread attention in heating commercial establishments, and it was not long before it commenced to take the place of hot water in many sections.

With the great increase in the demand for cut flowers, growers who had been devoting their glass to miscellaneous stock made haste to transform their establishments into veritable factories for turning out roses and other flowers. The keenness of competition in this kind of work quickly led to the necessity of concentrating energy upon a few crops, and thus was evolved the specialist.

### AN ERA OF SPECIALIZATION.

Specialization assumed considerable importance as early as 1875, and from that date to the present time its development has been phenomenal. The change from the old methods was, of course, gradual, as has been shown, and can be brought out sharply only by a comparison of the work in different epochs. Roses were still the leading crop, but carnations, violets, and chrysanthemums were coming into prominent notice. The varieties of roses were constantly changing, the popular demand for any one lasting scarcely more than a few seasons, and the number of varieties grown commercially was greater than at present. With the demand for long stems and the necessity of being able to control growth at all times came the evolution of the present methods of growing roses on shallow benches.

Between 1875 and 1880 Southern-grown vegetables began to have a marked effect on Northern markets. In order to compete with the Southern growers better facilities in the way of forcing houses were necessary; hence, wide and high steam-heated houses came into use. Most of these houses were erected in the vicinity of Boston, and were at first of the lean-to type. They were from 20 to 25 feet wide and 10 to 12 feet high at the back, with the slope to the south side, where there was a 5-foot wall, the upper half of which was of ventilating sash. Many houses of this type were erected around Boston and Providence and some were put up near New York.

Owing to the increased demand for greenhouses and the fact that it was no longer possible for ordinary carpenters and builders to keep pace with the times, companies were organized which devoted special attention to greenhouse construction, some of them having been engaged in the manufacture of boilers and other apparatus used in connection with greenhouse work. Competition in such lines was developed early, and in all cases this had a tendency to greatly advance the work.

What proved to be a marked impetus to horticultural work was the organization at this time of the Society of American Florists, which held its first meeting in 1885. In looking back over the history of plant growing under glass it is not difficult to trace the marked influence of well-organized societies in advancing the interests of those engaged in any line of work. In the earlier days, as already pointed out, it was the societies near Philadelphia that gave that city preeminence in horticultural lines, and it is surprising that there should have been at that period, and even now, such apathy on the part of many florists toward society work. Association is essential to the advancement of business, and every effort put forth toward increasing membership and keeping the members interested is so much toward increasing trade and advancing business generally.

At the first meeting of the Society of American Florists the president, Mr. John Thorpe, gave some authentic facts, of a statistical nature, relating to the work of growing plants under glass. He states that the actual number of flowers produced at this time (1885) was almost incredible. To his personal knowledge nine growers of roses sent to New York 4,000,000 flowers, and yet this was not 50 per cent of the roses sent to that market alone. He estimates that the aggregate number of roses grown around Boston, Philadelphia, Cleveland, Chicago, Washington, and in all other places could not have been less than 24,000,000. The number of carnations grown was at least five times greater, or about 120,000,000. He estimated, furthermore, that at least one-fourth as many roses and carnations were grown by private establishments and represented as much value as if they were thrown on the market. The amount of space occupied by flowering plants and bulbs in the open air was estimated to aggregate at least 12,000 acres, in addition to several thousand acres used for seeds.

In 1885 the American Florist, a journal devoted to floriculture, appeared, and shortly after the Florists' Exchange, a trade paper.

In 1888 another innovation in greenhouse construction was inaugurated, that is, the use of iron framework. This is the latest and unquestionably the best form of construction, and it came rapidly into use. Although the first cost of construction is higher for an iron house, its durability is so much greater that it is the cheapest in the end.

According to Mr. W. A. Burnham, an experienced greenhouse constructor, the first iron greenhouse was erected in 1881, but such houses did not begin to attract general attention on the part of commercial growers until 1888, as already stated. Rapid improvements had also been made as regards the glass used, the small sizes having been abandoned and glass 16 by 24 inches and even 16 by 30 inches being

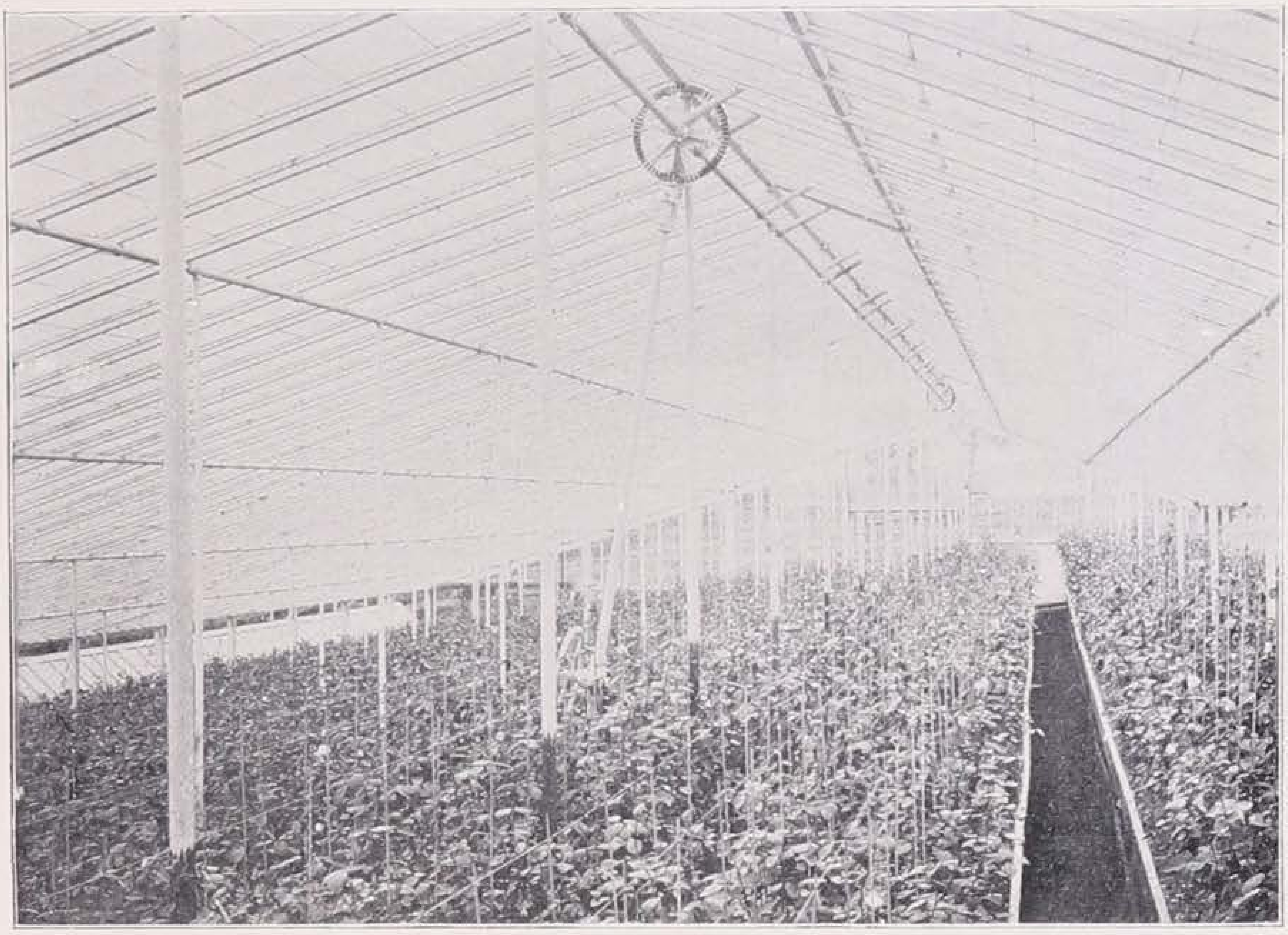

FIG. 1.—MODERN ROSE HOUSE.

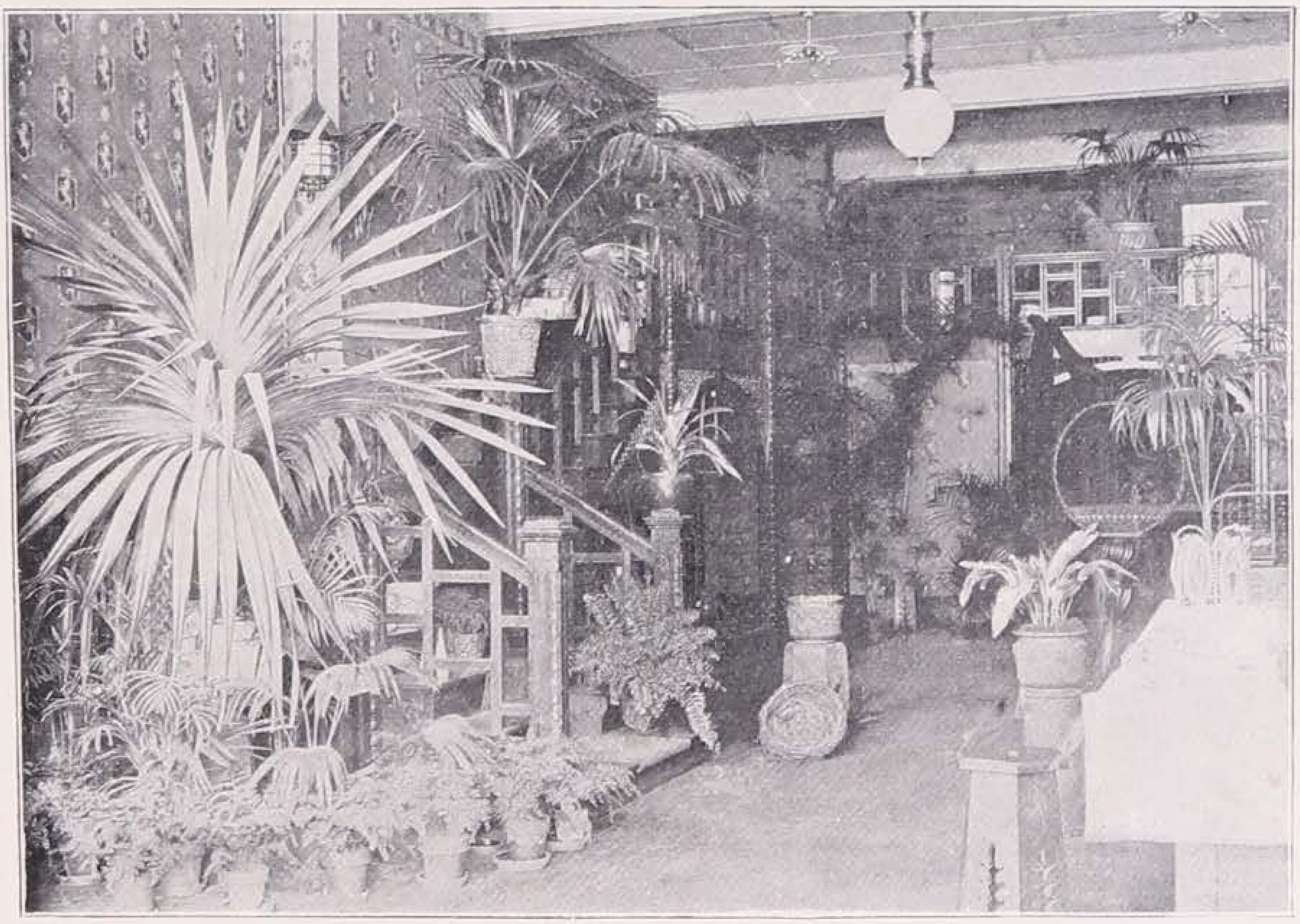

FIG. 2.—RETAIL FLOWER STORE.

FIG. 1.—TOMATO HOUSE.

FIG. 2.—LETTUCE HOUSE.

FIG. 1.—CARNATION HOUSE (INTERIOR VIEW).

FIG. 2.—CARNATION HOUSES (EXTERIOR VIEW) AND CARNATIONS IN THE FIELD.

generally adopted. All these improvements tended to the production of higher grades of plants and flowers by increasing the amount of light and greatly multiplying the possibilities of the grower. (Pl. LI, fig. 1.)

The growers of vegetables under glass also found it necessary to increase the size of their houses, thus relatively cheapening them and at the same time changing the form to better meet the requirements suggested by experience. The plain lean-to type was in a measure abandoned and a modified three-quarter span began to come into general use. Houses 35 and 40 feet wide were found to have advantages over narrower ones, and in many cases they were made 300 to 400 feet long. (Pl. LII.)

There was a rapid increase in the number of retail florists' establishments, especially in cities, and many of the retailers had given up growing flowers, having found it to their advantage to devote their entire time to the management of retail business. The carnation was coming into more prominent notice, and it was given a great impetus in 1891 by the formation of the American Carnation Society, an organization which has done much to cultivate a taste for one of our most beautiful flowers. (Pl. LIII.)

### PRESENT STATUS OF THE INDUSTRY.

The growth of the industry for the past few years has been remarkable. As a rule, the improvements in methods of producing and handling the crops have kept pace with the improvement of the crops themselves Competition is so keen that specialization has been carried into details which a few years ago were not thought of. In the handling of cut flowers and plants retail dealers play an important part. Many of these men, as already pointed out, are not producers at all, but depend wholly on producers and wholesale dealers for their stock. The retail stores in the large cities are models of artistic elegance (Pl. LI, fig. 2) and do much toward developing a taste for the highest ideals in floricultural effects; hence, it is not surprising to find the business as a whole divided into many special fields. Houses, frames, boilers, and other accessories are now made by specialists, and cut flowers are grown by specialists and handled by wholesalers and retailers who are specialists. What is true of cut flowers is also true, with certain exceptions, of both ornamental and bedding plants.

A number of special works on floriculture and vegetable culture have appeared, and a third journal, the Florists' Review, is published to meet the wants of growers, wholesalers, and retailers of flowers and plants.

It is a difficult matter to reach even approximate conclusions as to the amount of capital invested in the work, the value of the products, etc. A careful investigation of the question has been made by means of a special circular of inquiry, and also through representative men in various parts of the country. More than 12,000 copies of the circular referred to were sent out, but for one reason or another the returns were not very satisfactory. From all the data at hand, however, we are led to believe that there are now in the United States not less than 10,000 commercial establishments devoted to growing plants under glass. Of this number, probably 1,000 are engaged exclusively, or nearly so, in the forcing of winter vegetables, such as lettuce, cucumbers, tomatoes, and some minor crops. Within 15 miles of Boston there are probably not less than 40 acres of glass, or 1,742,400 square feet, devoted to vegetables alone. Two-thirds of this is in houses, the rest being in hotbeds and frames. Around Providence, R. I., there are probably not less than 10 acres of glass, while the amount devoted to vegetable growing about New York, Chicago, and other cities will bring the total up to 100 acres, or about 4,500,000 square feet. Including all equipments, such as boilers and other accessories used in connection with the industry, this glass represents an average value of not less than 50 cents per square foot, or $2,250,000 in all, and this will bring to the grower 50 cents per square foot annually, or $2,250,000 from the producers' standpoint. Nine-tenths of the products are sold at retail, either by the grower himself, or by the retailer, who may not be a grower. The valuation from this standpoint represents double what it is from the standpoint of the wholesaler, or $4,500,000 for forced vegetables.

Summarizing the forcing of vegetables under glass in the United States, therefore, we have the following:

| | |
|---|---|
| Number of square feet devoted to the industry | 4,500,000 |
| Value of establishments | $2,250,000 |
| Wholesale value of annual product | $2,250,000 |
| Retail value of annual product | $4,500,000 |
| Number of men employed | 2,250 |

There are probably not less than 9,000 commercial florists' establishments in the United States. Some of these contain areas of glass which cover acres, while others contain only a few hundred square feet. Taking the country as a whole, it is estimated that there is an average of 2,500 square feet of glass for each establishment, or 22,500,000 square feet in all. New York has the largest number of establishments, there being not less than 1,100 or 1,200, with glass amounting to nearly 4,500,000 square feet; Illinois, with 600 to 800 establishments and over 4,250,000 square feet of glass, is second; while Pennsylvania, with 800 or 900 establishments and about 4,000,000 square feet of glass, is third. The estimated value of the establishments in this country, including houses, boilers, and all fixtures, is placed at 50 cents for each square foot of glass, or $11,250,000 in all. The income to the producer will average 50 cents per square foot annually, or $11,250,000, and double that amount when viewed from the standpoint of the retailer. Considering the matter from the retailer's standpoint, therefore, the total value of the annual output is $22,500,000, or $1 for each square foot of glass.

It is estimated that the retail value of cut flowers sold annually is $12,500,000, the estimated apportionment of this sum being, for—

| | |
|---|---|
| Roses | $6,000,000 |
| Carnations | 4,000,000 |
| Violets | 750,000 |
| Chrysanthemums | 500,000 |
| Miscellaneous flowers, including lilies, etc | 1,250,000 |

Estimating the average retail value of roses, carnations, and violets at $6, $4, and $1 per hundred, respectively, the total number of each sold annually, based on the above values, would be, of—

| | |
|---|---|
| Roses | 100,000,000 |
| Carnations | 100,000,000 |
| Violets | 75,000,000 |
| Total | 275,000,000 |

The retail value of the plants sold is placed at $10,000,000. Taking the plant trade as a whole and the country in the aggregate, the average-sized pot used is estimated to be 3 inches, and the average retail price 10 cents per pot. This means that there are no less than 100,000,000 plants sold every year.

To handle this business in its entirety requires probably an average of not less than one man for every 1,500 square feet of glass, or 15,000 men in all. Fifteen hundred square feet of glass per man may seem like a low estimate, and such is the fact when considering commercial establishments of any size. The larger the area of glass, other things being equal, the more square feet one man can handle. As a matter of fact, some of the large rose-growing establishments do not use more than one man for each 10,000 square feet. Large carnation establishments will run about the same as roses, while violets, owing to the great amount of work involved in cleaning the plants and picking the flowers, average higher. It is the many thousand small establishments that increase the amount of labor required.

### CONCLUDING REMARKS.

It is fitting in conclusion to call attention to some of the modern methods of handling and disposing of the vast amount of material produced by the establishments in question. Some references have already been made to this matter, but they are of a general nature only.

Many of the crops grown pass through several hands before reaching the consumer. Some of the larger establishments, especially those devoted to vegetable growing, dispose of their products through special agents, who receive a salary for this work, and are expected to keep in close touch with the markets and look after every detail, so as to obtain the highest price for the material handled. That such a method pays and pays well is evident from the fact that some of these agents receive salaries exceeding any paid by ordinary business establishments except in very special lines.

Auction sales are another important innovation which enables the plant grower to dispose of much of his stock. Within the past few years these sales have become quite popular, and have done much toward broadening the opportunities for work, especially in plant growing.

A vast amount of stock, especially cut flowers, is now handled by wholesale commission houses, which are to be found in nearly all the large cities. These houses have every facility for the rapid handling of flowers, and afford to the growers an opportunity of disposing of stock which a few years ago was not possible. Some of these wholesale men are already finding it necessary to specialize, and for this reason are making reputations for having on hand the best in the market in the way of roses, violets, or whatever their specialty may be.

In addition to wholesale commission houses, there are in some larger cities cut-flower exchanges, which handle a great deal of stock. These exchanges are controlled and managed largely by growers themselves, and are conducted as nearly as possible on an equitable basis. The New York Cut Flower Exchange has been in existence for five or six years, and its success has been quite marked. It has for its supporters some of the best growers in the Eastern United States, and the prices received through this cooperative plan are said to be very satisfactory.

In close touch with the commission houses and exchanges are the retail stores, which are by far the most important factors in connection with this business in the matter of handling and disposing of stock. The amount of flowers and plants handled by these establishments in some of the large cities is almost incredible. Undoubtedly, the annual sales of some of the best establishments of this kind in New York City will not fall short of three or four hundred thousand dollars. The stores themselves are looked after with the greatest care, every attention being given to the satisfying of artistic desires on the part of the customers. As already pointed out, the successful men in this business are those having sufficient artistic ability not only to cater to the demands of the customers, but to create new fads. The arrangement and handling of the flowers, the boxes, ribbons, delivery wagons, messenger boys, and every detail must be of the most artistic kind in order to attract attention and draw trade.

It frequently happens that, owing to circumstances, quantities of flowers are left on the hands of wholesalers, commission men, and others. Most of this material is now disposed of to a class of men known as street fakers, who often play an important part in relieving the pressure on an already full market. These fakers are to be found everywhere in large cities, and, with their push carts and other facilities for locomotion, they are doubtless able to supply a class of trade that could not be reached in any other way.

Through the trade journals growers, wholesalers, and retailers are kept in close touch with each other. These journals are published weekly, and each has its staff of special correspondents, who watch the markets and call attention to every detail worth noting. A review of the market reports in them for the past ten years brings out some interesting points. For instance, by averaging their weekly quotations from January, 1890, to December, 1899, it is seen that while there has been an enormous increase in the production of cut flowers, prices have not decreased as much as would naturally be expected. The following table shows the average prices received for roses, carnations, and violets in four of the principal markets during the period named:

*Average wholesale price per 100 of roses, carnations, and violets, from 1890 to 1899, inclusive, in the four principal cut-flower markets.*

| Market. | Roses.a | Carnations. | Violets. |
|---|---|---|---|
| Chicago | $5.65 | $1.63 | $1.09 |
| Boston | 6.55 | 1.61 | .84 |
| Philadelphia | 6.29 | 1.48 | .87 |
| New York | 4.32 | 1.35 | .89 |
| General average | 5.70 | 1.51 | .92 |

a The American Beauty rose is excluded from this estimate on account of the high price it commands in comparison with other varieties.

It will be seen by this table that Chicago leads in the prices of carnations and violets and that Boston stands at the head in the prices quoted on roses. The change in prices for the past ten years is shown in the following table, the averages being given for two periods of five years each:

*Average wholesale price per 100 of roses, carnations, and violets, in five-year periods, from 1890 to 1899, inclusive, in the four principal cut-flower markets.*

| Flowers. | Chicago. | Boston. | Philadelphia. | New York. |
|---|---|---|---|---|
| Roses: | | | | |
| 1890-1894 | $6.77 | $7.11 | $6.57 | $5.10 |
| 1895-1899 | 4.52 | 6.00 | 6.01 | 3.56 |
| Carnations: | | | | |
| 1890-1894 | 1.85 | 1.73 | 1.61 | 1.65 |
| 1895-1899 | 1.49 | 1.53 | 1.40 | 1.17 |
| Violets: | | | | |
| 1890-1894 | 1.17 | .93 | .60 | 1.07 |
| 1895-1899 | 1.01 | .74 | .73 | .71 |

The following table shows the percentage of decrease in prices during the past five years as compared with the previous five:

*Percentage of decrease in wholesale prices of roses, carnations, and violets, from 1895–1899, as compared with those received from 1890–1894.*

| Market. | Roses. | Carnations. | Violets. |
|---|---|---|---|
| | *Per cent.* | *Per cent.* | *Per cent.* |
| Chicago | 33 | 19 | 9 |
| Boston | 16 | 12 | 20 |
| Philadelphia | 8 | 13 | *a* 22 |
| New York | 30 | 29 | 34 |

*a* Increase.

Viewing the work as a whole and considering its marvelous development, it stands out as one of the most striking examples of the advance of wealth and culture. The increasing love for flowers denotes a growing refinement and a higher appreciation of all things artistic, which promises well both for the individual and the nation.

# RISE AND FUTURE OF IRRIGATION IN THE UNITED STATES.

By Elwood Mead,

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## REMAINS OF ANCIENT IRRIGATION WORKS.

The earliest pathway of civilization on the American continent led along the banks of the streams. In various parts of the Southwest, notably in the Salt River Valley of Arizona, in northern New Mexico, and along the southern borders of Colorado and Utah are well-defined remains of irrigation works which have outlived by many centuries the civilization to which they belonged. In at least one instance the bank of an ancient canal has been utilized as a part of modern works.

Riding up the valley of the Rio Grande, in the first half of the sixteenth century, Spanish explorers found in the midst of arid surroundings beds of beautiful roses, "not unlike those in the gardens of Castile," as they noted in their diaries. They also found Pueblo Indians irrigating the thirsty soil, as their forefathers had done for centuries before them and as their descendants are still doing to-day. In this valley and along the tributary streams, and at other places in the desert wastes of the Southwest, Spanish settlements sprung up and maintained themselves by means of these life-giving waters. The ditches at Lascruces, N. Mex., have an unbroken record of three hundred years of service, the history of which is written in the banks of the canals and in the fields irrigated. This is due to the sediment with which the waters of the Rio Grande are laden. Year after year this has slowly added layer on layer to the sides and bottoms of these ditches, until from being channels cut below the surface of the soil they are now raised 2 or 3 feet above. It is here that one can yet find agriculture almost as primitive as that of the days of Pharaoh, where grain is reaped with the sickle and thrashed by the trampling of goats.

## EARLY IRRIGATION IN CALIFORNIA.

From these settlements and from the conquered cities of Mexico adventurous missionaries pushed their way still farther westward until they came in sight of the Pacific, teaching the Indians the crude art of irrigation, which they had learned either in Spain or of the simple inhabitants of the interior, and making oases of bloom and fruitage among the hills and deserts of the coast. So came the early churches and gardens of California and the first small impulse toward the conquest of its fertile soil, which must always be gratefully associated with the memory of the Mission fathers.

Measured by their cost or the skill required to construct them, the small, rude furrows which watered these gardens are now of little importance. Compared to the monumental engineering works which have succeeded them, they possess to-day but little interest. The best preserved of these Mission gardens is now an insignificant feature in a landscape which includes miles on miles of cement-lined aqueducts, scores of pumping stations, and acres on acres of orange and lemon orchards, cultivated with thoroughness and skill not surpassed in any section of the Old World or the New. It was far different at the end of the eighteenth century, when the thirty or more of these gardens which were scattered along the coast between the Mexican border and San Francisco were the sole resting places of weary travelers and their fruit and foliage the only relief in summer from the monotonous landscape presented by the brown and arid hills which surrounded them on every side. They were under those conditions not only successful centers of influence from which to carry on the Christianizing of the Indian tribes, but forces tending to break up the migratory impulse by the establishing of homes among the early Spanish explorers.

## BEGINNINGS OF MODERN IRRIGATION.

For the beginnings of Anglo-Saxon irrigation in this country we must go to the Salt Lake Valley of Utah, where, in July, 1849, the Mormon pioneers turned the clear waters of City Creek upon the sun-baked and alkaline soil in order that they might plant the very last of their stock of potatoes in the hope of bringing forth a crop to save the little company from starvation.

Utah is interesting not merely because it is the cradle of our modern irrigation industry, but even more so as showing how important are organizations and public control in the diversion and use of rivers. Throughout the pioneer period of their history the settlers of Utah were under the direction of exceptionally able and resourceful leaders, who were aided by the fact that their followers were knit together by a dominating religious impulse. These leaders had the wisdom to adapt their methods and shape their institutions to conform to the peculiar conditions and environment of a land strange and new to men of English speech. They found that irrigation was necessary to their existence in the home that they had chosen, and that the irrigation canal must therefore be the basis of their industrial organization, which was largely cooperative; hence, the size of their farms, which are less than 30 acres upon the average, the nature of their social relations, which are close and neighborly. (Pls. LIV and LV show some methods of irrigation and the improvement following the irrigation canal.)

FIG. 1.—THE FIRST IRRIGATION.

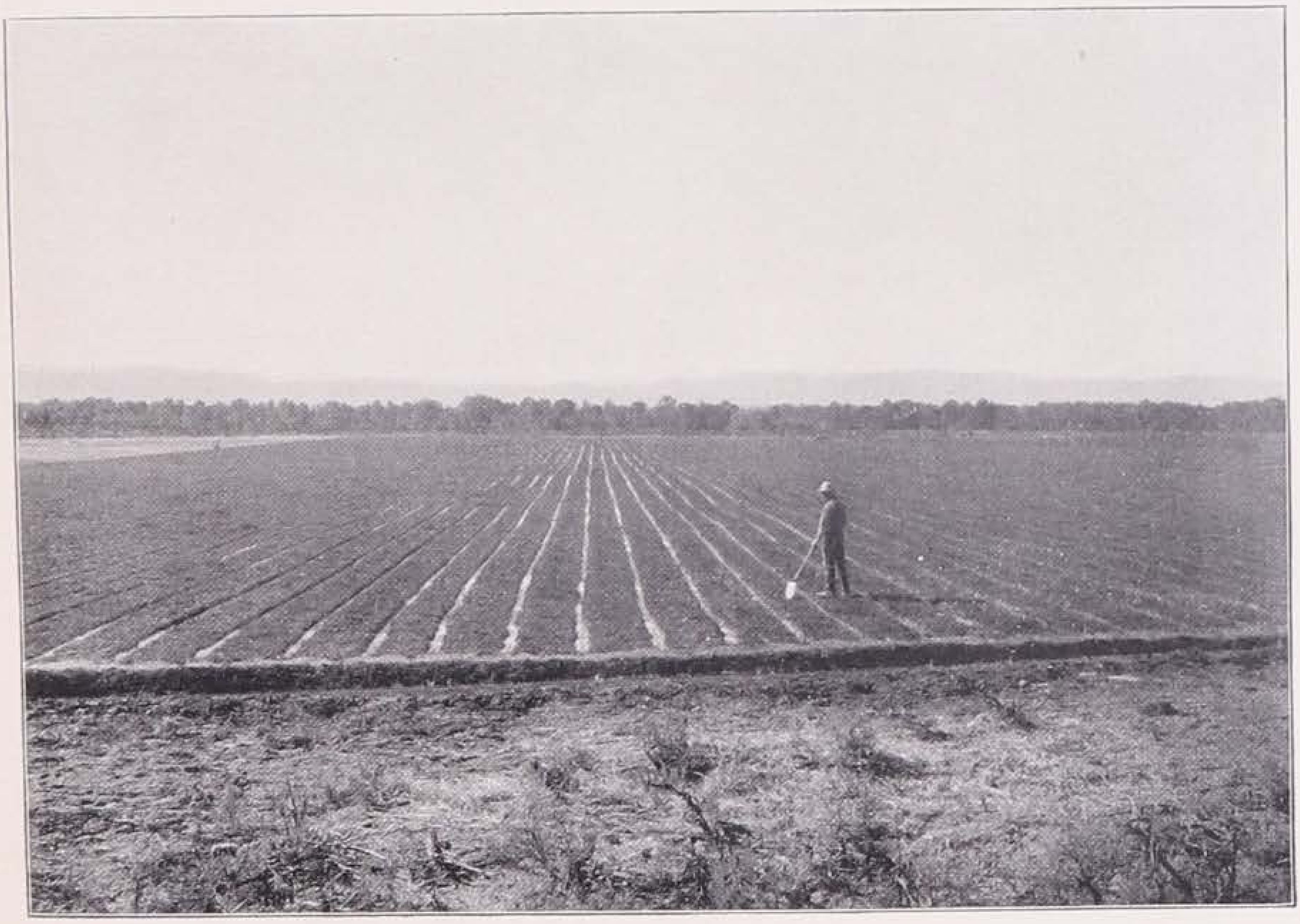

FIG. 2.—A LATER IRRIGATION.

FIG. 1.—APPEARANCE OF IRRIGATION CANAL WHEN FIRST COMPLETED.

FIG. 2.—APPEARANCE OF IRRIGATION CANAL TEN YEARS AFTER COMPLETION.

FIG. 1.—VIEW AT THE HEAD OF ONE OF THE EARLY IRRIGATION CANALS IN UTAH.

FIG. 2.—MOUNT UNION, FROM UNION PASS.

That the great material results which quickly followed could have been realized without the cohesion which came from an association dominated by religious discipline and controlled by the superior intelligence of the head of the Mormon Church, is doubtful; but that the character of institutions in the valleys of Utah, both industrial and social, was chiefly due to the environments in which they were placed is beyond dispute. Cooperation became the dominant principle simply because the settlers were in a land without capital, and it was beyond the power of the individual to turn the mountain current from its course and spread it upon his lands. Only the labor of many individuals, working under organization and discipline, could make the canals or distribute the waters. A small farm unit was chosen, not because men were less greedy for land than in all other new countries, but because it was quickly seen that the extent of the water supply was the measure of production, and their ability to provide this was small. Diversified farming, which is one of the leading causes of the remarkably even prosperity of Mormon agriculture, was resorted to because the Territory was so far removed from other settlements that it was compelled to become absolutely self-sustaining. The small farm unit made near neighbors, and this advantage was still more enhanced by assembling the farmers' homes in convenient village centers. One reason for adopting this plan, in the first place, was doubtless for protection against the Indians, but it has become a permanent feature, which is still adhered to in making new settlements because most satisfactory to the social instinct. (A view at the head of one of the early irrigation canals in Utah is shown in Pl. LVI, fig. 1.)

### COOPERATIVE COLONIES IN COLORADO AND CALIFORNIA.

The discovery of gold in California created the Overland Trail, which wound its tortuous course across the hitherto trackless wastes of the arid domain. Its stations were usually along the banks of the streams. In the neighborhood of these, settlers had established themselves, and by means of simple furrows turned the waters of the streams upon the bottom land. This was the extent of irrigation throughout the vast region it traversed, outside of Utah, before the Union Colony at Greeley, Colo., became the second historic instance of the beginnings of the present system, and one which furnished a different standpoint for a study of the subject.

As Utah is the result of a religious emigration, so Greeley is the creation of the town meeting. Its founding marked the beginning of a new and different industrial development in Colorado. Before this it was the wealth of the mines or the migratory and adventurous experiences of the range live-stock business which had attracted settlement. Greeley, on the contrary, represented an effort of home-making people, both to enjoy landed independence and social and intellectual privileges equal to those of the towns and cities they had left. Among its first buildings was Colony Hall, and among its first organizations the Lyceum, in which all the affairs of the community were debated with a fervor and fearlessness quite worthy of Horace Greeley's following. Cooperation was adopted in the construction and management of public utilities, of which the irrigation canal was the first and most important. The wisdom and justice of making common property of the town site, the beauty and value of which could only be created by the enterprise and public spirit of all, was recognized and put into practice with satisfactory results. The only deliberate extravagance was the erection at an early day of a school building worthy of the oldest and richest New England community. The highest methods both of irrigation and cultivation were sought out through numberless experiments, until Greeley and its potatoes grew famous together. The home and civic institutions of the colony became the pride of the State, and the hard-won success of the community inspired numerous similar undertakings and furnished an impulse which resulted in the reclamation and settlement of northern Colorado. Boulder, Longmont, Loveland, and Fort Collins were the outgrowth of success at Greeley, and each adopted many of the ideas and tendencies of the parent colony.

Twenty years subsequent to the beginning of Utah, and contemporaneously with the settlement of Colorado, similar influences began to make themselves felt in California, especially in its southern part. Anaheim is called the mother colony. This was cooperative in its inception, and its principal irrigation system has ever remained such. Riverside followed a few years later and represented a higher ideal; but the spirit of speculation in which California civilization was born soon fastened itself upon irrigation, as it had done in the case of mining, and ran a mad race through southern California. Irrigation in this State became corporate and speculative. Where Utah and Colorado had depended only upon their hands and teams for the building of irrigation works, California issued stocks and bonds, and so mortgaged its future. Men began to dream of a new race of millionaires, created by making merchandise of the melting snows, by selling "rights" to the "renting" of water, and collecting annual toll from a new class of society, to be known as "water tenants."

### CORPORATE CANAL BUILDING.

The investment of corporate capital in canals to distribute and control water used in irrigation began in California, but spread like a contagion throughout the West. For a quarter of a century it has been the leading factor in promoting agricultural growth of the western two-fifths of the United States. It has been the agency through which many millions of dollars have been raised and expended, hundreds of miles of canals constructed, and hundreds of thousands of acres of land reclaimed. It has built the largest overfall dam ever

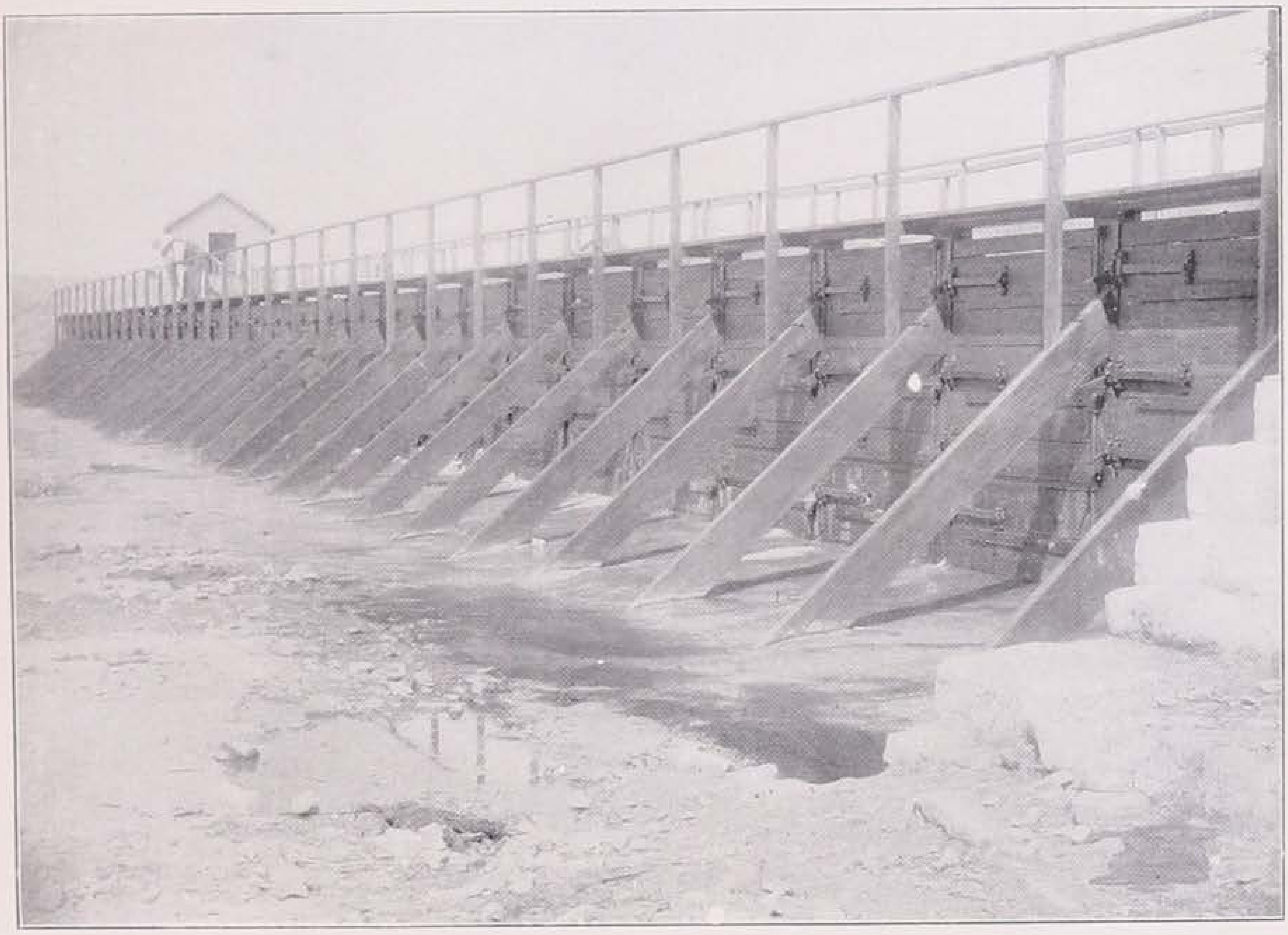

FIG. 1.—CANAL WASTE GATE CLOSED.

FIG. 2.—CANAL WASTE GATE OPEN.

placed in a large river. It has been the chief agency in replacing temporary wooden structures by massive headworks of steel and masonry, and has, by the employment of the highest engineering talent available and the introduction of better methods of construction, promoted the economy and success with which water is now distributed and used. The question which is now to be considered is how the vast fabric created through its agency is to be directed and controlled in order that it may not crumble of its own weight. (Pl. LVII.)

The construction of irrigation works by corporate capital came as a natural if not inevitable evolution. There came a time in the districts first settled when the opportunities to divert water cheaply had largely been utilized, and when the expenditure required was beyond the means of either the individual or the cooperation of many individuals. The preliminary outlay was too great. In older European countries experience has shown that no agency can be so wisely intrusted with these larger expenditures as the State. Large irrigation canals have been considered as being, in their nature, as much public improvements as are works to supply water to cities and towns. Being for the service of the public, those in older European countries have largely passed under public ownership.

In this country corporations have, so far as construction is concerned, taken the place of governmental agencies in other lands. Practically all of the larger and costlier works built within the last two decades have been of this character. The High Line Canal, which waters the land surrounding Denver, Colo., with its tunnel through the mountains and its aqueduct carried along the rocky cliffs below; the canals of the Wyoming Development Company, with its tunnel alone costing more than all the Greeley Colony canals combined, and its reservoir for storing the entire year's discharge of the Laramie River; the Sunnyside Canal of Washington, which when built traversed 60 miles of sagebrush solitude, are illustrations in three States of the nature of corporate contributions to irrigation development. Even in Utah, cooperation was not sufficient to reclaim all of Salt Lake Valley. For forty years the table-land north of the lake, one of the largest and best tracts of irrigable land in the valley, remained unoccupied, while the sons of the pioneers were compelled to seek homes in the surrounding States. To reclaim this land, a canal had to be carried for 3 miles along the precipitous sides of Bear River Canyon. The flow of the river had to be controlled by an extensive dam and the Malad River twice bridged by long and high aqueducts, and the million-dollar outlay required was more than home seekers could provide.

The creation of water-right complications came with the building of corporate canals. Previous to this it had been the rule for those who built ditches to own the land they watered, and there was little difference as to whether the right to water went with the ditch or with the land, because the ownership of both was united in the same person. But when companies were organized to distribute water for others to irrigate with and to derive a revenue from water rentals, there arose the question as to who was the owner of the right to the water diverted—the company transporting the water or the farmer who used it. The laws of nearly all the Western States make the ditch owner the appropriator. This has created a divided ownership of land and water, and many canal companies have framed water-right contracts on the theory of absolute ownership. These have proven a source of constant irritation to farmers. Some of these contracts require the farmer to pay, at the outset, a royalty or bonus for the "right" to receive water, the charge for this right varying from \$5 to \$500 per acre, depending on the scarcity of the water supply or the value of land and its products. There is a very prevalent feeling among farmers that as they are the actual "beneficial users" of the stream, they should be considered the appropriators, or at least that the owner of the land should share with the owner of the ditch in the right to water.

### OBJECTIONS TO CORPORATE CANALS.

Having dealt with the benefits derived from corporate investments in irrigation works, it is now proper to point out their defects. The most serious one is that nearly all large canals have been losing investments. The record of these losses is so stupendous that it is reluctantly referred to. A single enterprise in one of the Territories represents to its projectors a loss of over \$2,000,000. The Bear River Canal, in Utah, which cost over a million dollars, was recently sold under a judgment for about one-tenth of this sum. A single canal in California represents a loss to its builders of over \$800,000. These are not isolated cases. Similar instances might be multiplied indefinitely. They are not due to bad management, to dishonesty, or faulty engineering. Some of the worst failures in a financial sense have been handled by the brightest and most experienced men in the West, but they were not able to make their enterprises pay, that is, they have not paid their builders. Nearly all have been a success so far as the section interested was concerned, but the benefits have gone to the public and not to the investors. The reasons for this should be more generally understood. The following are the most important:

(1) The necessarily long delay in securing settlers for the land to be irrigated and in obtaining paying customers for the water to be furnished.

(2) The large outlay and several years of unprofitable labor required, as a rule, to put wild land in condition for cultivation. Settlers of limited means can not meet this outlay and in addition pay water rentals. Nearly all of the settlers on arid public land are men of

limited means; hence, canal companies have at the outset to furnish water at small cost, or furnish to a small number of consumers.

(3) The unsuitability of the public-land laws to irrigation development.

(4) The acquirement of the lands to be reclaimed, in many instances, before canals are completed by nonresident or speculative holders, who would do nothing for their improvement.

(5) Expenses of litigation. Experience has shown that in the estimates of cost of a large canal provision should be made for a large and long-continued outlay for litigation. It begins with the adjudication of the stream and is protracted through the controversies over water rights.

### WATER-RIGHT PROBLEMS OF THE ARID REGIONS.

After this brief sketch of the beginnings of American irrigation, some of the lessons of which will be considered at a later point in this article, we may appropriately turn to the great arid region as a whole and the complex legal, economic, and social problems with which its agriculture will vex the future.

Mount Union (Pl. LVI, fig. 2) rises in solemn grandeur in the Wind River Mountains of Wyoming south of Yellowstone Park. From this peak flow three streams, which, with their tributaries, control the industrial future of a region greater than any European country save Russia, and capable of supporting a larger population than now dwells east of the Mississippi River. These streams are the Missouri, the Columbia, and the Colorado. The first waters the mountain valleys on the eastern slope of the Rockies and the semiarid region of the Great Plains; the second, the Pacific northwest, including part of Montana, all of Idaho, and the major portions of Oregon and Washington; the third, the Southwest, embracing much of Utah and western Colorado, parts of New Mexico and California, and all of Arizona.

In this vast district, when reclaimed, homes may be made for many millions of people. To effect this result is a task inferior to no other in the realm of statesmanship or social economics. It is the nation's farm. It contains practically all that is left of the public domain, and is the chief hope of a free home for those who dream of enjoying landed independence, but who have but little besides industry and self-denial with which to secure it. As it is now, this land has but little value. In many places a township would not support a settler and his family, and a section of land does not yield enough to keep a light-footed and laborious sheep from starving to death. This is not because the land lacks fertility, but because it lacks moisture. Where rivers have been turned from their course, the products which have resulted equal in excellence and amount those of the most favored district of ample rainfall.

There are only 6,000,000 acres of cultivated land along the Nile. It is all irrigated. Where there is no irrigation there is desert. This little patch of ground has made Egypt a landmark in the world's history. It supports over 5,000,000 people and pays the interest on a national debt half as large as our own. The Missouri and its tributaries can be made to irrigate three times the land now cultivated along the Nile.

The essence of the problem to be met at the outset is the control and distribution of the water supply, since not only the enduring prosperity but the very existence of the homes created will be conditioned upon the ability to use these rivers for irrigation. The diverse interest of individuals and communities, and even of different States, will all be dependent on streams flowing from a common source. To reclaim all the land possible will involve the spreading of water over a surface as large as New England with New York added. Standing now at the birth of things and looking down the vista of the future, we can see in the course of these rivers the dim outline of a mighty civilization, blest with peace and crowned with a remarkable degree of prosperity, in case wise laws and just policies shall prevail in the years of the immediate future while institutions are forming. But if it be otherwise, if greed and ignorance are allowed to govern, and we ignore the experience of older countries than ours, there will remain to us only a gloomy forecast of legal, economic, and, possibly, even civil strife.

## THE APPEARANCE AND RESOURCES OF THE ARID REGION.

In discussing this phase of the subject, let us follow the Missouri, Columbia, and Colorado rivers in their lonesome courses through mountains, plain, and desert to the place where one joins the Mississippi, where another mingles its waters with the Pacific, and where a third flows into the Gulf of California. For it is not only interesting but important to see in the midst of what surroundings so large a future population must dwell, and upon what other resources than water and land it will rear its economic edifice.

The climate of the western half of the United States takes its chief characteristic from its aridity, or dryness. The heat of its Southern summers and the cold of its Northern winters are alike tempered and mitigated by lack of humidity. Neither the humid heat which prostrates nor the humid cold which penetrates to the marrow is known in the arid region. The Western mountains and valleys are a recognized natural sanitarium where thousands of invalids are sent each year by physicians to regain their health.

The dominant feature in the physical appearance of the arid regions is its mountain topography. On every hand a rugged horizon meets the view. From North to South, from Canada to Mexico, the Rocky Mountain Range makes the backbone of the continent. Along the

Pacific coast the Sierra Nevada and Cascade ranges lift their barriers to intercept the moisture and condense it into snow. Between these two principal chains, with their connecting ranges and outlying spurs, are many minor systems, so that the whole country is a succession of mountains and valleys, of forests and deserts, of raging torrents and sinuous rivers winding to their sinks upon the plains or making their difficult way to the distant ocean. The far West is thus a land of the greatest scenic beauties, and widely celebrated as such.

The cultivable lands lie in the valleys, rising with gradual slope on either side of the streams to meet the foothills. Narrowing to the mountains, these valleys widen as the river loses grade and approaches the sea or its confluence with a larger stream. There are valleys which will accommodate hundreds, others, thousands or tens of thousands, and a few, like the Sacramento, in California, where millions may dwell.

In the eastern portion of the arid region, and in high altitudes farther west, the land is covered with nutritious natural grasses, which furnish ideal range for live stock. But the characteristic badge of the region is the sagebrush. This brave plant of the desert is commonly held in derision by those who behold it for the first time, and until they learn to know it as the shelter and dependence of range live stock when the terrible blizzard sweeps from the north and as the sure indication of good soil and the humble prophet of the field, orchard, and garden. Thus, it happens that to the casual traveler the appearance of the region is forbidding. It is only in localities where the work of reclamation has been in progress long enough to permit the growth of trees, with farms and homes, that the value of the soil and climate can be appreciated. There are such instances in all the seventeen States and Territories of the far West. One of the most striking is the Salt River Valley of Arizona. Here the traveler, after a long and tiresome journey through waste places, finds himself suddenly confronted with homes rivaling in taste and luxury those of Eastern States, and with orchards and gardens which resemble more the century-old gardens of France and Italy than a creation of the last twenty years.

Similar instances are the San Bernardino Valley of southern California, the Salt Lake Valley of Utah, and the Boise Valley of Idaho.

### MINERAL WEALTH OF THE ARID REGION.

Another fact which contributes to the breadth of the economic foundation of Western agriculture is the variety and value of its mineral wealth. In this it is richly endowed, not only with the precious metals, but with the baser ones used in arts and industries, and with unusual quantities of coal, ore, and building stone, the latter of which includes many rare and valuable kinds, such as marble, onyx, and agate.

While the annual value of these products runs into the tens of millions of dollars, it is literally true that their development is yet in its infancy. With the extension of railroad facilities, the improvement and cheapening of mining processes, the extension of agriculture, and consequent increase in the volume and decrease in the cost of the home food supply, the gain in annual production will assume in the future dimensions which would now be considered beyond belief.

### SOURCES OF FUTURE PERMANENT PROSPERITY IN THE ARID REGION.

To the mines must be added the forests which clothe the mountain sides, especially those of the northern part of this region. To a large extent this is still virgin ground, where only the foot of the hunter and explorer has trodden. It is a region unrivaled in its opportunities for the development of water power. The Shoshone Falls in Idaho are scarcely inferior to those of Niagara. The hundreds of streams which fall from the 10,000-foot level of the Rocky Mountain Range to the 4,000-foot to 5,000-foot level of the plain at their base are destined to turn more wheels of industry than have yet been harnessed west of the Mississippi River. Back of the irrigated lands are the grazing lands, of which there are probably not less than 400,000,000 acres. These lands have been the dominant factor of the pioneer life of many of the arid Commonwealths, and they are destined, under proper management, to always constitute the great nursery of cattle, sheep, and horses. The irrigated farm has back of it the mine, the furnace, and factory, and the civilization of Western America can not fail to have a prosperous and varied industrial life. Here there can be no one-sided development, no community exclusively devoted to the production of corn, wheat, or cotton, to manufactures, or to commerce. The farm, the stock ranch, the lumber camp, the mine, the factory, and the store are destined to grow up and flourish side by side, each drawing support from and furnishing sustenance to the others.

### PRESENT AND FUTURE OF IRRIGATION.

The present situation, the results secured, and the tasks ahead in securing a wise disposal of the arid lands and in preventing the rivers from becoming an instrument of monopoly and extortion, will now be considered.

We are met at the outset by an entire absence of definite information. We do not know, nor is there any ready means of determining, how many irrigation works have been built. In many States no provision is made for their record. In only two States is this record even measurably accurate or complete. There may be 75,000 completed ditches, or there may be double the number, but either as to their number or as to the number of acres of land reclaimed thereby there is only surmise and conjecture. This, however, is known, that the highest priced and most productive farm lands on this continent are in the arid region; that the largest yield of nearly every staple crop has been obtained by the aid of irrigation; that not only has the growth of agriculture furnished a market for the factories of the East and supported the railroads which unite the two extremes of the country, but it is the chief resource of nearly every one of the arid States. Colorado leads all the States of the Union in her output of precious metals, but the value of the product of her farms is nearly double that of her mines.

In California it is the grain fields and orange orchards which support the majority of her industrial population and furnish the basis for her future material growth and prosperity. The beginnings of Utah were wholly agricultural, and without the irrigated farms the cities of that interior Commonwealth would as yet be only a dream. In a less striking degree the same condition prevails in Idaho, Wyoming, Montana, New Mexico, and Arizona. This is the situation, while irrigation is as yet in its infancy. The reclaimed areas, though making a large aggregate, look very insignificant relatively to the rest of the country when delineated upon a map of the arid region. The possibilities of reclamation have but begun to be realized, yet when every available drop of water shall have been applied to the soil the irrigated lands will constitute a comparatively small proportion of the entire country. The possibilities of irrigation are, however, to be measured not alone by the possible extent of the agricultural industry, but by the development of other resources which it will make feasible. The best and largest use of the grazing lands, the utilization of the forests, the development of mines and quarries, and the maintenance of railroads and commerce in the western half of the United States, all hinge upon the control and use of streams in connection with the fundamental industry of agriculture. Since irrigation is essential to agriculture in the arid States, the extent and character of its development must surely measure the superstructure to be built upon that foundation.

### GROWTH OF IRRIGATION AND NEED OF BETTER LAWS.

Some of the beginnings of irrigation have been referred to. The details of its growth can not be dealt with. It has been crude in many ways. There has been no attempt to provide for the diversion of rivers according to some prearranged plan having for its object the selection of the best land and the largest use of the water supply. Instead, each appropriator of water has consulted simply his ability and inclination in the location of his head gate. There has been an almost complete failure to realize that the time was coming when on many streams the demand would exceed the supply, and that a stable water right would be as important as a valid land title. The laws passed for recording claims are, as a rule, so loosely drawn and imperfect that they would be a source of amusement if the evil results of their operation were not so disastrous. More than half of the State laws provide for inaugurating a title to water by posting a notice on the banks of the stream. They have not aided the proposed appropriator, because the right to post other appropriations was unrestricted. They are of no use as a warning to others, because not one in ten thousand of the parties concerned ever see them. A search for these notices along the cottonwood borders of the Missouri and its tributaries would be the unending labor of a lifetime; hence, the requirement was and is ignored; it is another of the many influences tending to unsettle irrigators' just rights and bringing the attempts to frame laws for their protection into disrepute.

Looking over the field at the close of the century, we find that the United States stands practically alone among irrigation countries in having left all the work of reclamation to the unaided efforts of private capital, and in the prodigality of the surrender of public control of streams. In one respect the policy pursued has been successful. It has resulted in an enormous investment (not less than $100,000,000, and some estimates make it twice that sum) and the creation of taxable and productive wealth of many times the amount invested. We have now about reached the limit of this sort of growth. There will be few large private investments in canals hereafter until we have better and more liberal irrigation laws. Entrance on the coming century is confronted by larger problems; the storage of flood waters, the interstate division of streams, and the inauguration of an adequate system of public control, which will insure to the humblest handler of a shovel his share of the snows falling on mountains above his farm, no matter how far removed therefrom he may be.

### NEED OF REFORM IN THE MANAGEMENT OF ARID PUBLIC LAND.

Along with better water laws should come a corresponding reform in the management of the remaining arid public land. At the outset of its settlement these problems were entirely new to English-speaking men.

Early settlers came from the humid portions of Europe and settled along the humid coast line of the Atlantic and, later, in the humid valleys of the Ohio and Mississippi rivers. The land laws which they applied to the public domain of their day produced excellent results, making homes for millions of people and effecting a wonderful development of material resources.

When settlement had proceeded under these laws to the Missouri River and beyond, it was not strange that their principles were extended to the remaining public domain, for the vast majority of the American people had no conception whatever of the conditions existing in the far West. Not only the national lawmakers, drawn mostly from regions of abundant rainfall, but the legislators in the arid States themselves were blind to the necessities of the situation. The value of gold they knew, but the value of that other element of national wealth, which will continue to sustain vast populations long after the last ounce of gold shall have been taken from the mine, they did not even dimly appreciate. So, to a large extent, they merely reenacted upon their statute books the common law of rainy and foggy England.

### HOMESTEAD LAW NOT ADAPTED TO THE ARID REGION.

The homestead law may have served a useful, even a beneficent, purpose throughout large sections of the Republic, but it is not adapted to the settlement of a region where practically nothing can be grown except by artificial application of water. This fact has been learned at last through many years of hardship and disappointment, at the cost of many million dollars. One of the most pitiful pages in the history of the West is that which records the story of the settlement of the semiarid belt lying between the ninety-seventh meridian and the foothills of the Rocky Mountains. This is a territory 500 miles wide, extending from Canada to Mexico, including the western portions of the two Dakotas, Nebraska, Kansas, and Texas, and also eastern Colorado. In the absence of scientific demonstration to the contrary, tens of thousands of people rushed into this territory under the delusion that it was a land of reliable rainfall, or would soon become such as the result of settlement and cultivation.

New settlements sprung up in every direction, and important towns arose almost in a night. Men hastened from all parts of the country to claim their rights under the homestead law. Remembering the prosperity which similar armies of settlers had wrung from the virgin soil of the West, unlimited capital lent willing support to this new outward surge of growing population. The capital was largely lost, but the pathetic side of the picture was seen in the bitter disappointment of the settlers themselves. Many of them wasted the most useful and pregnant years of their lives in their brave persistence in the belief that the climate would change as the land came under cultivation, and that there was some magic potency in the homestead law to overcome the processes of nature. It is recognized at last that where water sufficient for purposes of irrigation can not be had the land is useful only for grazing. It is a mistake for the Government to offer to citizens land of that character on condition that they will settle upon 160 acres of it and make a living. There can be but one of two results—either the settler must fail or he must become practically the tenant of the person or corporation furnishing water for his dry land.

### OPERATIONS OF THE DESERT-LAND LAW.

The desert-land law was devised to promote the investment of capital rather than to encourage settlement. For this reason it did not require actual residence on the land reclaimed. Originally, whoever would irrigate 640 acres of land was given title thereto on the payment of the Government's price. Later this acreage has been reduced to one-half the original area. The operation of this law has been both useful and injurious. To give so large an area to men of small means is a mistake, because it is more than is needed to make a home and more than they can cultivate. It is not suited to corporate enterprise, or to reclaim large valleys which can be watered from a single canal, because it makes no provision for concerted or effective management of the entire area. Its field of effective usefulness has therefore been limited. While it has added somewhat to the taxable and productive wealth of Western States, it has also operated to transfer to single owners miles of water fronts which without this law would have been divided up into smaller farms with better social and agricultural conditions.

### THE CAREY ACT.

What is popularly known as the Carey Act, from the name of its author, Senator Carey, gives to each State the right to segregate 1,000,000 acres of land and to control both its reclamation and disposal to settlers. The limitations of the operations of this act confine its benefits simply to the opportunity to secure better management during the time of canal building and settlement. Five States have accepted the trust, but in only one, Wyoming, have any canals been completed. These canals have been built by companies operating under a contract with the State. In Montana it is proposed to construct State canals from money obtained by selling bonds secured by the land to be irrigated. Enough progress has not as yet been made to determine whether or not this innovation on past irrigation methods is to meet with success; if it does, the third step in the evolution of canal building, which is the construction of State works, will have been inaugurated.

### INFLUENCE OF THE RANGE INDUSTRIES.

To a certain extent there is an inevitable conflict between those who wish to use the public domain for homes and those who prefer to have it reserved for pasture, and, again, between those who wish to use the pasture for cattle and those who want it for sheep.

The range industries obtained possession of the field long before the higher utility of the lands for irrigation and settlement was generally appreciated. When irrigators did come, they worked more or less injury to the range stockmen, for each settler occupied a part of the water front and added to the number desiring to use the free grazing land. It is for the interest of the range-stock industry that access to streams be made as free as possible and that nothing be done to reduce their volume or prevent the overflow of natural meadows, while the higher interest of irrigation and settlement demands that the stream be diverted and its waters distributed over the widest possible area. The conflict is between the wasteful use of water on the one hand and its economical use on the other, and, in a sense, between a primitive and a more highly organized civilization.

This statement should not be construed as denying that the range-stock industry is of vast importance nor that it will continue to be a great source of wealth to the country. Throughout the West there are very large areas suited to nothing else. The point is that the higher interest of society lies in the most economical and profitable use of water to the end that homes may be made for the largest possible number. Neither water nor land laws have favored this result, but precisely the contrary. The object of reform should be to preserve and develop all interests, to adapt laws and institutions to the peculiar conditions and environment of the region. This can be done with far greater security to the pastoral industries than they enjoy under the present system, and at the same time land and water available for making homes and farms utilized to the best advantage.

### UNCERTAINTY AS TO STATE AND FEDERAL JURISDICTION.

The pioneers of irrigation are menaced by the uncertainty which exists as to the limits of State and federal jurisdiction in the control of streams. It has heretofore been assumed that the authority of each State within its borders was unquestioned, and two of the States contain constitutional provisions asserting absolute ownership and control of all the waters within their bounds. A recent decision of the United States circuit court in Montana holds this view to be erroneous, and that the snows which fall on public land and the streams which cross it are both under the control of Congress. A similar complication has arisen in litigation over a reservoir on the Rio Grande, in which both interstate and international rights are involved. In this case the United States Supreme Court has asserted the right of the General Government to protect the interests of navigation regardless of State statutes respecting the use of water in irrigation. The assertion of the paramount importance of riparian rights and of the protection of navigation, regardless of the use of water in irrigation, will add greatly to the uncertainty regarding water rights from the tributaries of the Missouri or any other of the rivers navigable in any portion of their course. The reclamation of the arid region involves the absorption of streams, and it can not be settled too soon whether or not such absorption is to be permitted.

### COMPLICATIONS FROM LACK OF UNIFORM WATER LAWS.

On the other hand, serious complications have arisen from the absence of any general or national regulations governing the division of water across State lines. There are many instances where one stream is a common source of supply to irrigators in two or more States. It has sometimes happened that the perennial flow of such streams has been first appropriated in a State along its lower course and utilized at a later period by other States near its source. Neither of the States concerned possesses power to remedy the evil, and each makes claim to all the water flowing upon its soil.

The conditions which govern irrigation throughout much of the arid region are practically uniform, and where this is true there is no question that a uniform irrigation law would operate with equal justice and efficiency; but, owing to the absence of such general supervision, water rights in States adjacent to each other are often as different in character as if these Commonwealths were on opposite sides of the globe. Failure to correct or regard these complications aggravates the evils to which they give rise and renders the ultimate adoption of a uniform system of laws far more difficult. There is but one thing the States have shared in common, and that is endless litigation over water rights. There is no uniformity of laws or decisions. The same issues are tried over and over again, and the precedent established in one case is overturned in another. The construction of costly works, and even the long use of water, has not always been sufficient to secure parties in their rights. Where rights have been successfully maintained, it has been done only at the price of constant lawsuits.

Usually the amount of water claimed is many times in excess of what the projected canal can utilize; frequently in excess of the entire volume of water in the stream. There is no one to protect the public interest as to the character of works to be built or to say whether they conform to good public policy. The courts confirm these loose appropriations, and the foundation for endless litigation is thus securely laid. The question soon arises as to who first appropriated the waters which do not suffice for all. There is then nothing to fall back upon except the faulty filings which were originally posted on the banks of the stream and the testimony of interested citizens. It frequently happens that old claims for very large amounts of water have not been utilized to their full extent until later comers have appropriated the unused surplus. The old claim is then enforced at the expense of the later one. The result is confusion, loss, and bitterness among neighbors.

The difficulty lies, first of all, in popular misconception regarding the nature of water rights and of property in water. This is enhanced by lack of scientific information concerning the character and extent of water supplies and of the amount required for beneficial irrigation. Still further, there is a great need for a different system of appropriating waters and of distributing a common supply among consumers. These delicate and complex issues can not be fought out among private parties without producing a condition of virtual anarchy, in which the weak must go down and the strong survive, regardless of their merits or necessities. The failure of the irrigation industry from the financial standpoint is almost wholly due to the illogical land and water laws which have been described.

### METHODS AND MEASURES NEEDED TO DEVELOP THE ARID REGION.

It is well to consider now by what methods and by what measures of legislation the splendid resources of the arid region may be opened to development.

The first step is to determine the proper control and just distribution of the water supply. The problem varies with different portions of the arid region. In the South, streams are generally torrential in character, furnishing the bulk of their waters in heavy floods, which must be stored in the many natural sites available in the mountains at a distance from the places where the water is to be applied to the soil. In the North, on the other hand, the problem is not that of storage, but of the diversion of great rivers like the Yellowstone, the Snake, the Columbia, and the Missouri. Here works adequate to the reclamation of the areas of arid land which remain can only be built at great cost, rivaling those along the Ganges and the Nile.

Before such development proceeds further it is desirable that some common agreement should be reached concerning the true character of water rights. The idea of private ownership in water apart from the land can not prevail without creating institutions essentially feudal in character. A water lord is even more undesirable than a landlord as the dominant element in society. It is indisputable, as has already been said, that the man who owns the water practically owns the land. A proposition which contemplates the turning over of all the land to a private monopoly, thus making a tenantry of those who may have their homes upon it in the future, could not hope to command popular support. But the idea of a private ownership of water, amounting to a virtual monopoly of this vital element, has been permitted to grow up in the West. To a certain extent it has obtained recognition in legislation and protection in judicial decrees and decisions. In other countries the doctrine has largely disappeared, and in our country it should give place to a more enlightened conception, and to the only principle that can safely be adopted as the foundation of the agricultural industry in the West.

The right to water which should be recognized in an arid land is the right of use, and even this must be restricted to beneficial and economical use in order that the water supply may serve the needs of the largest possible number. Ownership of water should be vested, not in companies or individuals, but in the land itself. When this principle is adopted, the control of the water is divided precisely like the land, among a multitude of proprietors. Reservoirs and canals are then like the streets of the town, serving a public purpose and permitting ready access to private property on every hand. Water monopoly is impossible under this method, and no other abuse is encouraged by it. Years of painful experience have abundantly proven that peaceful and orderly development can not be realized except as water and land are forever united in one ownership and canals treated merely as public or semipublic utilities rather than as a means of fastening a monopoly upon the community. In Wyoming and Nebraska the true principle has already been adopted by the State boards of control and put into practice with the best results. If it can be maintained and speedily extended to the other States, as it surely must be in time, it would mark an economic reform of the highest significance in the life of the West.

### APPROPRIATION AND DISTRIBUTION OF THE WATER SUPPLY.

Next in importance to the correct solution of the question of water ownership are the great problems of appropriation and of distribution. As soon as possible all ditches used in irrigation should be carefully measured by some public authority and the results of this measurement be given the widest publicity, in order that irrigators may know approximately how much is taken and how much remains to be taken by new canals. The need of this information is so obvious that it will perhaps be difficult for readers unfamiliar with the subject to credit the assertion that in all but four of the Western States the matter has been wholly neglected. This fact is largely responsible for the disheartening litigation which prevails so widely.

It is of almost equal importance to have a scientific determination of the practical duty of water, showing the amount required for different soils and crops. Still further, there must be some form of public control in the distribution of water. Trouble always results when this is left to rival users to determine how much they need, especially in years of partial drought, when the supply may be insufficient for all, and it is consequently necessary to recognize appropriations in the order of their priority.

(Check gates on main canal and a measuring weir are shown in Pl. LVIII.)

### PUBLIC SUPERVISION AND CONTROL OF IRRIGATION.

The entire discussion leads up to one inevitable conclusion: This is that irrigation, over and above all other industries, is a matter demanding public supervision and control. Every drop of water entering the head gate, and every drop escaping at the end of the canal, is a matter of public concern. The public must determine, through constitutions and statutes, the nature of water ownership. The public must establish means for the measurement of streams and for ascertaining how much water may be taken for each acre of land under the principle of beneficial use. The public must see that justice is done in the distribution of water among those who have properly established their rightful claims to it. We have thoroughly tried the method of

FIG. 1.—A CHECK AND LATERAL GATE ON MAIN CANAL.

FIG. 2.—A CIPPOLETTI MEASURING WEIR.

leaving all this to private initiative and management, and, along with magnificent material progress, we have reaped a large crop of deplorable financial results.

While much must be left to the action of States and communities, there is still a wide field for national effort. Only the nation can legislate as to the public lands and reform the abuses which have been referred to in connection with the present system of land laws. There is a strong popular demand in the West for legislation providing public aid in the construction of works of too great magnitude and cost for private enterprise and a growing belief that one of two things should be done: Either the arid States should be placed in a position to extend this aid, or the General Government should extend the work it is now doing in the reclamation of certain Indian reservations to the reclamation of the unoccupied public lands. One policy much discussed and widely favored is legislation which will permit of the leasing of the public grazing lands for a term of years at a small annual rental, the proceeds to be given to the several arid States and applied by them to irrigation development. If this is carried out, the settlers owning the contiguous irrigated land should be favored; the object being to unite with the lands reclaimed a certain portion of the public pasture.

The National Government alone can make the best and broadest study of the various economic questions related to the development of agriculture on arid lands. This includes not only the measurement of streams and survey of reservoir sites, but also a consideration of practical methods of applying water to the soil and of social and industrial institutions adapted to the environment of the arid region. The nation alone can deal with the conflicting rights in interstate and international streams and with the construction of great reservoirs at their head waters, with a view to benefiting the several States lying along their course. The National Government is already active along all these lines, and the field for the expansion of its efforts is wide and inviting.

## INFLUENCE OF IRRIGATION UPON PEOPLE AND COUNTRY.

While a description of existing conditions in the far West necessarily includes references to many evils and disappointments, there is a brighter side to the picture, and the future is luminous with new hopes for humanity. A vast population will make its homes in valleys now vacant and voiceless, yet potentially the best part of our national heritage. They will create institutions which will realize higher ideals of society than the world has yet seen. Irrigation is much more than an affair of ditches and acres. It not only makes civilization possible where men could not live without it, but it shapes that civilization after its own peculiar design. Its underlying influence is that which makes for democracy and individual independence.

### IRRIGATION PRODUCTIVE OF SMALL PROPRIETORS.

Where land can only be cultivated by means of the artificial applition of water, and where that water is not under speculative control, it is owned in small holdings. This is so because irrigation intensifies the product of the land and so demands much labor. It is a kind of labor which can not profitably be left to hired hands. The result is a multitude of small proprietors working for themselves. This fact is strikingly illustrated in southern California. Here the farms are small and almost exclusively occupied by their owners. But the great wheat ranches in other parts of the State, notably in the Sacramento Valley, depend chiefly upon hired laborers, who make no homes of their own. The Sacramento Valley has less population now than it had twenty-five years ago. Of the increase of the rural population of the State between 1880 and 1890, 77 per cent went to the irrigated counties, and largely consisted of families who bought small farms and proceeded to do their own work. The influence of a great mass of small proprietors tilling their own land can not fail to have a very marked effect upon the character of the institutions.

### DIVERSIFIED FARMING A FEATURE OF IRRIGATION.

Irrigation lends itself naturally to diversified farming and tends to make population self-sufficient within itself. Although in certain localities, especially those where the climate is favorable to raisins and oranges, the contrary has sometimes been true, the tendency of irrigation as a whole has been to discourage the production of single crops and make families independent by producing the variety of things they consume. This tendency is steadily gaining ground. The diversified farming which irrigation both permits and encourages will be an important element in contributing to the independence of the people who shall inhabit the arid region of the future.

### IRRIGATION AS A TRAINING IN SELF-GOVERNMENT.

Another interesting feature of irrigation is the training it gives in self-government. A farmer under irrigation can not remain ignorant and indifferent of public questions. He has to consider his interest in the river which feeds his canal and the nature of his relation to other users along its course. It is a training school in self-government and gives the first impetus to civilization in rainless regions. The capacity of the American farmer has already been demonstrated. He is the author of the best of our irrigation laws. Colorado was the first State to enact a law providing for the public control of streams and some sort of systematic procedure for the establishment of rights, but the credit of that is not due to her statesmen, but to the discussions of the Greeley Lyceum and the public spirit and independence of the irrigators under the Colony Canal. Opposed by the conservatism of the legal profession and the prejudices of those not practically familiar with the subject, they had a long and doubtful struggle to secure the adoption of a statute which for a time made the State the lawgiver of the arid region.

In Utah the practices of water users are a hundred years in advance of the State laws. This is due to the fact that irrigators recognize insensibly the community nature of their interest in the streams. The old feudal idea of private ownership in water has never made an irrigated district prosperous, and it never will.

### IRRIGATION AND COOPERATION.

Another feature is the tendency toward cooperation. Under the Wyoming law accepting the Carey grant this cooperation is made obligatory. Every settler under a canal becomes a shareholder therein. Not only does the right to water attach to the land, but a share in the canal sufficient to carry the water also goes with it. In fact, the need of watering many farms from a common source and of organizing a community under rules and discipline for the distribution of the supply make a nursery of cooperation. Its most conspicuous manifestation is in the widespread and successful fruit exchanges of California. There are many instances of smaller and more local organizations of a cooperative industrial character, and they are multiplying rapidly. They seem likely to deal with yet larger affairs in the future as communities gain in age, numbers, and wealth.

### EFFECT OF IRRIGATION ON SOCIAL LIFE.

Heretofore one of the evils of the irrigated home has been its isolation. The valleys of many streams are narrow. The broad areas which lie between these valleys are the home of cattle and sheep, but not of men. The Anglo-Saxon thirst for land, and the opportunity which the desert-land act gave to gratify it, resulted at first in a wide separation between homes, and in a loss to the pioneer of the advantages of schools, churches, and social life. Under the larger and later canals the tendency has been in the other direction. The European custom of making homes in village centers has been adopted in parts of Utah, Wyoming, Idaho, and California, and steadily gains in public favor. Where farmers live in villages, their families enjoy ready access to schools, churches, libraries, and entertainments. The agricultural society of the future in the Western valleys will realize a happy combination of town and country life—the independence which springs from the proprietorship of the soil and the satisfaction of the social instinct which comes only with community association. Such conditions are favorable to the growth of the best forms of civilization and the noblest institutions. This is the hope which lies fallow in the arid valleys of the West. Its realization is well worth the struggle which is impending for the reform of our land and water laws, and which will impose high demands upon our statesmanship and call for the exercise of the best order of patriotism.

### THE COMMERCIAL IMPORTANCE OF IRRIGATION.

The commercial importance of the development of irrigation resources is being realized in the West at the present time as never before. Especially in California there is a new awakening, and an effort on the part of the best elements of citizenship to remove the obstacles which have formerly hampered both public and private enterprise. The East, as a whole, is beginning to realize the great part which the West is to have in the events of the twentieth century. World-wide forces are working to hasten the day of its complete development and of the utilization of all its rich resources. The Orient is awake and offering its markets to the trade of the Pacific coast. With the development of this trade there will come an impulse for the completion of the material conquest of arid America by the enlistment of public as well as private means in the storage and diversion of its streams for the irrigation of its hundred million acres of irrigable soil; the harnessing of its water powers to mill and factory wheels; the crowding of its pastures with new millions of live stock; the opening up of its mines and quarries; the conversion of its forests into human habitations; the coming of a vast population, and the growth of institutions worthy of the time and the place.

# SUCCULENT FORAGE FOR THE FARM AND DAIRY.

By Thomas A. Williams,
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## EARLY FORAGE CONDITIONS.

In the early years of the settlement of this country the farmers found no difficulty in securing plenty of forage from the native grasses for the few live stock they possessed. The supply was abundant for their every need (in fact, seemed unlimited), and little thought was given to the cultivation of crops designed especially for forage purposes. If anything was needed in addition to the native grasses, the lack was more than supplied by the waste or roughage from the various garden and field crops, such as beans, peas, turnips, and cabbage.

As the country became more thickly populated, and a greater proportion of the land was brought under cultivation, the native forage supply was reduced. Furthermore, with the advance of agricultural industries came better methods of caring for stock, and gradually it became necessary to devote some of the cultivated land to the production of forage crops. At first these crops were grown for pasturage or for hay, but with the development of the dairying industry came the demand for succulent feed to keep up the flow of milk in cows during the season of drought in summer and autumn, when pasturage became reduced, and during the winter, when the fresh pasturage was cut off entirely. The supplying of succulent feed for these two seasons presented very different problems.

On the one hand, it was necessary to provide crops on the approach of the droughty season and to arrange for a succession of these while it lasted, the feeding being done from the field or by pasturing off directly; on the other hand, it was not only necessary to grow and harvest the supply of forage for winter, but it must be preserved in such a manner as to be ready for use at the proper time. In the South the problem was less difficult than in the North, since, owing to the climatic conditions, it was possible to secure fresh feed for at least a large portion of the late fall and winter by the use of winter rye, oats, and other so-called winter annuals. Naturally, root crops were among the earliest grown for the purpose of supplying succulent feed for the fall and winter, since they were already extensively grown for this purpose in the Old World. Although these crops have received considerable attention from farmers in different parts of the country, and their cultivation for forage has been at times quite general in certain sections, they have never assumed the place in American agriculture that they occupy in England and other parts of Europe, and it is doubtful if they ever will do so. The reason for this may be found in part in the different conditions under which agriculture has developed in this country, but principally in the fact that corn, one of our standard crops, so readily takes the place of root crops in the farm rotations and is adaptable to use in so many ways as a food for stock. Then, too, the advent of the silo gave the American farmer a means of preserving this crop for an indefinite period in a most satisfactory condition for feeding to all kinds of live stock.

## PRESENT METHODS OF PRODUCING SUCCULENT FORAGE.

In the United States succulent food is in the main at the present time provided by means of soiling crops, temporary or annual pastures, and silage.

The crops that are most valuable for the production of succulent forage comprise coarse, quick-growing plants that draw their nourishment largely from the atmosphere and produce relatively large amounts of foliage. They are much less exhausting to the soil than grain and other so-called money crops, and include most of the best soil renovators.

## THE PLACE OF SUCCULENT FORAGE CROPS ON THE FARM.

Just as it must be generally admitted that a system of diversified farming is preferable for the country at large, so it must be agreed that succulent forage crops may be made to form a very important part in the rotations to be followed in practicing such a system. These crops can usually be grown in such a manner as not only not to interfere in any way with the regular yields of grain or other primary crops, but even to the great advantage of the latter on account of the direct beneficial effect which they may exert on the fertility of the soil. This is especially true of such leguminous crops as vetches, cowpeas, and crimson clover.

A strong point in the favor of growing crops for succulent forage lies in the fact that an increased number of stock may be maintained on a given amount of land and that the dairy products may be very materially augmented, both on account of the possibility of handling relatively larger numbers of milch cows and also of the greater returns that may be secured from each animal. This is of special significance in the older, more thickly settled portions of the country, as is also the fact that the keeping of this increased number of stock insures more manure for the land. This last is in itself an item of great importance in the maintenance of the fertility of the farm, and, taken in connection with the direct beneficial effects upon the soil of many of the crops grown for soiling and ensiling, is a most substantial argument in favor of giving these crops a regular place in plans of crop rotations.

Another point in favor of the growing of these supplementary forage crops is the fact that the general health of farm stock may be kept in better condition, especially in winter, by the judicious use of succulent forage, which serves as an appetizer and promotes the digestion generally.

GROWTH OF THE PRACTICE OF SOILING IN THE UNITED STATES.

In 1821 Thomas Massey, of Delaware, advocated soiling for the dairy, and urged the great value of corn as a forage crop.[1] In the same year a system of soiling was recommended by a prominent agriculturist, with the following crops in the order mentioned: (1) Grass, including clover; (2) oats; (3) indian corn; (4) cabbage, with the addition of turnip tops and trimmings from other root crops.[2] Other writers of this period speak of the value of corn for this purpose, and from the time that the Government first began to issue reports on the various crops grown in this country it has been regarded as the most important fodder crop. The reports for the early forties contain many references to its use for soiling as well as for cured fodder. Soiling seems to have been quite general about this time in the Eastern and Southern States, but in the then Western States of Ohio, Indiana, and Michigan it was said that "the pastures were too extensive for much to be done in soiling," although "corn was regarded as the best crop for this purpose." In Massachusetts and New York, where the dairying industry was largely followed, soiling was quite favorably regarded and its practice urged by the more advanced dairymen. In addition to corn, other crops, such as peas and oats, were grown, especially in Maine, where, according to the reports for the late forties and early fifties, the production of live stock and forage crops were matters of great commercial importance.

There has been but very little complete soiling practiced in the United States. Occasionally, where the acreage of land is limited, as may be the case in the immediate vicinity of the larger cities and towns, it has been found expedient to keep the animals confined in summer as well as winter and to supply green feed in the form of soiling crops. The general practice has been, however, to combine soiling with pasturing, using the former in a supplementary way only, the animals being allowed to run on the pasture a part of the time and receiving in addition a sufficient amount of freshly cut forage to keep them in proper condition.

One objection early urged against soiling was that the animals were not allowed sufficient exercise when complete soiling was practiced

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[1] American Farmer, May 25, 1821.
[2] Ibid., July 20, 1821.

and that their health was injuriously affected to a greater or less extent. On this account the system followed most generally in the United States is to be preferred. Complete soiling has been urged by some on the ground that under partial soiling stock is likely to become restless in the pasture in attempts to get at the soiling crops. This difficulty may be avoided, as a rule, by growing the crops at a distance from the pasture and feeding only in the barn or yard.

### TEMPORARY PASTURES.

Too little place is given to temporary pastures on the average American farm, but one effect of the recent periods of drought has been to turn attention more strongly to this method of producing forage. Often it is much more profitable to furnish stock with succulent food in this way than by soiling, the extra labor and expense of cutting the crop and hauling or carrying it to the feeding place being saved. It is not always possible to keep sufficient help on the farm to attend to the work of soiling properly, but by the use of the temporary or annual pasture the stock may be supplied with the desired feed and the permanent pastures brought safely through a droughty season, because of the lessened drain on their resources. True, this may not be the most economical manner of feeding succulent forage, owing to the waste from the trampling of the animals, but it is much better than keeping the stock on overgrazed pastures, both as regards the condition of the animals and the future productiveness of the pastures.

In certain parts of the country, notably in the Middle West and some sections of the South, this practice of sowing supplementary pastures has become much more common than formerly, partly because of the effect of drought on the yields of forage from the permanent meadows and pastures and partly through the increased demand for succulent feed arising from the growing interest in dairying and the increase of stock on farms heretofore largely devoted to the raising of cotton and grain.

In the main, the crops that are grown for soiling can be also used in these supplementary pastures, but there are certain varieties which are best adapted for this purpose. Among such may be mentioned rye, turf oats, sorghum, rape, vetches, field peas, millet, beggar weed, and bur clover.

### HISTORY OF THE PRACTICE OF ENSILAGE.

#### PIONEER ATTEMPTS AT PRESERVING FORAGE IN SILOS.

The first recorded American silo for the storage of fodder was built in 1875 by Dr. Manly Miles, who says he was led to make the experiment through the favorable reports made by farmers practicing this method of preserving corn and other forage crops in France. He used four small silos, two of which were filled with corn and two with the heads of broom corn. The results were most satisfactory, and Dr. Miles published an account of his experiments the following year.[1]

In 1876 attempts at preserving forage in silos were made by Messrs. Francis Morris, of Maryland, and C. W. Mills, of New Jersey. The results of Mr. Morris's trial were published the following year, and those of Mr. Mills in the Journal of the American Agricultural Association for 1881. Others followed in the footsteps of these pioneers, some with success and others with failure, and the subject was much discussed in the various farm journals. Occasional notices regarding this method of preserving forage had appeared in American journals as early as 1873, but all related to European practices. A great deal was added to the interest exhibited by American farmers through the translation of a French book on the subject, in which M. August Goffart described the method of ensilage followed by himself and others in France. It is interesting to note that while the work of M. Goffart undoubtedly had much to do with the spread of this practice in the United States, it was a German, Herr Adolph Reihlen, who first demonstrated the great value of corn as an ensilage crop. His experiments were carried on in the early sixties, and as a result the ensilage of corn was soon practiced in both Germany and France.

One of the most effective agents in advancing the claims of the silo was the ensilage congress first held in New York City in 1882, in which two days were devoted to the discussion of this method of preserving forage. The consensus of opinion at that time was expressed in the resolution, unanimously adopted by the congress, "that it has become a well-established fact by six years' successful use in this country, and by the concurrent testimony of many intelligent farmers, that the ensilage system is of great advantage to the farming interest and to all mankind."

The progress of this system of preserving forage was no doubt much hindered by the extravagant statements made by some of its early advocates. Practical farmers hesitated to adopt it because of the visionary character of these claims. However, the advocacy of Dr. Miles, Governors Price and Smith, and Messrs. Morris, Mills, Sprague, Brown, and other men prominent as scientific and practical farmers was proof conclusive that there were advantages to be gained by the ensilage of certain forage crops. Here and there enterprising farmers and dairymen began to build silos, and gradually the practice was accorded a permanent place in American agriculture. Seven years after Dr. Miles made his first experiments a report was published by the Commissioner of Agriculture giving the results of the experience of ninety-one farmers and stockmen in different sections of the country, and while these included by no means all the silos that were built at that

[1] Country Gentleman, October 6, 1876.

time, the report is undoubtedly fairly representative of the practice of ensilage throughout the country as a whole. More than half the reports came from Massachusetts and New York, and only a dozen from the States west of New York and south of New Jersey. Some idea of the rapid development of the use of the silo may be gained from the fact that in the report of 1882 but three were recorded from Wisconsin, while in 1896, according to Mr. C. P. Goodrich,[1] "in the town of Lake Mills, Jefferson County, Wis., which contains but thirty-four sections of land, there are not far from seventy silos, and the use of not one of them has been discontinued, but more are going up." It is noticeable that from the first the silo has been most generally used in sections where the dairying industry is paramount.

### CONSTRUCTION OF SILOS AND TREATMENT OF CONTENTS.

It is interesting to note that in the United States the development, both as to the construction of the silo and the treatment of the contents, has been along lines of greater simplicity. The expensive structures of masonry, built by most of the earlier advocates of this method and patterned after the silos of M. Goffart and other European farmers, have given place to those of wood, which are at once cheaper and more easily built, while wooden walls are less conductive of heat and cold.

The early practice of placing heavy weights on the material in the silo in order to press it down and exclude the air, and which was thought to be very necessary to the preservation of the forage, was pretty generally abandoned some years ago, as it was found that the forage kept quite as well without such pressure. It was also thought to be of the greatest importance that the filling of the silo should be rapidly done. Dr. Miles was the first to combat this idea, arguing that "with slow filling, without treading down the fodder, the temperature of the mass would rise to a point that is fatal to the bacteria that cause acid fermentation and that sweet ensilage" would result. This view was soon found to be upheld by experiment, and for ten years or more it has been generally accepted that rapid filling is unnecessary, many farmers maintaining that the best quality of sweet ensilage is made by slow filling. Another early idea was that the fodder should be firmly packed as it was put into the silo, but it has been found by experience that all that is really necessary is to keep the surface leveled off and perhaps to tramp the fodder down a little along the edges near the walls of the silo.

In order that the temperature of the whole mass may be kept as uniform as possible, it is a common practice to delay the leveling off of the fodder put in one day until the temperature has risen to the proper degree when the hot material is leveled off, being well packed

[1] Report Kansas State Board of Agriculture, third quarter, 1896, p. 116.

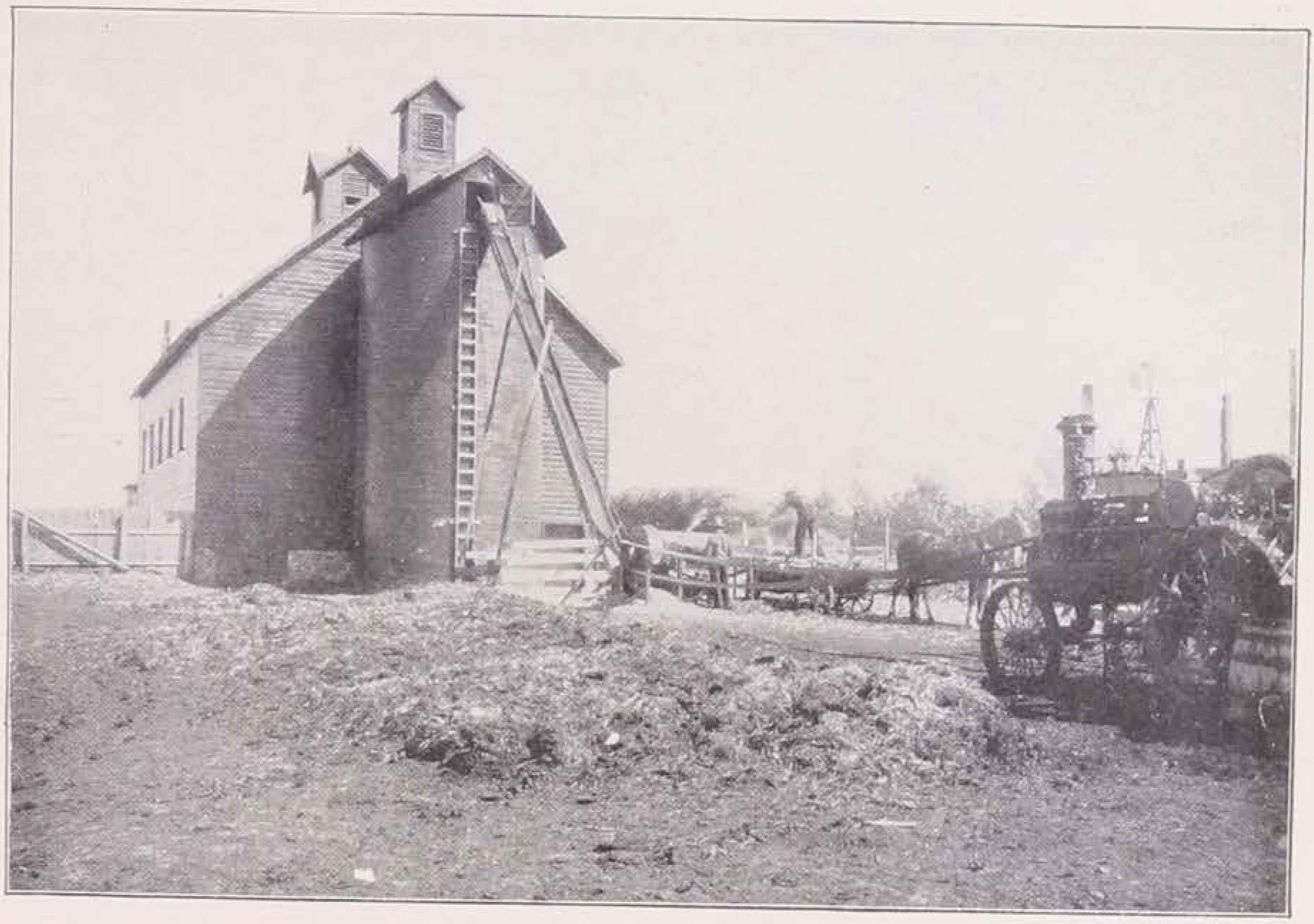

FIG. 1.—A ROUND SILO ATTACHED TO DAIRY BARN ON FARM OF SOUTH DAKOTA AGRICULTURAL COLLEGE, SHOWING METHOD OF FILLING.

FIG. 2.—AMERICA'S BEST FODDER CROP (FIELD OF CORN GROWN NEAR WASHINGTON, D. C.).

at the edges, and fresh fodder is added at once. This maintains a higher temperature in the outer portions of the mass and results in silage of a more uniform quality. The former practice was to cover the fodder with planks or boards, which were deemed necessary to keep the silage from spoiling at the top. This covering of boards was discarded, however, soon after it was learned that heavy weighting was unnecessary, and a covering of straw, chaff, grass, or uncut cornstalks was substituted. Nowadays the covering is often omitted entirely, but it is generally considered the best practice to cover with straw, chaff, or grass, since a few inches on top will mold and spoil anyway, forming a practically air-tight covering, and the addition of the straw or other material saves this loss in silage.

At first silos were either square or rectangular, but more or less difficulty was experienced from the spoiling of the silage at the corners, and it was also difficult to make the high wooden silo strong enough to resist the lateral pressure of the mass of silage. This led to the building of the circular silo (Pl. LIX, fig. 1), which form is generally preferred at the present time. There are no corners in such a silo, and a much stronger structure can be made with less building material than in the square or rectangular type. Moreover, the capacity of the round silo is greater in proportion to the wall space. It is the present practice when building a square or rectangular silo to board up or otherwise cut off the corners, thus lessening the danger of loss of silage. Metal linings for the inside of wooden silos have been tried, but with poor success, usually proving less durable than wood. Recently steel siding has been used in place of wood for the outer part of the wall of the silo, and it is said to compare favorably with lumber as to cost.

The first silos built in the United States were "pit silos," and these are still sometimes made, but aside from their cheapness they have no advantage of consequence over those built on top of the ground. A serious objection to them lies in the difficulty in feeding the silage from them. On side-hill situations they can sometimes be used advantageously. It is often possible to build the silo partly below and partly above ground, materially lessening the cost, but retaining the advantages of the above-ground silo.

The desirability of silage as a food for farm animals during the winter and also in times of drought has led to many attempts to construct cheap silos, especially in sections where building materials are high. One of the most satisfactory of these cheap structures is known as the "stave silo." It is built much as a round tank, but is without top or bottom other than the soil, and is composed of 2-inch lumber of varying width held together by hoops of one-half inch iron, with suitable blocks for tightening. When filled a temporary roof may be placed on the silo, or straw or grass may be spread over the silage.

A still simpler and more inexpensive method of preserving fodder fresh from the field is practiced in some sections, notably in Texas and elsewhere in the Southwest. This is by means of the "stack silo." The freshly cut forage (sorghum is usually used) is drawn into compactly built stacks, generally topped with grass, and carefully raked down and heavily weighted. The forage undergoes fermentation and is said to be of good quality, while the loss from molding is seldom very great, being confined to the surface.

### VALUE OF ENSILAGE AS A FOOD FOR STOCK.

The value of silage as a food for all kinds of farm stock is now pretty generally recognized. It is seldom fed entirely alone, but usually in connection with a small amount of hay and grain. In the case of horses, it is generally conceded that silage should form but a part of the ration, especially when the animals are doing hard work. On dairy farms silage holds a particularly important place, but even here it has had to win its way against strong opposition. Although it was early admitted that this forage when properly fed materially increased the flow of milk and exerted a beneficial influence on the health of dairy cattle, many dairymen refrained from using it because it was said to taint the milk and butter. This has been shown to be largely erroneous, at least so far as silage of good quality is concerned, and in any event may be avoided by feeding the cows only after milking. It has been shown by experience that the cost of milk and butter can be materially reduced by the judicious use of good silage.

In summing up the advantages of silage under the system of agriculture prevailing throughout the greater part of the United States at the present time, it may be confidently maintained that with no other method can so much forage that is so palatable and of such feeding value be secured, be so safely harvested, stored so economically, and fed with so little waste. The silo is certainly a most valuable adjunct of intensive farming, may almost be regarded as a necessity on any well-ordered stock or dairy farm, is a safeguard in times of drought as well as in excessively wet seasons; its use is by no means necessarily confined to the wealthier farmers, but is spreading rapidly in all sections of the country where the acreage of land is limited or where succulent forage is needed during the winter months.

### THE BEST CROPS FOR SUCCULENT FORAGE.

#### CORN.

Corn (Pl. LIX, fig. 2), the most valuable crop of our forefathers, early assumed an important place as a forage crop, not without some opposition, however, for it is said that the idea of sowing it for fodder was at first ridiculed.[1] As early as the second decade of the century

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[1] Flint: Grasses and Forage Crops, p. 154, fifth edition.

this crop is mentioned as a most valuable one for soiling, and from the first introduction of the practice it has been regarded as the best to grow for this purpose.

It was early observed that certain varieties of corn were more adapted to use for soiling and fodder than others. These have been improved and increased by selection and crossing until at the present time there is a long list of varieties, some of which are suitable for soiling and ensiling in any part of the United States.

Two points have been kept in mind by those endeavoring to develop the varieties of fodder corn, namely, the desirability of varieties with a long season of utility and producing heavy yields of foliage rather than of grain. Thus, we have the various "evergreen" varieties, which remain in condition suitable for feeding for a relatively long period, and other varieties, which give exceptionally large amounts of forage. These last are especially valuable for ensilage. By the use of a judicious selection of early and late varieties, and planting at proper seasons, it is now possible to have plenty of green corn for soiling for a large part of the summer and autumn in most parts of the United States.

### CLOVER AND OTHER LEGUMES.

As the need of succulent forage became more generally recognized, it was found desirable to grow several crops for use each season in order that a succession of fresh forage would be assured. It was also found that a better quality of forage might be secured by selecting a suitable variety of crops to be grown in this way. Among the more important crops used for this purpose, in addition to corn in the early part of the century, were field peas, usually grown with oats or other small grain, clover, cowpeas, rye; and, a little later, millet, sorghum and other crops came into use.

Clover.—Red clover was grown in Rhode Island as early as 1750. John Bartram is said to have grown it on his place near Philadelphia, Pa., prior to Revolutionary times, and, according to Darlington, it was introduced into general cultivation in Chester County, Pa., during the last decade of the eighteenth century. Suffolk County, N. Y., was an early center for the cultivation of this crop, and considerable seed is said to have been exported from there. Red clover was included in nearly all lists of crops desirable for meadows, and its use for soiling seems to have been quite general in the North during the early part of the present century. It did not win its way unchallenged, however. A writer from Indiana, in the United States Patent Office Report for 1849, speaks of the strong prejudice against clover prevailing in his section on account of frequent deaths among cattle when first turned on it, and because worms destroyed corn following the clover. Its value as a soiling crop was early recognized, however, and it is still to be regarded as one of the best perennial crops available for this purpose, as well as for use in the silo.

Mammoth, or sapling, clover is frequently grown and used in the same way as red clover, and in some sections, especially where the soil is wet and heavy, alsike replaces both of these.

COWPEA.—In the South the cowpea early assumed the place occupied by clover in the North. A writer in 1821 recommended the cultivation of this crop for forage and soil renovation,[1] and there are references to its use for these purposes at least as early as 1815. Many writers for the United States Patent Office reports and farm journals during the second quarter of the century speak of the great value of the cowpea (several varieties of which were grown chiefly under the name of black-eyed peas) in the South. A writer from Louisiana says, in the United States Patent Office Report for 1849, that the cowpea ranks next to corn in importance to the sugar planter, both for its value for forage and as a soil renovator, while another from Tennessee calls it "perhaps the most valuable crop in the South." Although it was more often made into hay or the crop fed off on the ground, it was also often used for soiling, and in recent years is frequently made into silage, being generally regarded as next in value to corn and sorghum for this purpose in the South. It is used to best advantage in connection with corn as a mixed silage. During recent years many new varieties of cowpeas have been developed, some of them, because of their season of maturity and upright habit of growth, admirably adapted for soiling and ensilage.

FIELD PEA.—One of the first leguminous crops to be grown in the United States for succulent forage was the field pea. For many years the cultivation of this crop was confined largely to the New England States, but of recent years it has received more attention and is now quite generally grown in the Northern United States, where it is deservedly popular not only as a succulent forage but also as a hay crop. There are a great many varieties now on the market, varying widely as to hardiness, date of maturity, and yield. The seed is usually sown with some of the small grains, chiefly oats, the mixture containing about equal quantities of peas and grain. The crop is, perhaps, most commonly used for soiling, but is equally valuable for pasturage and silage. The combination makes a forage of high feeding value and palatability, and the yield is usually good.

ALFALFA.—Another legume of great importance as a soiling crop is alfalfa, or lucerne. A writer in 1821 regards it as a most valuable crop for South Carolina, and claims to have grown it for seven years, with the best of results, securing from six to eight cuttings per year.[1] A New Jersey farmer, writing a few years later (1823), says: "Of all grasses, it is the most profitable for soiling;" and Judge L. Buel, of Albany, N. Y., an authority on such matters, also speaks highly of it

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[1] American Farmer, 1821.

for this purpose. In fact, in the earlier years of its cultivation in the United States it seems to have been grown almost exclusively for soiling. The seed was brought from France, and the French name "lucerne" was generally used. It was much less widely grown than red clover, however, until after the introduction, in the early fifties, of the Chilian variety, on the Pacific coast, from whence its cultivation has spread over the whole United States. Although largely grown as a hay crop at the present time, it is also much used for soiling. The early season at which it is ready for use in the spring, the fact that several cuttings may be made each year, and the high feeding value of the forage make it a very desirable crop to grow for this purpose. The recent introduction of the hardy Turkestan alfalfa by the Department of Agriculture promises to make this desirable forage crop available to sections where it could not be grown heretofore on account of unfavorable climatic conditions.

SOY BEAN.—The soy bean was introduced from Japan in the early part of the century, but was grown in a desultory way for a long time, only coming into prominence as a forage crop within comparatively recent years. It was apparently first grown in the botanic garden at Cambridge, Mass. In 1829 Thomas Nuttall[1] wrote regarding its possible value for cultivation in the United States, and another writer tells of its having been grown at Cambridge in 1829 and at Milton, Mass., two years later.[2] It is now regarded as one of the most valuable crops for soiling and ensilage. Careful selection on the part of those engaged in growing seed for the market has resulted in the development of early, medium, and late varieties, so that it is now possible to get a good supply of fresh soy-bean forage for a large part of the summer and autumn. Although probably less valuable in the South than the cowpea, it has a more extended northern range, and hence serves as an intermediate between that crop and clover.

VETCHES.—Of the vetches, common and sand (or hairy vetch) are the only sorts that have been grown to any extent in this country, and these, while grown and used in essentially the same way, have been by no means as commonly cultivated as field peas. Common vetch seems to have been first introduced, and both spring and winter varieties were grown as early as 1820, principally under the name of tares. Several writers in the farm journals published in the early twenties speak of their value for soiling and supplementary pasturage, and in some sections large fields were devoted to the cultivation of these legumes. One farmer speaks of growing 30 acres of tares annually. Sand, or hairy vetch, is of much more recent introduction, and is, if anything, better adapted to general culture throughout the United States than the common vetch.

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[1] New England Farmer, October 22, 1829.

[2] Farmers' Cabinet, October 15, 1847.

Crimson clover.—Crimson clover is one of the most valuable legumes grown in the Middle Atlantic States. It was introduced from Italy in 1818 by Bedingfield Hands, of Chestertown, Md., and first grown by him and others to whom he gave seeds. In the first notes regarding it that appeared in the agricultural journals it is called Italian clover, but this name was soon supplanted by the one now in most common use. In 1820 Mr. Hands gave an account of the introduction of this clover and his experiments with it,[1] and still earlier a Dr. Anderson, to whom Mr. Hands had given seeds, recorded the results of his trials, speaking enthusiastically regarding the value of the crop, particularly for green forage. Aside from being one of the most valuable cover crops and soil fertilizers grown in the Eastern United States to-day, crimson clover ranks high as a forage crop, especially where the climatic conditions are such that it can be sown in the autumn for an early crop the next season. Affording an excellent hay when cut in the right season and properly cured, it is also extensively used in soiling and for filling the silo, as well as in annual pastures.

Japan clover.—Japan clover was an accidental introduction from Japan, as it name indicates, first coming into notice in this country about 1830. It now occurs quite abundantly in the naturalized state throughout the greater part of the region south of the Ohio River. It is, perhaps, most valuable as an annual pasture crop, but is also used in other ways. Its ability to endure heat and drought and to thrive on a great variety of soils renders it of much importance as a forage as well as a soil renovator. It is available as a pasture plant from May until heavy frost.

Florida beggar weed.—Florida beggar weed has only recently become of importance as a cultivated crop. It is a native of the West Indies and quite likely, also, of southern Florida, where it was first cultivated. The plant is an annual and is well adapted to the light, sandy soils of portions of the South. Its cultivation is spreading rapidly, and although it has thus far been most commonly grown for hay, it is also valuable for soiling, pasturage, and ensilage.

Velvet bean.—Another succulent forage crop which has recently attracted much attention is velvet bean. Its first introduction into the United States seems to have been through the Department of Agriculture some thirty years ago. Until within a few years it was grown solely as an ornamental plant, but proving adapted to the light, sandy soils of the South, it was taken up as a soil renovator and forage crop, and is now being grown and used in essentially the same ways as the cowpea.

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[1] American Farmer, May 19, 1820.

FIG. 1.—JAPANESE BARNYARD MILLET, GROWN AT THE UNITED STATES GRASS EXPERIMENT STATION, WALLA WALLA, WASH.

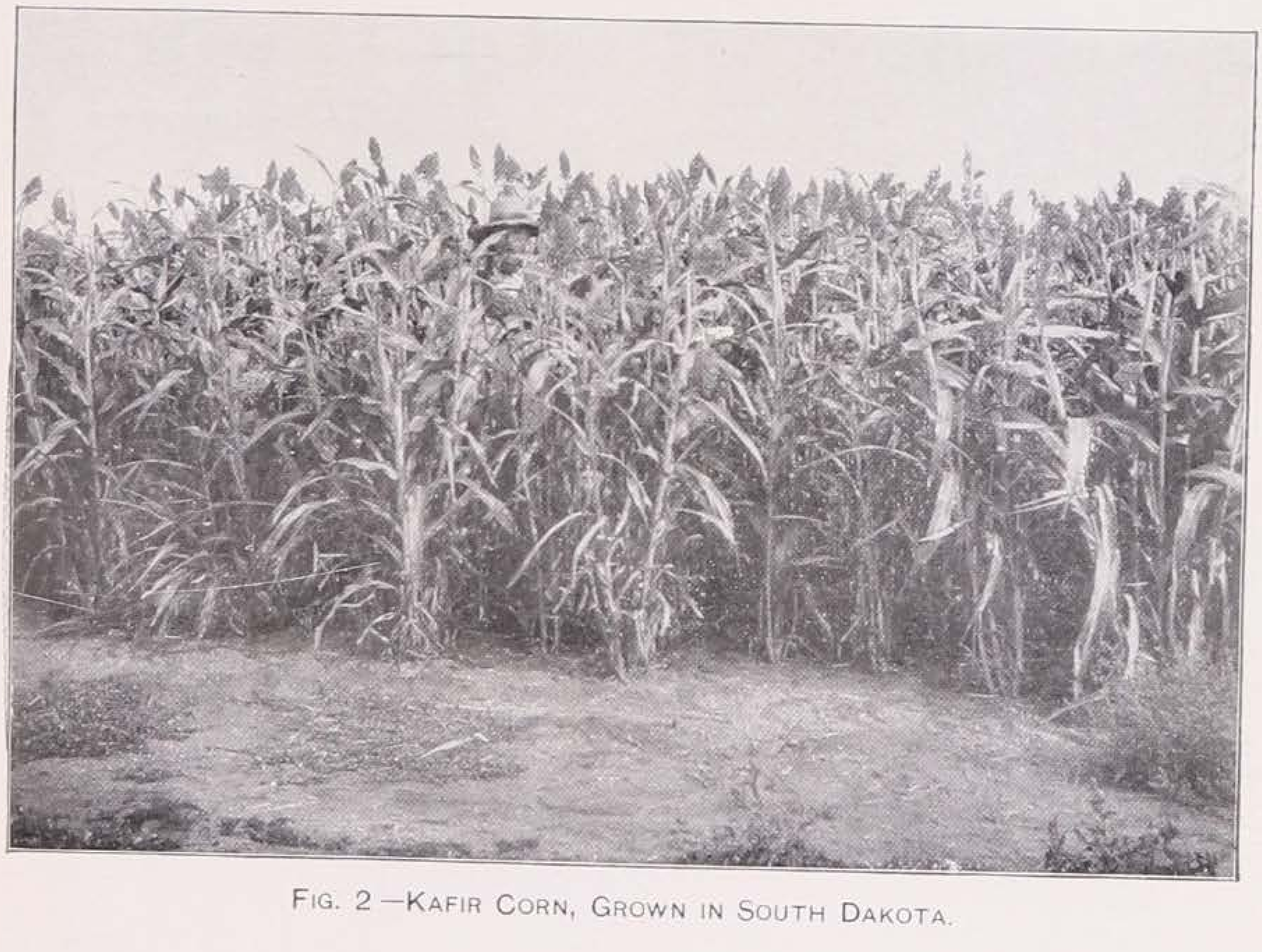

FIG. 2—KAFIR CORN, GROWN IN SOUTH DAKOTA.

## MILLETS.

Millet was recommended for soiling by various writers in the early twenties, and its use for this purpose was urged in the United States Patent Office Report for 1847. Varieties of both foxtail and broom-corn millets seem to have been included in these early discussions, although it is difficult, often impossible, to tell just what kind of millet the writer had in mind. At one time Hungarian millet attracted some attention, but it soon gave way to common millet and German millet. During recent years several varieties of broom-corn millet have come into prominence, notably certain sorts introduced from Japan and Russia. Another millet which has been highly recommended by prominent agriculturists is Japanese barnyard millet (Pl. LX, fig. 1), a recent introduction from Japan. Pearl millet can also be used to advantage as a soiling crop, and is perhaps more valuable for this purpose than for any other.

## SORGHUMS.

In some parts of the United States, especially in the South, sorghum has, since its first introduction, been regarded as a valuable soiling crop. Under the name of Guinea corn its cultivation for this purpose was urged by John Lorain in the Memoirs of the Philadelphia Agricultural Society as early as 1810, and frequent references to it occur in farm journals during the succeeding decades. A writer in 1822 speaks of the great value of "Guinea corn"[1] in South Carolina, and its use as a forage seems to have early become quite general in the South. Fresh impetus was given to the growing of sorghum by the importation of new and valuable varieties (especially of the saccharine sorghums) from South Africa, China, and other countries, during the early fifties. The value of the saccharine varieties for soiling was soon recognized, particularly in the South, and this use of them has spread until it is now quite general wherever soiling is practiced to any extent. The more recently introduced Kafir corn (Pl. LX, fig. 2) and Jerusalem corn, nonsaccharine varieties, are also much used in Kansas and neighboring States, and the growing of these crops is spreading rapidly, particularly in sections where the dry weather is liable to interfere with the raising of indian corn. The sorghums are valuable to grow for ensilage, but are not generally regarded as equal to corn for this purpose. They may also be used to advantage in temporary pastures.

## OTHER CROPS FOR SOILING, PASTURAGE, OR SILAGE.

Many other crops are available either for soiling, pasturage, or silage, but their use has not become general, and in many cases their value is only local on account of their cultivation being limited by

[1] American Farmer.

soil or climatic conditions. Among such crops may be mentioned rescue grass, more or less extensively grown in the South for winter pasturage; rape, quite widely grown in the Northwest in recent years for soiling and pasturage; bur clover, a valuable annual pasture crop for the South and Southwest; Guinea grass, grown in the extreme South and regarded as valuable for soiling; sweet clover, grown to some extent in the South and West, for soiling and silage; Australian saltbush, valuable for soiling and pasturage, particularly on alkali soils in the Southwest.

# WORK OF THE BREEDER IN IMPROVING LIVE STOCK.

By JOHN CLAY, Jr.,
*Chicago, Ill.*

INTRODUCTION.

The work of the breeder in improving cattle, sheep, and hogs is a subject that can be best considered in detail. Looking back, one sees a wide trail, with numerous bypaths deviating from the main track; and then looking forward, one sees the fields that are yet unbroken, and wonders where will the end be. The work assigned to the writer is to endeavor to trace and comment on the work of the improving breeders, the men who by choice or by chance have made our cattle, sheep, and hogs such as they are to-day.

EXTENSION OF THE CATTLE INDUSTRY.

Behind us lies the New England shore, beautiful as to scenery, but with rocky hills and narrow glades sparsely grassed. Southward is New York State, with widening valleys and deeper soil, while still farther south lie Pennsylvania and the Virginias—all the home of scrub cattle for many generations. In these sections and in Texas and in the California valleys was the mother lode of the present cattle business, and following it came sheep and hogs. But it was not until the arrival of the era when our agriculture crossed from the original States of the Union to the great valleys of Ohio, Indiana, and Kentucky that the searchlight of improvement was flashed upon the live-stock industry, which has been developing new fields year by year. When the industry reached the prairie a plain of unrivaled richness was exposed. As blue grass supplanted blue stem, and golden corn supplied winter food and gave fattening power, then the breeder felt the pulsation of the coming strife. Look over this land to-day. Illinois, the great central State of the West, produces a perfect hog, with sheep still waiting for the improver's hand, and cattle rapidly climbing the golden stairs of perfection—by no means at the top as yet, but with aspirations to be there by and by. The great wave of improvement which began in the thirties and covered pretty thoroughly the Central West, was arrested with the war, but swept on again with widening scope when hostilities had ceased. Down in Texas, the "Longhorns" had accumulated, and there was a market North, but the quality of the stock was undesirable. Westward, under the shadows of the Rockies, scarcely bigger than a man's hand, was a bovine cloud silver lined. During war times Iliff was in Colorado, Kohrs had tested Montana.

There was a glamor in free grass, and, at a time when our beef and mutton supply needed great extension, the ranchman sprang up with his herds and flocks on every creek. His advent had a vast influence and gave a great stimulus to the breeding of fine stock. The cattle man wanted bulls and the sheep man wanted rams, by the wholesale. True it is, that the demand was erratic, but when it came it was a perfect flood. We had it in the early eighties, and now it is with us again. Geographically speaking, the wave of improvement has been westward. To-day it is working strongly in the Southwest and inter-mountain regions. Texas is drawing heavily on our best cattle blood. The valleys of the Rockies are importing bulls and raising alfalfa, while the Northwestern States are taking both rams and bulls by the car load. But the cattle man is more aggressive in this line than his brother stockman. On the Pacific coast much has been done in the way of improvement, but there progress is often retarded by droughts, distance from market, and low prices. Some of the California herds show wonderful breeding. For many years past, with all the herds in pastures, the opportunities for development have been excellent, and as a consequence the cattle in that State are of high grade, most of them strong in Shorthorn blood, which has been freely imported in years past and industriously nursed and multiplied.

### SOME OF THE DIFFICULTIES OF EARLY CATTLE BREEDERS.

The United States and Canada (for the latter is so intimately related to this country in the way of improving live stock that it must be included in the forward movement) are countries of magnificent distances, and while, of course, we have had the railroads, still the foundation of the work of improvement was laid so long before the iron horse came into action that it is almost impossible to estimate the geographical difficulties of our earlier breeders. In England a good day's journey on horseback took Bates or Booth or Bakewell to almost any point he had to reach, but the men of Ohio, when they went forth to search for blue blood, had to cover vast territory, cross great rivers and lofty mountain ranges, and ferry an ocean that knew not the whirr of the screw and was but hearing the echo of the side-wheeler. Only great faith and indomitable perseverance surmounted these geographical obstacles, and the knowledge that the country was far behind the times in meat and milk producing was an incentive to action, for in those men's minds there was undoubtedly a glimmering of the future.

## REVIEW OF CONDITIONS.

### NEED OF MORE AND BETTER MEAT.

However congenial the work of the breeders may be to them personally, collectively there has been an enormous influence behind them in the incentive for improvement. The cry of the country has been for more meat and better meat. We need more and better hams and bacon; we still lack in both quantity and quality in our mutton, while in beef there seems to be a tremendous pressure for the better qualities. While our cattle statistics may show a decline in numbers of some classes of cattle, still much is made up by the system of early maturity. The two-year-old has taken the place of the three-year-old on the block. To estimate the actual difference in production would be a perpetual-motion problem and one that could only be approximated, but it is patent to everyone that decrease in numbers has been largely offset by forcing methods. We have a fair number of medium cattle. It is the prime bullock that is being called for. The unfortunate lethargy of the ordinary breeder during the decade previous to 1896 in refusing to use better blood is reflected in both cattle and sheep.

CATTLE AND SHEEP INDUSTRIES COMPARED.

After the boom in cattle prices, from 1882 to 1884, we underwent a period of depression that drove the average breeder of fine stock almost out of the market. The depletion of our pure-bred herds was heartbreaking. Once before, during the civil war, we experienced a similar condition, but with good reason. Here we were in the piping times of peace, with the country prosperous, with a spirited demand for our meats, and yet in some years the great bulk of the well-bred bulls had to be steered. In a similar but far less extravagant degree the breeder of fine sheep suffered. The sheep business is always more uncertain than the cattle trade; more subject to sharp fluctuations; more susceptible to political and commercial conditions; it depends upon wool and mutton, the former an uncertain quantity in the world's markets, and a political football. The life of the sheep raiser is a sort of seesaw; now he has the high-growing plum of success and profit within his grasp and now he is down; down on the hard ground of failure and loss. One year he is Sisyphus, striving hard to push his great stone up hill; the next a veritable Jason, who has found the golden fleece. Wool goes up, then follows the sacrifice of mutton. Wool declines, but it is not certain that mutton will improve in quality or price, nor have we had in this branch of the trade that steady foreign demand that has characterized our beef, bacon, and cheese trade. Then there are enigmas in the sheep trade past all understanding, and disheartening to the improving breeder. When a New Mexico lamb, hairy, half goat in form, but with a clean-cut, fine face, that equals the profile of the Cheviot, sells as high as the best Southdown or Shropshire, our ideas of breeding get a shock. But withal there is a tendency to push vigorously the development of our flocks. There is a disposition to follow the middle course, to cultivate wool, but not sacrifice mutton, and vice versa. Unlike the cattle trade, our great source of sheep supply is the open range. Gradually the days of cattle grazing on free grass are being numbered. The lights that were kindled in early days in Texas and burned brightly in Colorado, Wyoming, Montana, and other Western States from 1865 to 1895 are getting dim and will soon be but a reflection in the bovine sky. Against this come increasing flocks on the cattle ranges. We are, so to speak, in a transition state, so far as our flocks are concerned. With low prices for wool, and our sheep unable to compete in a mutton line against our beef and hog products, the small raiser of sheep in such States as Ohio and Indiana was driven out of the field.

On free grass they could be produced cheaply, and the fed Western wether—raised, say, in Wyoming and finished on Nebraska corn—could be placed on the market at a figure far below the cost of the same animal in the granger States. In a milder form we had a similar experience in cattle. When the ranchman found out the value of the grass on the arid regions, and was not overstocked, he raised a steer for a comparative trifle, and the men on the high-priced lands of the Eastern and Central States found a new competitor, who cut into their profits. But that era is coming to a close. The free grazing lands, or, at least, the watered portions, are being preempted in one way and another, so that the cost of producing a steer in the West varies but little from that of growing one in the East, when the cost of transportation to market and other incidentals are considered. The breeding of cattle on free grass is practically a thing of the past. A few large herds remain, but in another decade they will have gone. The free grass of the West will be cropped by cattle that are fed in fields in the winter, by steers imported from other parts of the country, but the lion's share will go to our vast flocks of sheep that have found a natural home in the valleys and divides of the Western and intermountain States. But the day is coming to sheep, as well as to cattle, when free grass will not be enough. As their numbers augment, and they crowd one upon another, cropping the wild grass more closely and killing its productive power, winter feed will have to be supplied, and the cost of production will be materially increased. Then will come with them, as it has with cattle, more attention to breeding.

## SECTIONS WHERE GREATEST IMPROVEMENT IS SEEN.

There is no place where demand stimulating supply has had greater effect than among the pasture herds of the West and Texas, especially the latter State at present. If you want a supply of good feeders in large numbers, where do you go? To the Panhandle of Texas, the valleys of Colorado, or the wind-swept divides of Wyoming, and you find there the material that tops the market. Of course, there are solitary lots of native-bred steers that are better, but if any large number of first-class young feeders is needed you must look beyond the Missouri. Why? Because those cattle men neither slumbered nor slept. They were buying blood, and that blood crossed on the already improved Texan or Western cow gave us the steer that fitted the feed lot. When the farmer of the East and Central West could have secured the means in the shape of a good bull at no greater cost than $50, he used a scrub, and the result is seen in our central markets. Native steers have deteriorated, Westerns improved. Not the ranchman who breeds by hundreds has led the van, but it is the small breeder in the valleys or by the streams in the West who has made the most rapid progress. As in cattle, so in sheep. The writer expects to see smaller flocks in the West, more attention to winter feeding, and consequently less loss. Then will come the day when the flocks of the pure-blood breeder will be drawn upon heavily and undoubtedly successfully, although, from the peculiarities of this trade, it is by no means so certain that the results will be as far-reaching in this branch of our live-stock trade as in the beef-making line, and incidentally, of course, in our dairy products.

### INFLUENCE OF FOREIGN DEMAND.

Undoubtedly, the foreign demand has been the greatest incentive to improvement. It developed years ago in the inquiry for our hog products, an issue we were able successfully to meet. In our sheep exports we are still away below the European standard. True, we send large numbers of sheep to Great Britain, but they fill a third-rate place. Thus far blood has not been used effectively in this line, but it will come. It is with cattle that we are at present reaping the best results of well-sown seed. We go to the parent country; buy in Aberdeen their best Shorthorns and Angus cattle; from Hereford and other parts of England we import the best White-faced blood. Streaming through our native pure-bred herds it reaches in diluted form our feed-yard steers, and then it returns across the ocean, giving that reciprocity of trade which England cultivates so generously.

Twenty-five years ago I rode across an Illinois farm. The original owner had "trekked" from Kentucky. He built wisely and well, and his sons were reaping the benefit. There was blue grass in profusion divided into generous inclosures by osage-orange fences, and the fine buildings were shaded by oaks and black walnuts—a heritage for any prince. On the pastures were 1,000 cattle, not extra in quality, but rough beef. They needed still the varnish that comes from corn. "We want these in England and we must have them," was my remark.

Think of it; a quarter of a century ago we had not, commercially speaking, sent a live bullock across the Atlantic, but since then endless numbers, both dead and alive, have found their way to Europe. The Europeans do not get our best cattle because New York and Boston still claim these, but the exporter buys a grade close to the top. He wants nothing else. This influence on the market has been far-reaching and all-powerful when we come to gauge quality. Our foreign demand is here to stay, and it is a most important factor in our commerce. It can be helped mightily by the breeders of both classes—those who raise the bulls and those who raise the steers. It is a fertile field, boundless in its size, and it is ready to be cultivated. It is a mine from which we can dig more gold than from all the real mines put together. It gives labor and means of support to hundreds of thousands of our farmers, and that means happiness, individual and national. One of the wellsprings of our prosperity rises in our export trade, and among its various branches our live-stock products form no mean proportion, for in our annual shipments across the Atlantic we estimate our cattle and sheep in the hundreds of thousands, and our dressed products in millions of pounds. Our live-cattle exports alone last year exceeded in value $30,000,000, while our meats and dairy products had an aggregate value of $180,000,000, a seventh of the total value placed upon our exports of domestic merchandise in the calendar year 1899.

## IMPORTATIONS.

### THE THREE LEADING BEEF BREEDS.

It will not be a serious digression to give here a bit of historical matter as leading up to present conditions and showing some of the efforts exerted to improve our live-stock blood. The bovine aborigines of this country were of Spanish origin. Early in the seventeenth century Dutch settlers in New York introduced cattle from their mother country. A little later Sweden sent over a consignment to some of her sons and daughters. Several importations from Denmark were made about the same time, and the British Isles furnished their quota also. These cattle were imported for practical purposes (food and work), and the questions of breed or race did not enter very largely into the consideration. From such mixed ancestry our so-called "native" cattle sprang into existence. As immigration increased and as our pioneers forced their way through the "forests primeval" toward the Allegheny, toward the Ohio, and toward the Mississippi, our bovine stocks increased materially in numbers, but became essentially of more and more mixed breeding. Importations were largest from Great Britain, and the predominating strain in the conglomeration was British. Not until the dawn of the nineteenth century, in fact not until the century was sixteen or seventeen years old, were there any notable importations of "improving cattle." The years 1816 and 1817 are notable for the importation of numerous Shorthorns, Hereford, and Devon individuals, Kentucky getting the choicest specimens of the two former breeds. Lewis Sanders and Henry Clay were the first importers of Shorthorns and Herefords, respectively, into the blue-grass regions of that State. It was in 1834 that Shorthorn importations began in right good earnest, with the formation of the Scioto Valley Association in Ohio. Purchases were made almost regardless of prices asked, but the animals and their progeny found ready sale among the then extensive breeders and graziers of Ohio. The Clays and others made important importations into Kentucky in the years 1837, 1838, and 1839. In the last-named year Bates blood found its way from Kirklevington to New York. In 1853, at the Lord Ducie's dispersion sales of Bates and other strains, Americans purchased freely, particularly of Oxfords and Duchesses. Ohio and Kentucky received very notable importations, and in these States were established some of our now most historical herds. American investments in connection with Shorthorns exceeded those in connection with all other breeds combined. Famous in our Hereford history is the importation of 1840, the bulk of which became the property of Mr. Corning, of Albany, N. Y. It was not until many years later, however, that importations were on any large scale. The last few years have seen decreased importations of White-faces as of other breeds, because of the era of comparatively low prices and unprofitable breeding operations through which we have just passed.

The remarkable demand from the range country for Hereford breeding stock has given an immense stimulus to the Hereford industry. Their adaptability to range conditions has established their reputation as "incomparables" in that respect, and the most notable purchases of the past few years have gone to Texas and the northern ranges. Angus cattle came in the seventies, and their preeminence in the feed lot and upon the butcher's block is the result of careful breeding and good management. Their character fits them for the climate of Illinois or Iowa, but they do not, as a rule, possess enough hardiness or "rustling" qualifications to be a success on the open range. This brief résumé of our three leading beef breeds may convey some idea of the efforts put forth to better our bovine stocks. The general effects have already been noted.

### SHEEP.

Our earliest ovine stocks were, as with cattle, of Spanish blood. Wool was the primal consideration, and the Merino filled the bill completely. When mutton became more of a factor we got the Southdown and the Shropshire, the Cotswold and the Lincoln, combining both these most important commercial items.

### IMPROVEMENT IN BOTH CATTLE AND SHEEP.

In both cattle and sheep we have had the material for foundations secure enough to support any superstructure, but in too many cases we have builded unwisely, or have suffered from adverse causes that could not apparently be combated. To-day, however, we may mark improvement, and two of the strongest reasons for this are the wonderful demand among our ranchmen for good bulls and good rams and the excellent demand from abroad for our products, bovine, ovine, and porcine, reference to which has already been made.

### PEDIGREE.

What is pedigree? A mass of hieroglyphics to the ordinary mortal, a sweet morsel for the expert to roll off his tongue when walking through a herd. "Full of Duchess," "full of Anxiety or Wilton," "full of Blackbird blood," is the too often repeated song of the champions of the Shorthorn, Hereford, and Angus breeds. Pedigree, in the language of the poet, is the "claims of long descent." The dictionary adds "lineage," but in the animal world it means the way to uniformity. How long pedigree has been practiced we know not, but undoubtedly it was in vogue long before we heard of it in print. Certain it is that on the borders of England and Scotland, among the Cheviot hills, it was unwittingly resorted to generations ago, but so far as practical and general purposes are concerned its historic exponents were in sheep, Bakewell; in cattle, Bates and Booth. These men built a strong foundation. They grafted stock on hardy roots. Another question often arises in our minds, Would they have followed their system to the disasters that overwhelmed their successors? It is scarcely worth discussing except from the sentimental side. My own idea is that these masters in the art of blending blood would have seen the rocks ahead and veered the ship.

### NEW ERA IN BREEDING.

With the use of pedigree in its conservative and carefully considered way we entered a new era in the history of breeding. The soil had long been ready, but the plow and the guiding hand were wanting. They came, they saw, they conquered. In groping about and testing the new fad, as it was called, individual merit was never forgotten. It was the keystone of the arch on which the paper pedigree was built. Bakewell's instinct, Bates's keen scent for the good animal, laid the great fabric of line breeding more strictly than pedigree on a wise and, to them, seemingly impregnable foundation.

The American breeders, casting around for better blood than was at hand, were not slow to recognize and utilize this new invention, if we may so call it. Importations were made, the history of which in detail it is not within our province to recount. Their influence was wonderful, but much of the good blood while coursing through the veins of the common cattle in the districts where good luck had taken it, was lost in hopeless contamination in the backwoods scrub. But much also remained, and was eventually concentrated in Kentucky, the beau ideal spot of the States, so far as the bovine race is concerned. The vicissitudes of the breeder of fine stock were many. Commerce ebbed and flowed; panics came, and war spread over the land, but amid all, pure blood was cared for, nursed, and nurtured.

### SPECULATION IN PEDIGREE.

It was not until some years after the war that speculation in pedigree, which had been inoculating the system of the American breeder of Shorthorns for many years, reached flood tide. Its zenith was attained at the New York Mills sale in 1873. Nothing in the history of Shorthorns (and sympathetically in other beef breeds) ever did more harm than the above sale. It is often referred to with pride, but it was the culmination of a vicious system, the exploding of the balloon, whose inflation had been a gaseous mixture of pedigree sans individual merit and "no surrender" of ideas once fixed. By some people this would probably be named fashion. Fashion has its votaries, and it takes a superhuman effort to stem the tide. You went to a sale (and we speak now almost exclusively of Shorthorns, the other beef breeds not appearing at that time in any large number), and what was the result? A good cow, heifer, or bull, excellent in individual merit, and with a stainless pedigree, so far as pure blood went, sold for a song, while some puny, delicate, consumptive-looking beast with a fashionable lineage was bid up to fabulous prices. Then the bubble burst, and into the whirlpool went many a staunch breeder who, carried along with the current, could not escape the vortex. The rebound from such a blow was detrimental to all breeders, but more especially to those in the Shorthorn trade, and from which they have but slowly (though we hope surely) recovered.

The damage done was more indirect than direct. Individual breeders suffered heavily, but nothing in proportion to the raisers of cattle. Pedigreed cattle were at a discount, and there being little or no demand, well-bred calves were made into steers and heifers were sent to the butcher. In my own case, for a half dozen years every male was steered, and that in a region where blood was almost priceless. To-day we are suffering in our markets for this neglect of pedigree. The breeders sowed the wind and the raisers reaped the whirlwind.

### ABUSE OF PEDIGREE.

But the abuse of pedigree went further. From line breeding it went on to incestuous breeding. Bates sinned here and intensified the heresy. Hundreds fell into the rut. Then came tuberculosis, or to put it more plainly, consumption. The cry of pure Bates or Booth was a fearful shadow hanging over the premier tribe of cattle. The master hands were gone and their disciples failed to carry on the work. Our American breeders pursued the above course with a determination worthy of a nobler cause. It spread all over, and, though Kentucky probably suffered worst, we saw it in every other State and Canada. Shorthorns have been specially spoken of in this respect, as the writer's acquaintance with them has been most intimate, but we know enough of the dairy breeds, more particularly the Jerseys, to speak of the extraordinary ravages tuberculosis has made in their ranks. To get impressive power that would supply the block or pail, sacrifices were made that eventually led to disaster. Tuberculosis came, and is to-day existent in many of our best herds of cattle, plain or pedigreed. Nature exacts the penalty for reversion or disobedience of her laws. This is the reef our improving breeders must guard against. We see intensity of blood used with grand effect in sheep, among our Lincolns in England, with Border Leicesters in Scotland, and notably with Cheviots in their native hills; but in cattle we have had signal failures in Shorthorns and Jerseys. Let our Hereford and Aberdeen-Angus brethren take warning from the past.

## THE BATTLES OF THE BREEDS.

In discussing the work of the breeder and his forward movements we must refer to the so-called "Battles of the breeds." These have been fought over and over again and so repeatedly that the subject is almost threadbare, so far as the press is concerned. But instead of deprecating them, we think they should be encouraged. People will lose their temper both on field and farm, in stall and show yard. The class of personal argument that we have listened to around a show ring, often running into abuse and sometimes growing almost into fisticuffs, should not be encouraged, nor should the jockeying indulged in by the professional showmen be allowed; but the honest, fair discussion of merit, either on paper or by practical illustration, should certainly be given a fair field and no favor. Nothing in our bovine history can equal the struggle made for place and position by our Hereford breeders. Their enterprise, their perseverance, and the magnificence of their methods call forth the highest praise. I would not like to aver that it equals the individual efforts of the early improvers of our cattle in their importation of Shorthorns, but it is so much more recent and the movement so much larger and so intense in its results that the history of sixty years ago is dwarfed in our minds. In the dairy breeds we have had the same experience as with our beef breeds. The Jerseys were boomed, were advertised, were carried up to the zenith of their powers, and then came the natural results of inbreeding and incest. And yet I would be the last to say that great good was not done in these booms of the past or will not be done in further eruptions which the future will produce. The world would be nowhere if we had not the man of progress. You may gallop too fast, but that is certainly better than never to reach your goal. Let us survey the subject a little closer, not so much in a spirit of criticism as to show forth, if possible, in bold relief from the pages of the past some of the mistakes we have made in our live-stock methods of improvement. Sixty or seventy years ago there was no necessity for any argument as to the different breeds of cattle or sheep we imported. Then the only object was to get blue blood. The breeders of the old country had shown the way—had blazed a path through the scrub forest and undergrowth. Every drop of blood was gold to our farmers and stockmen and eventually to our commerce. Nobody can detract from the efforts of our early pioneers who imported Shorthorns, the premier tribe of beef cattle, then and now.

No man loves the Shorthorn more than does the writer. Take them all round, both in the stall and at the pail, and they fill the bill for the general-purpose animal better than anything else in our bovine world. Traverse America, traverse Great Britain and Ireland, traverse Australia, traverse Argentina, and everywhere you see Shorthorn eyes peering at you—ten head at least to one of any other breed. Trace the history of the Shorthorn in America, and you will find its pages largely made up of fads. It is the same thing with the Jersey in our milk breeds, but the writer takes up the other side of the question, because he knows it better. The original importer was looking to improve our scrub cattle, for the end is beef and butter, and so the early efforts were in this line. Soon there developed a spirit that ran to fashion, and fashion meant "Pure Bates" and "No surrender." This fad worked untold harm. Then came the red craze, which further intensified the misfortunes attending line breeding and fashionable pedigrees. The virgin fires of "red and nothing but red" are still kept burning. You might write and work forever, but your efforts to extinguish these foolish fires would still be unavailing. There is nothing of the chameleon in our Shorthorn breeders. They prefer a paper skinned, hairless red to the sappy mellow touch of the roan, and to-day the cry is all "Cruickshanks, Cruickshanks"—a beefy beast, but wanting in activity and hardihood for our Western world. The breeders of our White-faces and Blacks have followed a different course. To use an expression from one of our light operas, they have worked "to make the punishment fit the crime." Of course, we have our pedigree men among the above breeders, because they can not be dispensed with, but forms have not been sacrificed. The type needed or bred by some master hand in England is not necessarily the animal wanted on our Western farms, where semitropical suns pour down their relentless rays, nor does it follow that a bull fitted for an English meadow can be transplanted with good effect to the prairie or the valleys of the Platte River. What I say, and I say it without fear of contradiction, is that our Hereford and Aberdeen-Angus men have tried to meet the requirements of our ordinary breeders better than have the Shorthorn men. They have improved the type to meet the demands of our climate, of our feed, and the vast distances thousands of our cattle have to travel for water. They have met the conditions, not retreated from them. In the moments of success, which are the lot of our Hereford and Aberdeen-Angus breeders, it will take steady heads to keep the ship on a level keel.

The White-faces have taken the range country. The Blacks are breaking into the breeding districts of the West, slowly, it is true, on account of the laziness and want of energy of the males; but still so steady is the improvement (see stock yards records) of these beef cattle that their onward march can not be stopped. Our dressed beef men take these cattle in preference to all others, and my lesson in life makes me follow the practical in preference to the theoretical. I have more faith in Armour's scales than in Coate's Herdbook, and the Blacks on the block are the ideal of the butcher. I saw it in Scotland in early days; at Smithfield later, and nearly every day at the Chicago stock yards since. These facts teach us that the improving breeder must take lessons from his daily teachers, and in this fight of the feeder for recognition in the final court of appeal in our central stock yards will he find much that is useful and absolutely necessary to his existence in this age of competition. For the above reasons, stated frankly, the writer believes in the "Battle of the breeds" being carried on good naturedly at home and abroad.

## TYPE.

Type is a wide word in the way it is used by our breeders of live stock. It has been used and abused, discussed and argued, until one is almost tired of it, and still no word is to be more used in the days that are coming. Types of cattle and sheep are going to be located in America just as they are in Great Britain. As you find the Shorthorn and the Ayrshire, the Hereford and the Aberdeen-Angus in their own peculiar localities, as you find the beautiful, graceful Cheviot on its native hills only, and the Cotswold on the downs that guard the Severn Vale, so the days are coming when, along with improvement, we are going to have "types" in different places and localities. See what a hold the Hereford has taken of the range. He is an ideal grazer. Some men will tell you solemnly that it is a mere boom that has sent the producer of the West crazy after the White-faces. On the surface much has been done in this line, but to find the real reason you must go to the root of the matter. You must impartially inquire into the whys and wherefores. We see in this movement a beginning of types in American cattle at least. The range is appropriating the Hereford because he suits the conditions and climate. He is naturally a grazer, with courage and perseverance, a fine traveler, and in many respects more indifferent to climate than any other beef breed.

But I go a step further, and say the breeders of pure-blood Herefords have improved their cattle so as to meet the views of the men who use their bulls. Twenty-five years ago what was the Hereford in America? A coarse-boned, heavy-horned, narrow-hipped beast, with no twist, deficient in his loin and rough in his forequarters. At that time the Shorthorn was leading the van in every direction. The Aberdeen-Angus and Galloways were not in numbers sufficient to compete with the other tribes. The progress of the Hereford has been forward, surely and not slowly. The breeders have met the issue. They saw the faults of their breed and started to remedy them. They have adopted the Shorthorn qualities of fine bones, good ribs and loins, fining down the shoulders, grasping at early maturity, and yet preserving all the good characteristics of the breed. Have our Shorthorns (still, and I think always to be, the premier breed of both America and Great Britain) made equal progress? The answer is certainly in the negative. From Bates we have run wildly to Cruickshanks—from roans to reds, and reds with no surrender, no room for argument, no listening to the voice of warning. If our breeders had retained the courage of Bates, the milking power of Knightley, the beauty of the Rose of Sharons, the sea-otter touch of the roans, with a dash of the Booth and Cruickshank early maturity and beef-making powers, then we would have had an animal that suited our Western country, and there is where we need bulls. I utter this criticism in no partial spirit. My experience is with beef, mutton, and pork, the ultima thule of all our live stock, and it is merely written to show forth from one point of view, and, as I think, the right one. What we need in cattle is to make beef and butter. In the struggle for existence we must meet issues, and during the past quarter of a century in our beef breeds the Herefords and Aberdeen-Angus have made wonderful strides, while our Shorthorns have actually stood still, or at least have made but little advance. The breeders of the latter have neglected type, the type, at least, which is needed in our Western country. We may, however, look for better things. The improved demand will bring forth better results, and then, too, different countries need different types. As we grow older we have more time to think and study the situation. The bull that suits the rich pastures of Illinois will not meet the requirements of the Colorado ranchman. We have reached the stage where type is not confined to the different classes of beef cattle, but goes further, reaching the localities and meeting distinct issues in all parts of the States.

So it is with sheep, but, as said above, this is an industry more various, needing more elasticity in its movements and ends than the beef, butter, or bacon business. There are two sources of income from the flock—mutton and wool. These products are as different as the poles. The one appeals to man's interior, the other to his exterior, and it does not follow when one is in demand the other follows suit. Consequently, the flock master has conditions to meet widely different from his brother breeder. The pendulum of his business tends sometimes toward wool. It is seldom that the best-wooled sheep meet the demand of the butcher. There is a continual wavering in the mind of the sheep man as to what course to pursue. Then there is the declining taste for large joints (more apparent now than ever before in our beef business). Still much is being done, and eventually we believe that the sheep of the American continent will find the spots where type is as necessary as in Great Britain. As the Cotswolds and the Cheviots are products of their native hills, firmly established, impregnable as Gibraltar from assaults of other breeds, it is certain that in the years to come we will have in Wyoming a general-purpose sheep widely different from that of Ohio or Ontario. It would be useless to prophesy what will be the leading breed. In a long stock-yard experience I have failed to make up my mind even vaguely on the subject. Certainly, we are drifting on to some more defined, stable foundation in our sheep business. As the Western flock master, at present the great producer, acquires land (as he is rapidly doing), and consequently increases his expense of production, he will need to look more narrowly to breeding only the best, or at least producing the type of sheep most suitable and profitable for his conditions. In this industry we are still in a transition stage, through which in our cattle business we have almost passed. Free range still serves the sheep man, but it will pass away also, and the men of the East will meet their brothers of the West on more equal terms.

## THE AMERICAN BREEDER AS A PERSONALITY.

As a personality, the American breeder of fine stock is a wonderful study. In the pioneer days it was not the rich merchant, the great landed magnate, traveled and educated, but it was the farseeing farmer, with modest means, who did the real work. Such men as the Renicks, the Smiths, and the Browns, men of mark and shrewdness and with an intense love of animals, were the pioneers, and continue to be practically the leaders to-day. Sometimes a rich man drops into breeding, but his efforts are apt to be desultory, often faddish, and rarely successful. In Great Britain the leaders have been noblemen and large landed proprietors, who took up breeding not only for profit, but as an incentive to their tenants. It was a sort of patriarchal system that flavors of the best in feudal days. It is true, of course, that Bakewell, Bates, and Booth, and latterly Cruickshank, were not rich men. It was their brains that evolved their different types. They had more than brains; they had genius. Their work, however, has been carried forward in a large degree by the rich landowners for reasons stated above, while in the States and Canada the rank and file of our breeders are farmers who have fought and are still fighting their way, having to make ends meet often in the face of countless difficulties. There is a dash and enterprise among our breeders that savors of success, which, if not a financial, is at least a national benefit. The tussles that take place in the show yard; the personalities, reprehensible in themselves, are but indications of that spirit of emulation which eventually leads on to bloodless battles won and new fields conquered. With all this collective vitality and wonderful energy there is no single case in our knowledge or remembrance at all comparable with the above British breeders. Maybe Abram Renick is of the same class. He approached them in his methods and foresight. His Rose of Sharons were a beautiful lot of cattle. The adjective beautiful is used advisedly, because his herd could not be called the perfection of bovine structure. But his life work was a great one. He had one ideal, and he attained it. He wanted a neat, small, rather effeminate animal, pleasant to the eye, with its mild expression and mellow hide, low-legged, active, a grazer with rapid maturing power; but to my idea there was a want of scale, and his bulls wanted that masculine power, the impress of head and neck, which you must have in a male animal, whether it be a bull, a ram, or a boar. Treating this great breeder with all due respect, we can not place him on the same pedestal with the great lights that illuminated the first days of Shorthorns in Britain or the climax of Cruickshank's career; but he stands far and away ahead of all other American breeders of any class of live stock, and the world, not only the continent, is richer for his efforts.

The criticism passed upon our breeders of all classes of live stock is that their methods are spasmodic. The nervous energy of our people leads on to this state of affairs. The writer has seen many herds of cattle and flocks of sheep, but scarce in one was there that remarkable uniformity or family likeness, that concentration of good points, that at once attracts the eye and gives character to the herd. The answer to the criticism is that we have not had the time, but we must endeavor to reach more uniformity. What a charm uniformity has to the buyer in our stock yards! From the intense practical ideas of our dressed beef men and Eastern buyers, the improving breeder can draw many a lesson.

In the stock yards of late years we have had remarkable instances of uniformity from the feed lots of some of our breeders of Aberdeen-Angus, perfect marvels, many of the lots of the best type of the beef animal, an Illinois herd marketing in December a lot of wonderful black beeves that on the hoof realized 8¼ cents per pound, the highest figure of the past fifteen years. The credit lies with our best breeders of this class for having advertised their products by practical illustration; no paper warfare, but by concentrating the facts in the beast before you. Probably the best work, relatively, of our breeders of late years has been with this class of cattle. They have shown us by their sacrifice in feeding steers that, as bulls, would have been a credit to any pasture, the wonderful powers of the Aberdeen-Angus as a beef animal; in fact, they have given us the living pictures, and remarkable ones they have been. The Aberdeen-Angus breed, transplanted from its native home to our shores, owes much to the personality of the men who have handled these cattle. In truth, they have been improving breeders, men of earnest devotion and single-mindedness, the image of the bovine Black ever in their eye, devotees to art in the realms of agriculture, just as keen as were the Greeks in pursuing the paths of Parnassus.

## CONCLUSION.

For over twenty-five years the writer has been intimately connected with American live-stock affairs. What a transformation has taken place! The general advance has been by leaps and bounds. True it is, that some classes of stock have forged ahead of others, but as a great collective forward movement nothing, so far as known, equals it. West of the Missouri most has been done. It was a virgin soil after the war, and the pioneers and ranchmen drew on the stocks of the older States for blood, in the use of which the source of supply has been outpaced; at least the general quality of the cattle is better than in the older States. There is still room for improvement. The ordinary breeder of cattle and sheep in the Central States has been careless during the past decade. He has allowed the Western pasture man and small ranchman to eclipse him in quality. He neglected his opportunities when bulls were cheap and plentiful. The improving breeder can only be kept going by selling his wares to the raiser of stock for market. The impulse of higher prices is remedying this evil and balancing to a great degree the different sections of the continent in blood and quality.

# DEVELOPMENT OF TRANSPORTATION IN THE UNITED STATES.

By Angus Sinclair,
*Editor Locomotive Engineering.*

## Mechanical and Business Problems.

Lord Bacon truly says that there are three things which make a nation great and prosperous—a fertile soil, busy workshops, and easy conveyance of men and commodities from place to place. The history of the world has proved Bacon's words to be true, but there have been nations blessed with a fertile country and busy workshops which have tried to get along without easy means of transportation, because of sectional differences concerning the defraying of the expense of constructing artificial arteries of intercommunication. The regions served by water transport were opposed to building roads for the convenience of localities remote from sea, lake, or river, and thus conflicting interests retarded the progress of some countries for the time being and left great spaces of fertile regions undeveloped.

In the course of two-thirds of a century a vast wilderness on the American Continent has been changed from gloomy, untrodden forests, dismal swamps, and pathless prairies into the abode of a high civilization. Prosperous States, teeming with populous towns, fertile farms, blooming gardens, and comfortable homes have arisen from regions where formerly savage men and wild animals were the sole tenants. A powerful factor in effecting this beneficent change has been the building of railroads.

### EARLY PRESSURE OF PRODUCTION UPON TRANSPORTATION.

Projects for providing facilities of transportation by rail originated almost simultaneously in the British Isles and the United States. Both countries were badly supplied with highways on which wheeled vehicles could convey heavy loads; both had tried canals and found them unsatisfactory in some respects. The increase of production of commodities faster than the means of moving them led enterprising men in both countries to look in the same direction for relief.

The conditions of urgent necessity which led to the inventing of the steam engine were repeated as the volume of produce and merchandise to be carried went beyond the capacity of water carriage and inferior roads. The steam engine came when great properties were deteriorating because horse power was incompetent to concentrate great effort in limited space. It was a foregone conclusion that the steam engine would be applied to locomotive purposes as soon as the horse proved unequal to the work of supplying the motive power for roads and canals.

The application of steam to water transportation delayed for a time the advent of the locomotive, but thoughtful men had glimpses of what the steam engine might do in moving loads on land almost as early as attempts were made to use steam in propelling boats.

## THE RAILROAD TRACK.

The railroad structure provided a way for the wheels of a vehicle to run upon a smooth, hard surface, where obstacles to progress, such as sinking of the wheels into soft places and mounting over stones or other projecting obstructions, would not be encountered. Such roads were to be found in various localities hundreds of years before the steam engine was invented. There are many traces of what were really stone railroads to be found in parts of Asia and Africa, where an advanced civilization flourished thousands of years ago. The rows of huge stone blocks, worn with myriads of wheels, are in many places the most substantial traces of an enterprising people long passed away. The writer has seen in the streets of Italian cities stone blocks laid down parallel, with a depression to keep the wheels of vehicles in place, and these make as smooth a roadbed as the inside surface of car-track rails provide for the truckmen of our large cities.

For hundreds of years stone ways were used in Germany and other countries in connection with quarries and coal pits. They were introduced into Great Britain in the eighteenth century. This kind of crude railroad was known by the name of "tramway," and Englishmen say it originated from the name of Outram, a noted individual, who took some interest in pushing these friction-reducing roads. As the word "tram" is German and has been used by all northern nations for a thousand years, the claim of Outram to the word is not acceptable. His name probably originated from the word, which was given to the man who drove the oxen outside of the trams of the plow. Outram was the outside man.

Burns, who wrote before Outram's time, in his "Inventory," says:

> An auld wheelbarrow more for token
> Ae tram and baith the legs are broken.

In the days anterior to railways the intercommunication between the people of different districts in Great Britain was not at all intimate, but those with the same interests seemed to find out what the others were doing. The British Isles are inflicted with rain, and rain is not good for dirt-made roads. It is, then, easy to imagine how well the invention of some coal miner was regarded who introduced tram rails to carry the wagons from the mine to the staith, or wharf, where the coal was dumped into ships.

One could not tell the coal-mining world of Great Britain at the beginning of this century much that was new about trams. The tramway began with long blocks of stone, that gave place to parallel wooden stringers for the wheels to run upon. The hand of progress covered the stringers with iron strips. Then some one found out that a cast-iron rail simplified matters, and a flange was put upon the wheels to prevent them from jumping the track. This was the condition of the world's "permanent way" when people of advanced ideas proposed to use it for steam-driven locomotives.

### NEED OF THE LOCOMOTIVE.

The nineteenth century had not advanced many years when people in the United States began to realize that something better than canals was necessary as a means of intercommunication if a great part of the nation's territory were to be opened up to settlement and civilization. There are numerous navigable rivers and long-reaching lakes on this continent, but geographically they are far apart, and there is no means of reaching vast regions except by land transportation. To the ordinary thinker a system of substantial macadam roads would have solved the difficulty as far as draft animals could have aided, but these roads were not tried to any extent.

The pinch of necessity wonderfully quickens the inventive faculties. Long before a mile of tramway was built in the United States in connection with coal mines, engineers and farseeing public men were discussing the possibilities of the steam engine as a means of accelerating land travel, and projects began to be agitated in different States to construct railways, or tramways, on which the steam engine could do the work of hauling the cars.

Those who looked favorably upon steam engines as motive power on railroads were a small minority, and they were considered by the majority as cranks and visionaries. Those regarded as sensible, progressive men, a little ahead of their time, favored horses for motive power.

The problem that public men were interested in was, How are we going to move our merchandise, and coal, and ore to the nearest point of water navigation? The transportation of passengers received little consideration from the early railroad schemers.

It might here be mentioned that had James Watt never lived, the use of the steam engine for transportation purposes would have been given to the American people just as soon as it was. Oliver Evans, a native of Delaware, invented the high-pressure, high-speed engine as an improvement on the Newcomen atmospheric engine when Watt was working out his ponderous slow-moving improvement on the same engine. The United States has been the land of high-speed, high-pressure engines, the type most suitable for locomotive purposes, and Oliver Evans was the originator.

The need for the locomotive was much more urgent in the United States than it was in any other country. There were long stretches between Western rivers and Eastern estuaries that needed to be connected. There were no well-constructed roads of any consequence, and such roads, had they existed, could not have offered rapid transportation, so the railway was the chief hope of connecting the remote territory with markets and the seaboard.

### FIRST AMERICAN LOCOMOTIVE.

The first locomotive that was tried on the American Continent to run on rails was imported from England by the Delaware and Hudson Canal Company. It was selected and brought here by Horatio Allen, a pioneer engineer, who was interested in railroad enterprises. The engine was taken to Honesdale, Pa., and tried there in August, 1829. Mr. Allen reported that it was too heavy for the railroad structure, and its use was given up. The engine weighed only 7 tons, and there was some diversity of opinion about its being too heavy for the railroad, but Mr. Allen's decision was final. Several engines of the same type worked for years successfully on English railways. From what is known about the structure of the road, engineers now agree that it was sufficiently strong to support twice the weight of Allen's engine, known as the "Stourbridge Lion."

The first thirty years of the nineteenth century were for Americans the period of speculation about the probable success of railroad building and the utility of the locomotive. Then the people set to work to build railroads, and within ten years (1840) the country had 2,755 miles of railroads and tramways.[1] For a few years there was decided uncertainty that the locomotive would be a practical form of motive power, and Allen's fiasco with the "Stourbridge Lion" helped to make the capitalists who were investing their money in railroad building timid about ordering locomotives while they could operate their cars with horses.

### EARLY RAILROADS AND LOCOMOTIVE BUILDING.

The South Carolina Railroad Company was one of the earliest in the world to decide that its railroad should be operated by locomotives, and the operation began in 1827, very soon after the beginning in England.

People of Baltimore, who have always shown much zeal in supporting enterprises likely to bring trade and commerce to the city, obtained in 1827 a charter from the legislature of Maryland to construct

[1] Report on Transportation by Land, Eleventh Census, by Henry C. Adams, special agent, p. 6.

a railroad from Baltimore to a point on the Ohio River. The building of the Baltimore and Ohio Railroad was begun without loss of time with imposing ceremonies. In the early part of 1830 the road had been finished from Baltimore to Ellicott Mills, a distance of 13 miles, and the company began operating that part by horses. There were several sharp curves on the route, and a belief was general that a railroad having curves could not be operated by locomotives. Peter Cooper, whose fame as a philanthropist is well known, was a resident of Baltimore at that time, and he did not share the popular belief that locomotives would not be capable of working around curves, so, to demonstrate the faith that was in him, he built a small locomotive in the Mount Clare shops, Baltimore, and tried it on the road. It was a very tiny affair of about 1½ horsepower, but it proved that a locomotive could haul a load on a curved road.

Cooper's experiment increased public confidence in the efficiency of locomotives, and the demand for this kind of engine increased as steadily as pieces of railroad were finished.

Machine shops capable of building locomotives were not very numerous, but a few shops undertook the work and succeeded very well under the circumstances. The first practical engine intended for everyday work was built by the West Point foundry, New York, for the South Carolina Railroad. It was a small engine, with a vertical boiler, but it worked as satisfactorily as the English locomotives built at the same time (1830). The West Point foundry continued to build locomotives for a time, and improved on the design and capacity of the first engine. Among their most celebrated productions was the "De Witt Clinton," built for the Mohawk and Hudson Railroad.

Shortly after the experiment with Peter Cooper's model locomotive on the Baltimore and Ohio the management of the company advertised for locomotives of American manufacture, offering to pay liberally for them. In due time this brought five engines, all built at different places, all different in design, and none of them imitating English models. The preference was given to an engine built by Davis & Gartner, of York, Pa. This engine had a vertical boiler and was for a time the type of locomotive used by the Baltimore and Ohio Railroad.

After this there were locomotive-building shops to be found in several towns. Mathias Baldwin had entered the business the year previous, and his "Ironsides," the second locomotive built in the United States, was running on the Germantown road, where it was doing good work, although the company published a standing notice that the locomotive would start daily with a train of passenger cars if the weather was fair, but that on rainy days horses would pull the train.

By 1840 there were about two hundred and seventy locomotives working on fifty-six railroads that were partly finished; but the greater part of the mileage was still operated by horses. It may seem surprising that so many locomotives should be employed on such a short mileage when horses were doing most of the work, but a locomotive during the first railroad decade was very little larger than the fire engine of to-day, and great care was taken to prevent it from working hard. The weight of the first Baltimore and Ohio regular locomotive was $3\frac{1}{2}$ tons.

### EARLY FREIGHT RATES.

The greater parts of early railroads were projected to join two or three towns by easy communication or to provide the means of carrying freight from the interior to harbor towns that were not well provided with water transport. Complaints were made in the interior, where farm products were raised, that the cost of transportation to a market often exceeded the value of the shipment. When we examine the railroad rates charged in 1840, we are not surprised at the complaints made by agricultural communities. A good many of the railroads were chartered as turnpikes, and any person could haul cars over them on paying the legal toll charges. This plan, which caused great confusion, did not have the effect of cheapening transportation. For years after steam motive power was generally introduced private cars were hauled, both freight and passenger, payment being exacted on a tonnage basis.

In 1840 Mr. W. H. Wilson, engineer of the Columbia and Philadelphia Railroad, reported that the rates of toll for the use of the road varied from 6 mills to 4 cents per ton-mile. There were twelve different rates, the average being 2 cents per ton-mile. It was said that in the first nine months of the operation of the Baltimore and Ohio the cost per ton-mile was 6 cents. In 1837 the charges for carrying freight on a few leading railroads were as follows, in cents, per ton-mile: Baltimore and Ohio, $4\frac{1}{2}$; Baltimore and Washington, 4; Winchester and Potomac, 7; Portsmouth and Roanoke, 8; Boston and Providence, 10; Boston and Lowell, 7; Mohawk and Hudson, 8. At that time passengers were charged between 2 and 3 cents per mile on the roads that carried them.

Although the rates were high from our present standpoint, the railroads did not obtain much profit from the work done. This arose from a variety of causes. The railroads had nearly all been built in an inferior fashion, with material that was too light for trains, although engines and cars were also very light and poorly built. On most of the lines the business offered was very small, but the trains had to be run, no matter what the extra expense was.

As late as 1873 Gen. Herman Haupt, general manager of the Atlanta and Richmond Railroad, testified to a Senate committee that local rates were $3\frac{1}{2}$ to 4 cents per ton-mile, and that local passengers were charged from 4 to 5 cents per mile. These rates, he acknowledged, were about twice as high as those charged on Northern railroads. He justified the high charges on the ground that business was small. He was dealing with conditions that existed on nearly all railroads up to 1860.

The men in charge of the operating and of the machinery of railroads had to learn their business by hard and often expensive experience. But they made steady progress, and every succeeding year, up to a certain point, saw the railway transportation done at reduced expense.

### RAILS AND ROADBED.

It was soon found out that strap rails and other forms of weak permanent way, laid on a soft, yielding roadbed, made the worst kind of a foundation upon which to build up a prosperous business. Railroad operators were not long in finding out that locomotives weighing under 10 tons were too weak for hauling paying loads, and that the small cars used had too much dead weight for the paying load. From 1840 to 1860 the improving of the weak points named occupied the attention of the most progressive railroad officials.

When there are good prospects for obtaining plenty of goods to transport by railway the most important preparation for doing the work at low cost is to have a good roadbed and a substantial track properly laid upon it. The engineers who supervised the building of early railroads believed that the first requirement of a good track was to have it as unyielding as possible. The first part built by the Baltimore and Ohio served for several years as a model for other railroad builders. A roadbed was first graded as nearly level as possible. A small trench was then made for each track and filled with rubblestone. On this were laid blocks of granite or other rock, about a foot square and as long as possible. The upper face and inner surface of these blocks were dressed perfectly smooth. Bars of iron, about an inch thick, were then laid on them close to the inner edge and fastened there.

In some sections granite or other rock blocks were laid at intervals with wooden stringers, to which the iron rails were fastened.

As late as 1841, in the building of the Erie Railroad, one of the presidents had piles driven for 100 miles on dry land, to make a substantial support for the stringers that were to carry the rails.

A few years' experience proved that the unyielding support to the rails turned the structure into a long anvil, on which the rolling stock was hammered to destruction. All who could afford the expense lost no time in putting in cross-ties to support the track.

Great varieties of rail sections were tried during the first twenty years of railroad building. First there was the plain strap noted for its "snakeheads," which was a form the rail sometimes took at a loose joint. Frequently these snakeheads forced their way up through the car floor. Contemporaneous with the strap was the fish-bellied rail, which was deeper in the middle than at the ends. This rail had to be kept in position by cast-iron chairs, secured to the stringers or cross-ties. Next came the U, or bridge, rail, laid with the flanges spiked to the supports. Eventually the T-rail came and gradually sent the others to scrap dealers.

### IMPROVEMENTS IN THE ENGINE.

The first direction that the improvement of rolling stock took was the extension of the wheel base of the engine so that the weight should be distributed over as much rail length as practicable with the lightest possible weight on any one spot. This movement was really begun in the United States, when, in 1831, John B. Jervis, chief engineer of the Mohawk and Hudson Railroad, put a four-wheel truck under the front end of an engine that was built under his supervision. This worked so well on weak, uneven track that it was gradually adopted by nearly all American railroads.

The coal railroads of Pennsylvania, Maryland, and New York, which frequently had more business than their motive power could handle, began using engines about the middle of the century which were extraordinarily heavy and powerful for that time. The companies using those engines could afford to build and maintain very substantial permanent way, which was not the case with the average railroad company. At the same time the engine for ordinary train service was working into an established form. By 1860 engines weighing about 20 tons were becoming common, and most of them were carried on two pairs of coupled driving wheels and a four-wheel truck in front. That form came to be known as the "American" engine, and it held almost exclusive control of the motive-power field with regular enlargements until about 1880. These engines were suitable for any service, passenger or freight, when used on fairly level roads, and are to-day the most popular motor ever put in front of a train.

The locomotive of 1900 is an example of steady evolution, and its leading features are survivals of the fittest. Vast improvements have been made in quality and finish of material. Certain important changes have been effected, among which these may be mentioned: The putting of iron and steel into frames and driving wheels that formerly were partly of wood; counterbalancing the driving wheels; making the fire box suitable for burning coal instead of wood; using equalizing levers between the wheels; placing the cylinders horizontally instead of vertically or inclined; using steel tires instead of iron; using steel for boilers instead of iron and for fire boxes instead of iron or copper; using iron or steel for tubes instead of brass. All these improvements have helped to increase the durability of the engine, to make it more efficient, and therefore to enable it to reduce the cost of hauling mile-tons of freight or passengers. Other changes made in the interests of economy are extremely high boiler pressure, increase in size, and using the steam on the compound system.

### STEEL RAILS.

Steel rails began to be introduced about 1867, and they steadily forced iron rails out of use, except for places where the traffic was very light. Engineers who have made the subject a special study say that a steel rail is from 8 to 15 times more durable than iron and is much less liable to breakage throughout the whole of its use. The invention of cheap methods of making steel rails has had a stupendous effect upon transportation. It brought the cereals of regions west of the Missouri River and of the remote Northwest into competition with the grain-raising districts of the Eastern States and of Europe and Asia; it caused a semirevolution in farming business in the British Isles, and strongly affected the condition and fortunes of millions of people. While inflicting injury on the interests of the few, the invention exercised a distinct beneficent influence on the many.

The iron rail and the 25-ton locomotive had pushed settlement and civilization far beyond the limits possible when the mule-hauled wagon formed the means of transport to waterways. Steel rails and huge locomotives make the railroad a close competitor with waterways in the cost of transportation; these have also made the capacity for reaching remote places almost unlimited.

It was only after the introduction of steel rails that railroad men began to grasp the conditions necessary to move a unit of passengers or freight at the least possible expense. The principal conditions are powerful locomotives, loaded to their utmost capacity with large cars carrying heavy loads and run over a fairly straight and level road. For the last ten years all competent railroad managers have been working in this direction.

Improvement in permanent way and in motive power greatly reduced the cost of transportation, but a great change in the methods of railroad operating and management preceded the physical improvements referred to.

### CONSOLIDATION AND EXTENSION OF RAILROADS.

It has already been mentioned that most of the early railroads were built to connect towns or waterways. They were mostly short roads that did not attempt to cooperate with one another in moving freight or passengers beyond their own limits. This led to very annoying delays and extra handling of freight. The line, for instance, between Albany and Niagara was in the hands of many separate companies that seldom worked in harmony, and nearly all other lines that were links in through routes were managed in a similar manner. By 1850 the people had become tired enough of the unnecessary discomforts endured on long journeys, and they began to demand radical reform. This gave personages who became known as "railroad kings" their opportunity.

## ECONOMICS OF THE GAUGE.

In connecting disjointed lines the consolidators lost an opportunity which may cause much inconvenience in coming years. They found a great variety of track gauges and chose the narrowest, 4 feet 8½ inches, now known as the standard. That gauge is too narrow for admitting of a properly designed boiler upon a large locomotive. Many locomotives are already at work that have reached the limit of their capacity, because the limited gauge prevents the boiler from being made larger. To obtain a large boiler it has been raised as high as bridges and tunnels will admit, and it can not be made any longer with economy, so that the question has been raised whether this country has not already nearly reached its limit of cheapness in railroad transportation. If the gauge had been made 6 feet, the Erie standard, or 5 feet 6 inches, which was the gauge of many Southern roads and that of Canada, the possibilities of making railroads compete successfully with water carriage would have been greatly increased. When all the leading railroads use locomotives of the greatest possible capacity for the gauge, and cars are made to carry the maximum load that can be safely conveyed on two four-wheel trucks, the cost of transportation will be reduced, but not to a radical extent. It is believed in some quarters that the bottom cost has nearly been reached unless some revolutionary change is made in the track and motive power.

One of the most curious facts met with in railroad history is the influences by which certain track gauges were established. The settling of the gauge likely to prove most convenient for the business to be done is an engineering problem which ought to have received careful study and profound calculation. Instead of that, the gauge was generally decided by some whim. In 1840 there were thirty-three separate railway companies in Great Britain, with 1,552 miles of track, and they had five different gauges, ranging from 4 feet 8½ inches to 7 feet—the narrowest gauge having more mileage than all the others. The former was George Stephenson's gauge, and it was established in a curious way. The gate openings of the first tram-road Stephenson was connected with were just sufficiently wide to permit wheels extending 5 feet to pass. At that time the flange of the wheel was on the outside. When the Stockton and Darlington Railway was built Stephenson put the wheel flanges inside. The width of the rail head was about 2 inches, so the inside gauge was 4 feet 8 inches. When the Liverpool and Manchester Railway was under construction the engineers concluded that it was better to give the wheels plenty of side play to make fast running easy, and they widened the gauge one-half inch, making it 4 feet 8½ inches.

The success of the Liverpool and Manchester Railway made George Stephenson a great man, and others were ready to imitate what he had done, so his gauge was adopted by most of the British railways.

He had locomotive building works that supplied many of our early railroads with engines, and the track gauge was generally established to fit the wheels of the engine. The South Carolina track was laid to 5-foot gauge, and the tendency in the South was to follow that width, but toward the Ohio River and some other Southern districts 5 feet 6 inches was the favorite gauge.

There was more confusion in the North. The roads that began with Stephenson engines had mostly 4 feet 8½ inches gauge; but there were to be found gauges of 4 feet 9 inches, 4 feet 10 inches, 4 feet 11 inches, and 5 feet. Canada had 5 feet 6 inches, and the Erie road 6 feet. The wide gauge was adopted for the Erie because the chief engineer said that the grades would be so heavy that enormously large locomotives would be needed to haul the trains and that the narrow gauge could not accommodate the size of engines necessary. The president favored the wide gauge because he did not wish the road to have facilities for interchange with other roads that might be the means of carrying trade away from New York City.

### RATES IN RECENT YEARS.

For the last thirty years the rates for the transportation of freight have been steadily reduced. In 1854 a leading trunk line with terminal in New York received an average 2.58 cents per ton per mile; in 1899 the rate had fallen to 0.517 of a cent. In 1870 twelve leading railroads received an average of 2 cents per ton-mile for freight, and in 1898 it had fallen to 7.53 mills. The average rate for passengers in the latter year was 1.973 cents per mile.

The rates for carrying passengers have not decreased in proportion to freight charges, but it is doubtful if the railroad companies earn more in proportion, for the cost of hauling trains has been greatly enhanced by the introduction of heavy, luxurious cars and accelerated speed.

### EXPANSION AND PROGRESS.

In the foregoing pages much space has been devoted to a consideration of the mechanical difficulties that were encountered by railroad engineers and constructors in the extension of the railway system of this country, for the reason that these difficulties were of a fundamental character and needed to be overcome before distant agricultural regions could be placed in practical and economical communication with their markets. In previous treatments of this subject, the dependence of agriculture upon these technical and fundamental features of transportation has not received due importance; hence, the present attempt to explain the indebtedness that agriculture and its extension in the United States owe to the mechanic, the engineer, the railroad constructor, the inventor, and the railroad manager. In the remainder of this paper attention will be given to industrial and economic features.

## ROADS AND CANALS.

When the nineteenth century began the inhabitants of the States forming the Union were settled within easy reach of navigable streams or estuaries of the ocean, which provided indifferent means of transportation. The most fertile land was often to be found farther from the waterways, but the expense of carrying produce to the market was in such cases greater than the value of the goods.

A glance at the map of the United States will show how bountifully nature has provided the Atlantic coast with inland waterways that extend far into the interior of the country. By the aid of these the nucleus of a great nation was established with practically no aid from artificial means of transportation. During the colonial period there was not enough State or national feeling to induce the people to join their energies in pushing enterprises, such as roads and improved waterways, for the public good. The long struggle of the Revolutionary conflict impoverished the people, never rich in the world's goods, and the close of the eighteenth century found the Government too poor to undertake the execution of public works greatly needed to aid the country in a progressive career.

Sentiment in favor of making better means of inland transit was, however, kindled, and it gradually but surely warmed up public opinion to engage in united efforts to carry out public works for the good of the country at large. The first useful manifestation of this sentiment was the building of good roads between important trade centers. Then came agitation in favor of the construction of canals. That the making of roads and canals did not achieve much progress in the early years of this century was due more to the poverty of the people than to their want of inclination.

The war of 1812 delayed to a great extent the construction of roads and canals, but peace was scarcely established when these public improvements were pushed with renewed vigor. By this time the invention of the steamboat was imprinting its mark upon the country and opening up prospects of extended inland commerce which never had been dreamed of when the century began.

## IMMIGRATION.

The nineteenth century has seen a mighty emigration, more stupendous than anything that happened in ancient times, and it has gone on so quietly that few people realize its vast proportions. This has been the emigration of people from Europe to the United States. The principal part of this immigration, which in itself has been sufficient to form a great nation, has happened since the beginning of the railroad era, and the extending of new railroads has constantly opened new worlds, where industry and thrift made possible conquests of wealth and comfort, such as no other movement of the human race has brought to the enterprising seekers after fortune.

THE STREAM OF TOILERS FROM EUROPE.

With road building, canal construction, and the sending of steamboats farther and farther inland, the United States was becoming the greatest center of commercial activity and enterprise in the whole world. The fame of this land of liberty extended beyond the Atlantic, and thousands of people, destitute of land or starving in forced idleness, looked to the United States as a land of promise, where industry would reap the reward of food, raiment, and comfort.

That started a stream of emigration which rose like a rippling brook, and increased as it advanced until it became a mighty river.

It is estimated that in the years from 1789 and 1820 about 250,000 immigrants came to the United States, a large proportion of them having arrived in the latest decade. Although the disturbance of the war of 1812 had prostrated enterprise, the last few years of the second decade of the century witnessed the inauguration of industrial activity, and were the beginning of the nation's irresistible march on the crusade of peaceful triumphs.

In the decennial period from 1821 to 1830 the immigrants numbered 143,439, and this brought the country to the beginning of the railroad-building period. The flood of immigrants then increased very rapidly, for the people in Europe found out that thousands of hands would be needed in the construction of railroad works, while others learned that the railroads were opening up new territory for settlement, where land could be bought cheaply, while a market would be open for the produce raised. In the decade 1831 to 1840 the Government records show that 599,125 immigrants arrived.

The stream of emigration was now becoming a flood. From 1841 to 1850 the population was increased by 1,713,251 people who came from beyond the seas. It went on increasing from this source till, in the decade from 1881 to 1890, it reached the immense proportions of 5,246,613. That was the high tide. From 1821 to 1899 immigrants to the number of 18,823,668 came to find homes in the United States. In the year 1882, which was the flood of the tide, the country received almost 800,000 immigrants.

The world never before saw anything comparable with this tremendous movement of people in so short a space of time. The population that Europe has thus lost in a hundred years is about equal to two-thirds of the population of Great Britain and Ireland in 1861, and is a little less than this fraction of the number of inhabitants in the United States in the same year. It represents five-sixths as many people as Great Britain and Ireland gained in population in the first ninety years of this century. If the ships on which these emigrants embarked carried, on an average, 500 passengers, more than 38,000 round trips have been made in ferrying them to their new homes.

No probability can be discerned that any later century will see the equal of this migration. The fairest parts of the world that were wildernesses in 1800 now teem with industry and population. There are no more virgin lands in abundance to occupy in this country; no more such enticements to draw millions from the homes of their fathers.

Much of this vast concourse of people rested not in towns upon their arrival, but marched out bravely to lands that had never felt the plow and to forests unmarked by the ax, and there by patient toil proceeded to enrich themselves and the nation under whose industrial flag they had enlisted.

INCREASE OF POPULATION, AGRICULTURE, AND RAILROAD MILEAGE.

The means of railroad transportation advanced steadily with the growth of population. Although early in the century a movement had been started for the construction of good roads, the work done scarcely made a mark on the map of the United States, and the people who settled more than a day's journey from navigable water or canals depended on railroads as almost their sole means of transporting their produce to markets. To them the railroad was looked upon to perform the functions done by turnpikes in other countries. On this account the people have given extraordinary encouragement to the building of railroads.

In 1840 the population of the country was 17,069,453, and there were 2,755[1] miles of railroads in operation, or 0.16 of 1 mile, about one-sixth of a mile for every 1,000 people. In the census year 1840 Ohio, Pennsylvania, New York, Virginia, and Kentucky raised 57 million bushels of wheat. During the same year Tennessee, Kentucky, Virginia, Ohio, and Indiana raised 181 million bushels of corn. The total volume of agricultural exports that year was worth $92,548,067.

The next decade, ending in 1850, found the population increased to 23,191,876 people, and the railroad mileage to 8,571,[1] or 0.37 of 1 mile for every 1,000 of the population. Pennsylvania, Ohio, New York, Virginia, and Illinois in 1850 raised 63½ million bushels of wheat, and Ohio, Kentucky, Illinois, Indiana, and Tennessee raised 281 million bushels of corn; Alabama, Georgia, Mississippi, South Carolina, and Tennessee raised 2.04 million bales of cotton; New York, Ohio, Pennsylvania, Virginia, and Tennessee had $222,900,000 worth of farm live stock on hand. The exports amounted to $108,605,713 in agricultural produce.

In 1860 there were 31,443,321 people, and 28,920[1] miles of railroad, or 0.92 of 1 mile to every 1,000 of the people. During 1860 Illinois, Indiana, Wisconsin, Ohio, and Virginia raised 84½ million bushels of wheat, while Illinois, Ohio, Missouri, Indiana, and Kentucky raised 397 million bushels of corn; Mississippi, Alabama, Louisiana, Georgia, and Texas raised 4.1 million bales of cotton; and the farms of New

[1] Report on Transportation by Land, Eleventh Census, by Henry C. Adams, special agent, p. 6.

York, Ohio, Illinois, Pennsylvania, and Kentucky had on hand 388 million dollars' worth of live stock. The value of agricultural exports was $256,560,972.

In 1870 the population had risen to 38,558,371, and the railroad mileage was 49,168,[1] or 1.28 miles to each 1,000 of the population. During that year Illinois, Iowa, Ohio, Indiana, and Wisconsin raised 141 million bushels of wheat; Illinois, Iowa, Ohio, Missouri, and Indiana raised 383½ million bushels of corn; Mississippi, Georgia, Alabama, Louisiana, and Texas raised 2.17 million bales of cotton; New York, Illinois, Ohio, Pennsylvania, and Missouri had on their farms 646 millions of dollars' worth of live stock. The export of agricultural produce was worth $361,188,483.

During the decade ended in 1880 the population increased to 50,155,783, and there were 87,724[1] miles of railroad, or 1.75 miles for each 1,000 inhabitants. Illinois, Indiana, Ohio, Michigan, and Minnesota raised 214½ million bushels of wheat in 1880, while Illinois, Iowa, Missouri, Indiana, and Ohio raised 1,030½ million bushels of corn, Mississippi, Georgia, Texas, Alabama, and Arkansas raised 3.89 million bales of cotton, and Illinois, Iowa, New York, Ohio, and Missouri had 574¼ million dollars' worth of live stock. The value of agricultural produce exported that year was $685,961,091.

In the 1890 decade the population was 62,622,250; there were 163,597[2] miles of railroads, 2.61 miles for every 1,000 of the population. Minnesota, California, Illinois, Indiana, and Ohio in 1890 raised 203¼ million bushels of wheat; Iowa, Illinois, Kansas, Missouri, and Ohio raised 1,173 million bushels of corn; Texas, Georgia, Mississippi, Alabama, and South Carolina raised 5.48 million bales of cotton, while the farmers in Iowa, Illinois, Missouri, Kansas, and New York had on hand 778 million dollars' worth of live stock. The export of agricultural products aggregated $629,820,808.

In 1900 the estimated population is 75,000,000; the miles of railroad, 190,000,[3] or 2.53 miles per 1,000 of population.

In 1899 Minnesota, North Dakota, Ohio, South Dakota, and Kansas produced 234 million bushels of wheat; Illinois, Iowa, Kansas, Nebraska, and Missouri raised 1,114 million bushels of corn; Texas, Georgia, Mississippi, Alabama, and South Carolina raised 8.2 million bales of cotton, and the farms in Iowa, Texas, Illinois, Kansas, and New York contained about 621 million dollars' worth of live stock.[4] The value of agricultural products exported was about $784,999,009.[5]

[1] Report on Transportation by Land, Eleventh Census, by Henry C. Adams, special agent, p. 6.

[2] Report of Statistician of Interstate Commerce Commission, 1898.

[3] Estimates of the Department of Agriculture, based on reports of the Statistician of the Interstate Commerce Commission.

[4] In 1900, without swine, $784,989,087.

[5] Bureau of Statistics, Treasury Department (subject to revision).

### LONG-DISTANCE TRANSPORTATION.

While the United States for many years continued to be almost exclusively an agricultural country, the center of population has remained near the middle of the settled portion. A century ago there were very few settlers west of the Appalachian Mountains except in Kentucky, Pennsylvania, and Ohio. The people were mostly settled on a strip about 1,600 miles long, extending along the coast from Maine to Alabama, the width depending upon the number and character of the rivers that provided means of transportation into the interior. Up to 1840 the center of population moved within a radius of 200 miles from Washington, D. C.; then it moved slowly westward. In 1850 it was near Parkersburg, W. Va.; in 1860 it was near Chillicothe, Ohio; in 1870 it was 48 miles east by north of Cincinnati, Ohio; in 1880 it was 8 miles west by south of Cincinnati and in 1890 it was 20 miles east of Columbus, Ind.

The center of population after 1840 began to be more and more influenced by the increasing population of the manufacturing and mining districts, and the greater part of the agricultural products came to be raised in States that were a long distance away from the center of population. It will be noticed that in 1840 and 1850 New York, Pennsylvania, and Virginia were among the best wheat-raising States, but after that the raising of cereals moved gradually to the Western States. This movement became very rapid after the introduction of steel rails enabled railroad companies to make material reduction in freight charges.

After railway construction began a part of the westward movement of population was surging in advance of railroad building, the enterprising people being contented to go forward and wait for the railroads that would give them easy communication with the commercial world by the time they had produce to sell and were ready to purchase the commodities that the outer world would supply. They went by rail, by boats on lakes and other waterways, and then by prairie schooner found their way to the more fertile regions open for settlement.

It was not safe, however, to settle far from a point of shipment by rail or water, because produce could be carried by wagons but a short distance before the cost of transportation would equal the value of the load.

The desired reduction of freight rates has not yet been accomplished; but the movement toward cheapness has been so pronounced that it is safe to predict that when railroads are using locomotives and cars of maximum power and capacity, a day's wages of a common laborer in New York may be sufficient to pay the charges on a year's food sent from St. Paul, Omaha, or Kansas City to New York. In 1887 the average charge for transporting a bushel of wheat from Chicago to New York by rail was 15.75 cents; in 1899 the charge was 11.6 cents. During the year 1887 the average rate per 100 pounds of meat from Cincinnati to New York by rail was 27.12 cents; during 1899 it was 24.83 cents.

Anterior to the steel-rail period, when wood-burning locomotives hauled cars loaded with from 500 to 600 bushels of wheat or from 15,000 to 20,000 pounds of other products, the rail freight charges for long distances were practically prohibitory. In 1858 the rate per bushel of wheat from Chicago to New York was 38.61 cents, and there was a very small margin of profit for the carriers. The introduction of more powerful locomotives and cars of greater capacity, together with water competition, pushed the all-rail rate downward till in 1870 it was 26.11 cents. At this time the lake and rail rate was 19.58 cents per bushel of wheat.

### DEVELOPMENT WEST AND SOUTHWEST.

There were now prospects that land in districts remote from water carriage would be cultivated with profit to the farmer, and the tide of immigration flowed rapidly into States that previously had a meager population. In the decade from 1860 to 1870 twelve States and Territories in the West, Northwest, and Southwest added the following approximate increase of population:

*Increase of population from 1860 to 1870.*

| State or Territory. | Increase of population from 1860 to 1870. | State or Territory. | Increase of population from 1860 to 1870. |
|---|---|---|---|
| Dakota | 9,000 | Minnesota | 268,000 |
| Illinois | 728,000 | Missouri | 539,000 |
| Indiana | 330,000 | Nebraska | 94,000 |
| Iowa | 519,000 | Texas | 214,000 |
| Kansas | 257,000 | Wisconsin | 279,000 |
| Kentucky | 165,000 | | |
| Michigan | 435,000 | Total | 3,837,000 |

This movement of immigration must have been greatly obstructed by the civil war, which covered nearly half of the decade. After peace and order were restored, the stream of immigration increased rapidly.

The increase of agricultural products was closely related to the increase of population. Cheap railroad rates enabled the more remote farmers to compete with farmers raising farm produce on the seacoast, and their dressed meat and grain were sent to consumers thousands of miles away. The subject of ocean transportation as relating to the distribution of the agricultural products in this country and the creation of a world market for them has been treated of fully in another publication issued by the Department.[1] The subject

[1] Statistics of Freight Charges for Ocean Transportation of the Products of Agriculture, October 1, 1895, to October 1, 1896, prepared by Mr. H. T. Newcomb, formerly chief of the section of freight rates, Division of Statistics, Department of Agriculture, now chief of the division of agriculture, Twelfth Census.

of canal transportation is a large one, and will only be mentioned in this paper, especially since the subject has been exhaustively treated of in other publications.[1]

## FREIGHT AND PASSENGER RATES.

### FREIGHT RATES.[2]

The following table shows the freight rates, in cents, per bushel for wheat and corn from Chicago to New York:

*Rates, in cents, per bushel for wheat and corn from Chicago to New York, 1870, 1880, 1890, and 1899.*

| Year. | Wheat. | | Corn. | |
|---|---|---|---|---|
| | By rail. | By rail and water. | By rail. | By rail and water. |
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| 1870 | 26.11 | 19.58 | 24.37 | 19.32 |
| 1880 | 19.8 | 15.8 | 17.48 | 14.43 |
| 1890 | 14.3 | 8.52 | 11.36 | 7.32 |
| 1899 | 11.6 | 6.63 | 10.08 | 5.83 |

The tendency of rates for live stock and dressed meat has been steadily downward, but not in the same proportion as the rates for cereals.

The following are the rates, in cents, per 100 pounds of live stock from Chicago to New York by rail:

*Rates, in cents, per 100 pounds of live stock from Chicago to New York by rail, 1872, 1880, 1890, 1895, and 1899.*

| Year. | Cattle. | Hogs. | Sheep. | Horses and mules. | Dressed beef. | Dressed hogs. |
|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| 1872 | | | | | 81 | |
| 1880 | 55 | 43 | 65 | 60 | 88 | |
| 1890 | 23 | 28 | 30 | 60 | 39 | 39 |
| 1895 | 28 | 30 | 30 | 60 | 45 | 45 |
| 1899 | 25 | 25 | 25 | 60 | 40 | 40 |

The distance from St. Louis to New Orleans by rail is about 754 miles. By water it is considerably greater. The river rates, however, compare favorably with the charges by rail. In 1866 corn and rye per bushel cost 9.05 cents during high water and 10.93 during low water. In 1877 these rates were 7.63 and 8.59 cents, respectively, and

[1] See Publications of the American Economic Association, Vol. V, 1890, Nos. 3 and 4, two papers on the canal question, by Edmund J. James, Ph. D., and by Lewis M. Haupt, C. E.; also Quarterly Journal of Economics, February, 1900, "The New York canals," by John A. Fairlie.

[2] All rates are expressed in gold.

grain in sacks of 100 pounds cost 20.04 cents for freight, while wheat in bulk was charged only 8.11 cents per bushel. In 1899 these latter rates had dropped to 10 and 4.50 cents, respectively. The rates for corn and rye were quoted in 1892 as 5 cents per bushel for high water and 7 cents for low water.

The distance from Cincinnati to New York is about 200 miles shorter than the distance from Chicago, but the rates for dressed meats are not materially lower. In 1868 the average rate per 100 pounds was 48.8 cents. In 1880 the rate was 33.41 cents; in 1890 it was 23.89 cents, and in 1899 it was 24.83 cents.

For bulky, fragile, and perishable articles higher rates are charged by railroad companies than for those heavy articles with which a car can be loaded to its full carrying capacity as measured by weight, and which are not likely to sustain damage in transit. The following table shows the rates, in cents, for 100 pounds of a variety of merchandise from New York to Chicago:

*Rates, in cents, per 100 pounds of merchandise from New York to Chicago by rail, 1867, 1870, 1880, 1890, and 1899.*

| Year. | Less than car load. | | | Regardless of quantity. | | | | |
|---|---|---|---|---|---|---|---|---|
| | Agricultural implements. | Lead. | Sugar. | Dry goods. | Cotton piece goods. | Boots and shoes. | Tea. | Drugs. |
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| 1867 | 137 | 60 | 60 | 137 | 137 | 137 | 135 | 137 |
| 1870 | 113 | 61 | ........ | 113 | 113 | 113 | 113 | 113 |
| 1880 | .......... | 40 | 40 | 75 | 75 | 75 | 65 | 75 |
| 1890 | 50 | 35 | 35 | 75 | 50 | 75 | 75 | 75 |
| 1899 | 50 | 35 | 35 | 75 | 50 | 75 | 75 | 75 |

Car loads naturally come cheaper than small quantities, but it was only the later generations of railroad officials who recognized this distinction. They have also treated shippers of different classes of freight more equitably than their predecessors. The following are the rates, in cents, per 100 pounds of a variety of commodities from New York to Chicago by rail, in car loads:

*Rates, in cents, per 100 pounds of articles from New York to Chicago by rail, 1867, 1870, 1880, 1890, and 1899.*

| Year. | Furniture. | Agricultural implements. | Crockery and earthenware. | Coffee. | Starch. | Molasses. | Soap. | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Castile. | Common. |
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| 1867 | 137 | 137 | 117 | 117 | 117 | 60 | 117 | 93 |
| 1870 | 113 | 113 | ........ | ........ | 78 | ........ | 98 | 60 |
| 1880 | 75 | 40 | 40 | 40 | 40 | 40 | 60 | 40 |
| 1890 | 65 | 30 | 30 | 25 | 25 | 30 | 65 | 30 |
| 1899 | 65 | 30 | 30 | 25 | 25 | 30 | 25 | 25 |

The following are the average freight rates, in cents, per ton per mile charged by different railroad companies:

*Average rates, in cents, per ton per mile by different railroads, 1867, 1870, 1880, 1890, and 1898.*

| Year. | Boston and Albany. | New York Central. | Erie. | Lake Shore and Michigan Southern. | Pennsylvania. | Chesapeake and Ohio. | Chicago, Rock Island and Pacific. | Illinois Central. | Union Pacific. | All in United States. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| 1867 | 2.201 | 1.98 | 1.465 | 1.745 | 1.497 | 3.753 | 2.185 | 2.085 | -------- | 1.925 |
| 1870 | 1.851 | 1.590 | 1.125 | 1.269 | 1.268 | 4.101 | 2.316 | 1.953 | 3.596 | 1.889 |
| 1880 | 1.207 | .879 | .836 | .750 | .918 | .866 | 1.209 | 1.543 | -------- | 1.232 |
| 1890 | 1.105 | .730 | .665 | .644 | .661 | .561 | .995 | .942 | 1.138 | .941 |
| 1898 | .839 | .606 | .575 | .530 | .521 | .369 | .966 | .695 | .95 | .753 |

PASSENGER RATES.

The following table shows the average rates, in cents, per passenger-mile charged by different railroad companies:

*Average rates, in cents, per passenger-mile, 1867, 1870, 1880, 1890, and 1898.*

| Year. | Boston and Albany. | New York Central. | Erie. | Lake Shore and Michigan Southern. | Pennsylvania. | Chesapeake and Ohio. | Chicago, Rock Island and Pacific. | Illinois Central. | Union Pacific. | All in United States. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| 1867 | 1.955 | -------- | 1.641 | -------- | 2.074 | -------- | 3.132 | 2.798 | -------- | 1.994 |
| 1870 | 2.342 | 1.77 | 2.47 | 2.204 | 2.167 | 3.979 | 3.426 | 3.29 | 4.301 | 2.392 |
| 1880 | 2.096 | 1.999 | 2.041 | 2.135 | 2.222 | 2.959 | 2.806 | 2.514 | -------- | 3.442 |
| 1890 | 1.858 | 1.91 | 1.584 | 2.253 | 2.094 | 2.056 | 2.149 | 2.022 | 2.045 | 2.167 |
| 1898 | 1.75 | 1.806 | 1.548 | 2.032 | 1.953 | 1.943 | 2.092 | 1.938 | 1.945 | 1.973 |

It will be seen from the above figures that the downward trend of passenger rates has not been conspicuous. Indeed, the above table shows that passenger rates were about as high in 1898 as they were in 1867. There is so much suburban business, which is carried at reduced rates, mixed up with the figures quoted that the real rates for through travel are higher than the table shows. As the rates on American passenger trains for first-class cars have been for forty years as low as were to be found in any country, it is not surprising that they have undergone little reduction.[1]

[1] For a detailed statement of railway transportation rates, see Bulletin No. 15, miscellaneous series, Division of Statistics, U. S. Department of Agriculture, Changes in the Rates of Charge for Railway and other Transportation Services, prepared under the direction of Mr. John Hyde, Statistician, by Mr. H. T. Newcomb, formerly chief of the section of freight rates.

The Midland Railway of England, which may be taken as a representative road, some years ago abolished second-class passenger rates, and now runs only first-class and third-class carriages. The rate for first class is $3\frac{1}{6}$ cents per mile, and for third class 2 cents per mile. Other railways charge from $4\frac{1}{2}$ cents to 5 cents per mile for first class, 3 to $3\frac{1}{2}$ cents for second class, and 2 cents per mile for third class, the latter rate being regulated by law.

Mr. George H. Daniels, general passenger agent of the New York Central Railroad, a high authority on railroad matters, in an address delivered before the Utica Chamber of Commerce on February 19, 1900, said :

> It is beyond question that American railroads to-day furnish the best service in the world, at the lowest rates of fare, at the same time paying their employees very much higher wages than are paid for similar service in any other country on the globe.
>
> In the United States the first-class passenger fares last year averaged 1.98 cents per mile, although on some large railways the average was several mills less than 2 cents per mile; in England the first-class fare is 4 cents per mile; third-class fare, for vastly inferior service, is 2 cents per mile, but only on certain parliamentary trains.
>
> In Prussia the first-class fare is 3 cents per mile; in Austria 3.05 cents per mile; in France 3.36 cents per mile.
>
> Our passenger cars excel those of foreign countries in all that goes to make up the comfort and convenience of a journey.
>
> Our sleeping and parlor car system is vastly superior to theirs; our baggage system is infinitely better than theirs, and arranged upon a much more liberal basis. American railroads carry 150 pounds of baggage free, while the German roads carry only 55 pounds free.
>
> The lighting of our trains is superb, while the lighting of trains on most foreign lines is wretched.

The annual reports of British railway companies do not show the charges of freight per mile, but Mr. E. G. Dorsey, a well-known civil engineer, investigated the subject several years ago, and his conclusion was that the rates averaged $2\frac{1}{2}$ cents per ton per mile. That is nearly three times the average rate charged by American railroads. Mr. J. S. Jeans, secretary of the Iron and Steel Institute of Great Britain, estimates the average rate for mineral to be 1.5 cents per ton per mile. The rates on railways on the Continent of Europe are a little higher than those of England for both freight and passengers.

# APPENDIX.

## SUMMARY OF INFORMATION ON VARIOUS SUBJECTS OF INTEREST TO THE FARMER.

# CONTENTS.

# APPENDIX.

## ORGANIZATION OF THE DEPARTMENT OF AGRICULTURE, DECEMBER 31, 1899.

### OFFICE OF THE SECRETARY.

SECRETARY OF AGRICULTURE, James Wilson.

The Secretary of Agriculture is charged with the supervision of all public business relating to the agricultural industry. He appoints all the officers and employees of the Department, with the exception of the Assistant Secretary and the Chief of the Weather Bureau, who are appointed by the President, and directs the management of all the divisions, offices, and bureaus embraced in the Department. He exercises advisory supervision over the agricultural experiment stations deriving support from the National Treasury, and has control of the quarantine stations for imported cattle and of interstate quarantine rendered necessary by contagious cattle diseases.

ASSISTANT SECRETARY OF AGRICULTURE, Joseph H. Brigham.

The Assistant Secretary performs such duties as may be required by law or prescribed by the Secretary. He also becomes Acting Secretary of Agriculture in the absence of the Secretary.

CHIEF CLERK, Andrew Geddes.

The Chief Clerk has the general supervision of the clerks and employees; of the order of business, records, and correspondence of the Secretary's office; of all expenditures from appropriations for contingent expenses, stationery, etc.; of the enforcement of the general regulations of the Department, and of the buildings occupied by the Department of Agriculture.

APPOINTMENT CLERK, Joseph B. Bennett.

The Appointment Clerk is charged by the Secretary with the preparation of all papers involved in making appointments, transfers, promotions, reductions, furloughs, or dismissals, and has charge of all correspondence of the Department with the United States Civil Service Commission. He deals with all questions as to positions in the Department which are under civil-service rules.

CHIEF OF SUPPLY DIVISION, Cyrus B. Lower.

The Supply Division has charge of purchases of supplies and materials paid for from the general funds of the Department.

### BUREAUS, DIVISIONS, AND OFFICES.

WEATHER BUREAU (corner Twenty-fourth and M streets NW).—*Chief*, Willis L. Moore; *Chief Clerk*, Henry E. Williams; *Professors of Meteorology*, Cleveland Abbe, F. H. Bigelow, Alfred J. Henry, Charles F. Marvin, Edward B. Garriott.

The Weather Bureau has charge of the forecasting of weather; the issue of storm warnings; the display of weather and flood signals for the benefit of agriculture, commerce, and navigation; the gauging and reporting of rivers; the maintenance and operation of seacoast telegraph lines, and the collection and transmission of marine intelligence for the benefit of commerce and navigation; the reporting of temperature and rainfall conditions for the cotton, rice, sugar, and other interests; the display of frost and cold-wave signals; the distribution of meteorological information in the interests of agriculture and commerce; and the taking of such meteorological observations as may be necessary to establish and record the climatic conditions of the United States or as are essential for the proper execution of the foregoing duties.

BUREAU OF ANIMAL INDUSTRY.—*Chief*, D. E. Salmon; *Assistant Chief*, A. D. Melvin; *Chief Clerk*, S. R. Burch; *Chief of Inspection Division*, A. M. Farrington; *Chief of Miscellaneous Division*, Tooie A. Geddes; *Chief of Pathological Division*, Victor A. Nörgaard; *Chief of Biochemic Division*, E. A. de Schweinitz; *Chief of Dairy Division*, Henry E. Alvord; *Zoologist*, Ch. Wardell Stiles; *In charge of Experiment Station*, E. C. Schroeder.

The Bureau of Animal Industry makes investigations as to the existence of contagious pleuro-pneumonia and other dangerous communicable diseases of live stock, superintends the measures for their extirpation, makes original investigations as to the nature and prevention of such diseases, and reports on the condition and means of improving the animal industries of the country. It also has charge of the inspection of import and export animals, of the inspection of vessels for the transportation of export cattle, and of the quarantine stations for imported neat cattle; supervises the interstate movement of cattle, and inspects live stock and their products slaughtered for food consumption.

DIVISION OF STATISTICS.—*Statistician and Chief*, John Hyde; *Assistant Statistician*, George K. Holmes.

The Division of Statistics collects information as to the condition, prospects, and harvests of the principal crops, and of the numbers, condition, and values of farm animals, through separate corps of county, township, and cotton correspondents, and individual farmers; and through State agents, each of whom is assisted by a corps of local reporters throughout the State. It obtains similar information from European countries monthly through consular, agricultural, and commercial authorities. It collects, tabulates, and publishes statistics of agricultural production, distribution, and consumption, the authorized data of governments, institutes, societies, boards of trade, and individual experts. It issues a monthly crop report and occasional bulletins for the information of the producers and consumers, and for their protection against combination and extortion in the handling of the products of agriculture.

SECTION OF FOREIGN MARKETS.—*Chief*, Frank H. Hitchcock.

The Section of Foreign Markets makes investigations and disseminates information "concerning the feasibility of extending the demands of foreign markets for the agricultural products of the United States."

OFFICE OF EXPERIMENT STATIONS.—*Director*, A. C. True; *Assistant Director*, E. W. Allen.

The Office of Experiment Stations represents the Department in its relations to the experiment stations which are now in operation in all the States and Territories. It seeks to promote the interests of agricultural education and investigation throughout the United States. It collects and disseminates general information regarding the colleges and stations, and publishes accounts of agricultural investigations at home and abroad. It also indicates lines of inquiry of the stations, aids in the conduct of cooperative experiments, reports upon their expenditures and work, and in general furnishes them with such advice and assistance as will best promote the purposes for which they were established. It is also charged with investigations on the nutritive value and economy of human foods. The collection of valuable matter on irrigation from agricultural colleges and other sources, as provided in the appropriation bill, is conducted by this office.

DIVISION OF CHEMISTRY.—*Chemist and Chief*, Harvey W. Wiley; *Assistant Chemist*, Ervin E. Ewell.

The Division of Chemistry makes investigations of the methods proposed for the analyses of soils, fertilizers, and agricultural products, and such analyses as pertain in general to the interests of agriculture. It can not undertake the analyses of samples of the above articles of a miscellaneous nature, but application for such analyses should be made to the directors of the agricultural experiment stations of the different States. The division does not make assays of ores nor analyses of minerals except when related to general agricultural interests, nor analyses of water.

DIVISION OF ENTOMOLOGY.—*Entomologist and Chief*, L. O. Howard; *Assistant Entomologist*, C. L. Marlatt.

The Division of Entomology obtains and disseminates information regarding injurious insects; investigates insects sent to the division in order to suggest appropriate remedies; conducts investigations in economic entomology in different parts of the country, and mounts and arranges specimens for illustrative and museum purposes.

DIVISION OF BIOLOGICAL SURVEY.—*Biologist and Chief*, C. Hart Merriam; *Assistant Chief*, T. S. Palmer.

The Division of Biological Survey studies the geographic distribution of animals and plants, and maps the natural life zones of the country; it also investigates the economic relations of birds and mammals, and recommends measures for the preservation of beneficial and the destruction of injurious species.

DIVISION OF FORESTRY.—*Forester and Chief*, Gifford Pinchot; *Superintendent of Working Plans*, Henry S. Graves.

The Division of Forestry investigates methods and trees for planting in the treeless West, gives practical assistance to tree planters, and also to farmers, lumbermen, and others, in handling forest lands. It studies commercial trees to determine their special values in forestry, and also studies forest fires and other forest problems.

DIVISION OF BOTANY.—*Botanist and Chief*, Frederick V. Coville; *Assistant Chief*, Lyster H. Dewey; *Special Agent in Charge of Section of Seed and Plant Introduction*, O. F. Cook.

The Division of Botany investigates botanical agricultural problems, including the purity and value of agricultural seeds; methods of controlling the spread of weeds or preventing their introduction into this country; the dangers, effects, and antidotes for poisonous plants, the native plant resources of the country, and other subjects of economic botany. It introduces, tests, and distributes valuable seeds and plants from foreign countries.

DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.—*Pathologist and Chief*, B. T. Galloway; *Assistant Pathologist*, Albert F. Woods.

The Division of Vegetable Physiology and Pathology has for its object a study of the normal and abnormal life processes of plants. It seeks by investigations in the field and experiments in the laboratory to determine the causes of disease and the best means of preventing the same. It studies plant physiology in its bearing on pathology.

DIVISION OF AGROSTOLOGY.—*Agrostologist and Chief*, F. Lamson-Scribner; *Assistant Chief*, Thomas A. Williams.

The Division of Agrostology is charged with the investigation of the natural history, geographical distribution, and uses of grasses and forage plants, their adaptation to special soils and climates, the introduction into cultivation of promising native and foreign kinds, and the preparation of publications and correspondence relative to these plants.

DIVISION OF POMOLOGY.—*Pomologist and Chief*, Gustavus B. Brackett; *Assistant Pomologist*, W. A. Taylor.

The Division of Pomology collects and distributes information in regard to the fruit interests of the United States; investigates the habits and peculiar qualities of fruits, their adaptability to various soils and climates, and conditions of culture; and introduces new and untried fruits from foreign countries.

DIVISION OF SOILS.—*Chief*, Milton Whitney; *Assistant Chief*, Lyman J. Briggs.

The Division of Soils is intrusted with the investigation, survey, and mapping of soils; the investigation of the cause and prevention of the rise of alkali in the soil, and the drainage of soils; and the investigation of the methods of curing and fermentation of tobacco in the different tobacco districts.

OFFICE OF PUBLIC ROAD INQUIRIES.—*Acting Director*, Maurice O. Eldridge.

The Office of Public Road Inquiries collects information concerning the systems of road management throughout the United States, conducts investigations and experiments regarding the best method of road making, and prepares publications on this subject.

DIVISION OF GARDENS AND GROUNDS.—*Horticulturist and Superintendent of Gardens and Grounds*, William Saunders.

The Division of Gardens and Grounds is charged with the care and ornamentation of the park surrounding the Department buildings, and with the duties connected with the conservatories and gardens for testing and propagating economic plants.

DIVISION OF PUBLICATIONS.—*Editor and Chief*, Geo. Wm. Hill; *Assistant Chief*, Joseph A. Arnold; *Assistant in Charge of Document Section*, R. B. Handy.

The Division of Publications exercises general supervision of the Department printing and illustrations, edits all publications of the Department (with the exception of those of the Weather Bureau), has charge of the printing and

Farmers' Bulletin funds, and distributes all Department publications with the exception of those turned over by law to the Superintendent of Documents for sale at the price affixed by him; it issues, in the form of press notices, official information of interest to agriculturists, and distributes, to agricultural publications and writers, notices and synopses of Department publications.

DIVISION OF ACCOUNTS AND DISBURSEMENTS.—*Chief and Disbursing Clerk*, Frank L. Evans; *Assistant Chief* (in charge of Weather Bureau disbursements), A. Zappone; *Cashier*, Everett D. Yerby.

The Division of Accounts and Disbursements is charged with the adjustment of all claims against the Department; decides questions involving the expenditure of public funds; prepares estimates of appropriations needed; contracts for annual supplies, leases, and agreements; issues requisitions for the purchase of supplies, requests for passenger and freight transportations; and attends to all business relating to the financial interests of the Department including payments of every description.

DIVISION OF SEEDS.—*Chief*, Robert J. Whittleton.

The Division of Seeds is charged with the purchase and distribution of valuable seeds. They are distributed in allotments to Senators, Representatives, Delegates in Congress, agricultural experiment stations, and by the Secretary of Agriculture, as provided by law.

LIBRARY.—*Librarian*, W. P. Cutter.

The Librarian has charge of the Library and supervises the arrangement and cataloguing of books, the preparation of bibliographies and similar publications, and the purchases of new books.

## APPROPRIATIONS FOR THE DEPARTMENT OF AGRICULTURE FOR THE FISCAL YEARS ENDING JUNE 30, 1898, 1899, AND 1900.

| Object of appropriation. | 1898. | 1899. | 1900. |
|---|---|---|---|
| Salaries, Department of Agriculture | $319,300 | $319,300 | $336,340 |
| Furniture, cases, and repairs, Department of Agriculture | 9,000 | 9,000 | 10,000 |
| Library, Department of Agriculture | 7,000 | 6,000 | 5,000 |
| Museum, Department of Agriculture | 3,000 | 1,500 | 1,500 |
| Postage, Department of Agriculture | 3,000 | 2,000 | 2,000 |
| Contingent expenses, Department of Agriculture | 25,000 | 25,000 | 25,000 |
| Animal quarantine stations | 12,300 | 12,000 | 12,000 |
| Collecting agricultural statistics | 110,000 | 105,000 | 110,000 |
| Botanical investigations and experiments | 15,000 | 20,000 | 20,000 |
| Entomological investigations | 20,000 | 20,000 | 20,000 |
| Vegetable pathological investigations | 20,000 | 20,000 | 26,000 |
| Biological investigations | 17,500 | 17,500 | 17,500 |
| Pomological investigations | 8,000 | 9,500 | 9,500 |
| Laboratory, Department of Agriculture | 12,400 | 12,400 | 17,700 |
| Forestry investigations | 20,000 | 20,000 | 40,000 |
| Experimental gardens and grounds, Department of Agriculture | 25,000 | 20,000 | 28,000 |
| Soil investigations[1] | 10,000 | 10,000 | 20,000 |
| Grass and forage plant investigations | 10,000 | 10,000 | 12,000 |
| Fiber investigations | 5,000 | ---------- | ---------- |
| Agricultural experiment stations [$755,000, 1898; $760,000, 1899; $765,000, 1900][1] | 35,000 | 40,000 | 45,000 |
| Nutrition investigations | 15,000 | 15,000 | 15,000 |
| Public-road inquiries | 8,000 | 8,000 | 8,000 |
| Publications, Department of Agriculture | 65,000 | 65,000 | 80,000 |
| Sugar investigations | 5,000 | 7,000 | 7,000 |
| Purchase and distribution of valuable seeds | 130,000 | 130,000 | 130,000 |
| Salaries and expenses, Bureau of Animal Industry | 675,000 | 900,000 | 950,000 |
| Irrigation information | ---------- | 10,000 | 35,000 |
| Tea-culture investigations | ---------- | ---------- | 1,000 |
| Total | 1,584,200 | 1,814,200 | 1,983,540 |
| *Weather Bureau.* | | | |
| Salaries, Weather Bureau | 150,540 | 153,340 | 153,320 |
| Fuel, lights, and repairs, Weather Bureau | 8,000 | 8,000 | 8,000 |
| Contingent expenses, Weather Bureau | 8,000 | 8,000 | 8,000 |
| General expenses, Weather Bureau | 717,162 | 765,162 | 768,162 |
| Meteorological observation stations | ---------- | 75,000 | 60,000 |
| Erection of building at Sault Ste. Marie, Mich | ---------- | 3,000 | ---------- |
| Repairs to buildings and grounds, Bismarck, N. Dak | ---------- | 3,000 | ---------- |
| Building addition to Western Bureau building, Washington | ---------- | ---------- | 25,000 |
| Total for Weather Bureau | 883,702 | 1,015,502 | 1,022,482 |
| Grand total | 2,467,902 | 2,829,702 | 3,006,022 |

[1] Of these amounts $720,000 is annually paid directly to the experiment stations by the United States Treasury.

## AGRICULTURAL COLLEGES AND OTHER INSTITUTIONS IN THE UNITED STATES HAVING COURSES IN AGRICULTURE.[1]

| State or Territory. | Name of institution. | Location. | President. |
|---|---|---|---|
| Alabama | State Agricultural and Mechanical College (Alabama Polytechnic Institute). | Auburn | W. L. Broun, M. A., LL. D. |
| | State Normal and Industrial School. | Normal | W. H. Councill, Ph. D. |
| Arizona | University of Arizona | Tucson | M. M. Parker, M. A. |
| Arkansas | Arkansas Industrial University. | Fayetteville | J. L. Buchanan, M. A., LL. D. |
| | Branch Normal College | Pine Bluff | J. C. Corbin. |
| California | University of California | Berkeley | B. I. Wheeler, Ph. D., LL. D. |
| Colorado | The State Agricultural College of Colorado. | Fort Collins | B. O. Aylesworth, M. A., LL. D. |
| Connecticut | Storrs Agricultural College | Storrs | G. W. Flint, M. A. |
| Delaware | Delaware College | Newark | G. A. Harter, M. A., Ph. D. |
| | State College for Colored Students. | Dover | W. C. Jason, M. A., B. D. |
| Florida | Florida Agricultural College | Lake City | W. F. Yocum, M. A., D. D. |
| | Florida State Normal and Industrial College. | Tallahassee | T. De S. Tucker, M. A. |
| Georgia | Georgia State College of Agriculture and Mechanic Arts. | Athens | H. C. White, Ph. D. |
| | Georgia State Industrial College. | College | R. R. Wright. |
| Idaho | University of Idaho | Moscow | J. P. Blanton, M. A., LL. D. |
| Illinois | University of Illinois | Urbana | A. S. Draper, LL. D. |
| Indiana | Purdue University | Lafayette | |
| Iowa | Iowa State College of Agriculture and Mechanic Arts. | Ames | W. M. Beardshear, M. A., LL. D. |
| Kansas | Kansas State Agricultural College. | Manhattan | E. R. Nichols, M. A. |
| Kentucky | Agricultural and Mechanical College of Kentucky. | Lexington | J. K. Patterson, Ph. D., LL. D. |
| | State Normal School for Colored Persons. | Frankfort | J. E. Givens, B. A. |
| Louisiana | Louisiana State University and Agricultural and Mechanical College. | Baton Rouge | T. D. Boyd, M. A., LL. D. |
| | Southern University and Agricultural and Mechanical College. | New Orleans | H. A. Hill. |
| Maine | The University of Maine | Orono | A. W. Harris, D. Sc. |
| Maryland | Maryland Agricultural College. | College Park | R. W. Silvester. |
| Massachusetts | Massachusetts Agricultural College. | Amherst | H. H. Goodell, LL. D. |
| | Massachusetts Institute of Technology. | Boston | Henry S. Pritchett. |
| Michigan | Michigan State Agricultural College. | Agricultural College. | J. L. Snyder, M. A., Ph. D. |
| Minnesota | The University of Minnesota | Minneapolis | C. Northrop, LL. D. |
| Mississippi | Mississippi Agricultural and Mechanical College. | Agricultural College. | |
| | Alcorn Agricultural and Mechanical College. | Westside | W. H. Lanier, B. A. |
| Missouri | School of Agriculture and Engineering of the University of Missouri. | Columbia | R. H. Jesse, LL. D. |
| | School of Mines and Metallurgy of the University of Missouri. | Rolla | R. H. Jesse, LL. D. |
| | Lincoln Institute | Jefferson City | J. H. Jackson, B. A., M. A. |
| Montana | The Montana College of Agriculture and Mechanic Arts. | Bozeman | J. Reid, A. B. |
| Nebraska | The University of Nebraska | Lincoln | C. E. Bessey, Ph. D., LL. D. |
| Nevada | Nevada State University | Reno | J. E. Stubbs, M. A., D. D., LL. D. |
| New Hampshire | The New Hampshire College of Agriculture and the Mechanic Arts. | Durham | C. S. Murkland, M. A., Ph. D. |
| New Jersey | Rutgers Scientific School (The New Jersey State College for the Benefit of Agriculture and the Mechanic Arts). | New Brunswick | Austin Scott, Ph. D., LL. D. |
| New Mexico | The New Mexico College of Agriculture and Mechanic Arts. | Mesilla Park | F. W. Sanders, Ph. D. |
| New York | Cornell University | Ithaca | J. G. Schurman, M. A., D. Sc., LL. D. |

[1] Including only institutions established under the land-grant act of July 2, 1862.

## AGRICULTURAL COLLEGES AND OTHER INSTITUTIONS, ETC.—Continued.

| State or Territory | Name of institution. | Location. | President. |
|---|---|---|---|
| North Carolina | The North Carolina College of Agriculture and Mechanic Arts. | West Raleigh | G. T. Winston, LL. D. |
| | The Agricultural and Mechanical College for the Colored Race. | Greensboro | J. B. Dudley, M. A. |
| North Dakota | North Dakota Agricultural College. | Agricultural College. | J. H. Worst. |
| Ohio | Ohio State University | Columbus | W. O. Thompson, D. D. |
| Oklahoma | Oklahoma Agricultural and Mechanical College. | Stillwater | A. C. Scott, M. A., LL. M. |
| Oregon | Oregon State Agricultural College. | Corvallis | T. M. Gatch, M. A., Ph. D. |
| Pennsylvania | The Pennsylvania State College. | State College | G. W. Atherton, LL. D. |
| Rhode Island | Rhode Island College of Agriculture and Mechanic Arts. | Kingston | J. H. Washburn, Ph. D. |
| South Carolina | Clemson Agricultural College. | Clemson College | H. S. Hartzog, LL. D. |
| | The Colored Normal Industrial, Agricultural, and Mechanical College of South Carolina. | Orangeburg | T. E. Miller, LL. D. |
| South Dakota | South Dakota Agricultural College. | Brookings | J. W. Heston, Ph. D., LL. D. |
| Tennessee | University of Tennessee | Knoxville | C. W. Dabney, Ph. D., LL. D. |
| Texas | State Agricultural and Mechanical College of Texas. | College Station | L. L. Foster. |
| | Prairie View State Normal School. | Prairieview | L. C. Anderson, M. A. |
| Utah | The Agricultural College of Utah. | Logan | |
| Vermont | University of Vermont and State Agricultural College. | Burlington | M. H. Buckham, D. D. |
| Virginia | Virginia Polytechnic Institute (State Agricultural and Mechanical College). | Blacksburg | J. M. McBryde, Ph. D., LL. D. |
| | The Hampton Normal and Agricultural Institute. | Hampton | H. B. Frissell, D. D. |
| Washington | Washington Agricultural College and School of Science. | Pullman | E. A. Bryan, M. A. |
| West Virginia | West Virginia University | Morgantown | J. H. Raymond, Ph. D. |
| | The West Virginia Colored Institute. | Institute | J. McH. Jones. |
| Wisconsin | University of Wisconsin | Madison | C. K. Adams, LL. D. |
| Wyoming | University of Wyoming | Laramie | E. E. Smiley, D. D. |

## AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES, THEIR LOCATIONS, DIRECTORS, AND PRINCIPAL LINES OF WORK.

| Stations, locations, and directors. | Number on staff. | Number of teachers on staff. | Principal lines of work. |
|---|---|---|---|
| Alabama (College), Auburn: P. H. Mell | 13 | 8 | Botany; soils; analyses of fertilizers and food materials; field and pot experiments; horticulture; diseases of plants; feeding experiments; diseases of animals. |
| Alabama (Canebrake), Uniontown: H. Benton | 4 | | Soil improvement; field experiments; horticulture; floriculture; diseases of plants; diseases of animals. |
| Arizona, Tuscon: R. H. Forbes | 9 | 3 | Chemistry; field experiments; meteorology; diseases of plants; horticulture (including date-palm orchard). |
| Arkansas, Fayetteville: R. L. Bennett | 8 | 4 | Chemistry of foods; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals. |

AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES, ETC.—Continued.

| Stations, locations, and directors. | Number on staff. | Number of teachers on staff. | Principal lines of work. |
|---|---|---|---|
| California, Berkeley: E. W. Hilgard | 30 | 11 | Physics; chemistry and geographical distribution of soils; fertilizers; field crops; horticulture; botany; meteorology; technology of wine and olive oil, including zymology; chemistry of foods and feeding stuffs; entomology; drainage and irrigation; reclamation of alkali lands; plant introduction. |
| Colorado, Fort Collins: L. G. Carpenter | 17 | 8 | Chemistry; botany; meteorology; field experiments; horticulture; entomology; irrigation. |
| Connecticut (State), New Haven: E. H. Jenkins | 15 | ........ | Analysis and inspection of fertilizers, foods, and feeding stuffs; chemistry; diseases of plants; horticulture; field experiments; entomology. |
| Connecticut (Storrs), Storrs: W. O. Atwater | 7 | 1 | Food and nutrition of man and animals; bacteriology of dairy products; field experiments; dairying. |
| Delaware, Newark: A. T. Neale | 8 | 7 | Chemistry; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; entomology; dairying. |
| Florida, Lake City: W. F. Yocum | 9 | 5 | Chemistry; field experiments; horticulture; entomology. |
| Georgia, Experiment: R. J. Redding | 8 | 1 | Field experiments; horticulture; entomology; mycology; pig feeding; dairying. |
| Idaho, Moscow: J. P. Blanton | 11 | 10 | Physics; chemistry; botany; field experiments; horticulture; entomology; feeding experiments. |
| Illinois, Urbana: E. Davenport | 12 | 7 | Chemistry; bacteriology; field experiments; horticulture; forestry; diseases of plants; feeding experiments; entomology; dairying. |
| Indiana, Lafayette: C. S. Plumb | 11 | 9 | Chemistry; pot and field experiments; horticulture; feeding experiments; diseases of plants and animals. |
| Iowa, Ames: C. F. Curtiss | 23 | 13 | Chemistry; bacteriology; field experiments; horticulture; diseases of plants; feeding experiments; entomology; dairying. |
| Kansas, Manhattan: J. T. Willard | 14 | 14 | Soils; horticulture; seed breeding; field experiments; feeding and digestion experiments; diseases of animals; entomology. |
| Kentucky, Lexington: M. A. Scovell | 10 | 1 | Chemistry; soils; fertilizer analysis; field experiments; horticulture; diseases of plants; entomology; dairying. |
| Louisiana (Sugar), New Orleans: William C. Stubbs | ........ | ........ | Chemistry; bacteriology; soils and soil physics; field experiments; horticulture; sugar making; drainage; irrigation. |
| Louisiana (State), Baton Rouge: William C. Stubbs | 23 | 6 | Chemistry; geology; botany; bacteriology; soils; field experiments; horticulture; feeding experiments; entomology. |
| Louisiana (North), Calhoun: William C. Stubbs | ........ | ........ | Chemistry; soils; fertilizers; field experiments; horticulture; stock raising; dairying. |
| Maine, Orono: C. D. Woods | 13 | 6 | Chemistry; botany; analysis and inspection of fertilizers and concentrated commercial feeding stuffs; horticulture; diseases of plants; seed tests; food and nutrition of man and animals; poultry raising; diseases of animals; entomology; dairying. |
| Maryland, College Park: H. J. Patterson | 16 | 7 | Chemistry; soils; field experiments; horticulture; diseases of plants; feeding experiments; entomology. |

AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES, ETC.—Continued.

| Stations, locations, and directors. | Number on staff. | Number of teachers on staff. | Principal lines of work. |
|---|---|---|---|
| Massachusetts, Amherst: H. H. Goodell | 22 | 9 | Chemistry; meteorology; analysis and inspection of fertilizers and concentrated commercial feeding stuffs; field experiments; horticulture; diseases of plants; digestion and feeding experiments; diseases of animals; entomology. |
| Michigan, Agricultural College: C. D. Smith | 16 | 9 | Botany and bacteriology; field experiments; horticulture; forestry; diseases of plants; feeding experiments; diseases of animals; entomology; dairying. |
| Minnesota, St. Anthony Park, St. Paul: W. M. Liggett | 14 | 7 | Chemistry; field experiments; horticulture; forestry; diseases of plants; food and nutrition of man; plant and animal breeding; feeding experiments; diseases of animals; entomology; dairying. |
| Mississippi, Agricultural College: W. L. Hutchinson | 12 | 4 | Chemistry; soils; field experiments; horticulture; feeding experiments; dairying. |
| Missouri, Columbia: H. J. Waters | 13 | 5 | Chemistry; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; entomology; drainage. |
| Montana, Bozeman: S. M. Emery | 7 | 6 | Field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; irrigation. |
| Nebraska, Lincoln: T. L. Lyon | 19 | 10 | Chemistry; botany; meteorology; field experiments; horticulture; forestry; feeding and breeding experiments; diseases of animals; entomology; irrigation. |
| Nevada, Reno: J. E. Stubbs | 8 | 4 | Chemistry; botany; soils; field experiments; horticulture; forestry; entomology; irrigation. |
| New Hampshire, Durham: C. S. Murkland | 14 | 8 | Chemistry; soil physics; field experiments; horticulture; diseases of plants; feeding experiments; entomology; dairying; road experiments. |
| New Jersey (State), New Brunswick: E. B. Voorhees | 8 | 1 | Chemistry; biology; botany; analysis of fertilizers and foods; pot and field experiments; horticulture; diseases of plants; food and nutrition of man; diseases of animals; entomology; dairy husbandry; bacteria of milk; irrigation. |
| New Jersey (College), New Brunswick: E. B. Voorhees | 8 | 4 | |
| New Mexico, Mesilla Park: F. W. Sanders | 14 | 8 | Chemistry; botany; field experiments; horticulture; diseases of plants; entomology; irrigation. |
| New York (State), Geneva: W. H. Jordan | 24 | -------- | Chemistry; bacteriology; meteorology; analysis and control of fertilizers; field experiments; horticulture; diseases of plants; feeding experiments; poultry experiments; dairying. |
| New York (Cornell), Ithaca: I. P. Roberts | 21 | 8 | Chemistry of soils; feeding stuffs and dairy products; soils; fertilizers; field experiments; horticulture; diseases of plants; feeding sheep and swine; diseases of animals; poultry experiments; entomology; dairying. |
| North Carolina, Raleigh: G. T. Winston | 13 | 8 | Chemistry; field experiments; horticulture; analysis of feeding stuffs; digestion experiments; poultry experiments. |
| North Dakota, Agricultural College: J. H. Worst | 12 | 6 | Field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; dairying. |
| Ohio, Wooster: C. E. Thorne | 13 | -------- | Soils; field experiments; horticulture; diseases of plants; breeding and feeding experiments; entomology. |

## AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES, ETC.—Continued.

| Stations, locations, and directors. | Number on staff. | Number of teachers on staff. | Principal lines of work. |
|---|---|---|---|
| Oklahoma, Stillwater: John T. Fields | 10 | 5 | Botany; field experiments; horticulture; diseases of plants; digestion and feeding experiments; diseases of animals; entomology. |
| Oregon, Corvallis: T. M. Gatch | 12 | 12 | Chemistry; soils; field crops; horticulture; diseases of plants; digestion and feeding experiments; entomology; dairying. |
| Pennsylvania, State College: H. P. Armsby | 18 | 7 | Chemistry; meteorology; fertilizer analysis; field experiments; feeding experiments; dairying. |
| Rhode Island, Kingston: A. A. Brigham | 12 | 4 | Chemistry; meteorology; soils; field and pot experiments; horticulture; diseases of plants; poultry experiments; oyster culture. |
| South Carolina, Clemson College: H. S. Hartzog | 13 | 8 | Soils; analysis and control of fertilizers; field experiments; horticulture; plant breeding; diseases of plants; feeding experiments; veterinary science; entomology; dairying. |
| South Dakota, Brookings: J. H. Shepard | 11 | 6 | Bacteriology; chemistry of soils and soil physics; field experiments; forestry; diseases of plants; feeding experiments; entomology; irrigation. |
| Tennessee, Knoxville: C. W. Dabney | 12 | 3 | Chemistry; botany; fertilizers; field experiments; horticulture; animal production; entomology; dairying. |
| Texas, College Station: J. H. Connell | 15 | 7 | Chemistry; soils; fertilizers; field experiments; horticulture; feeding dairy cows; sheep husbandry; diseases of animals; irrigation. |
| Utah, Logan: L. Foster | 11 | 8 | Chemistry of soils and feeding stuffs; alkali soil investigations; meteorology; field experiments; horticulture; forestry; diseases of plants; cattle and sheep breeding; feeding experiments; dairying; poultry experiments. |
| Vermont, Burlington: J. L. Hills | 12 | 5 | Chemistry; analysis and control of fertilizers and feeding stuffs; field experiments; horticulture; disease of plants; feeding experiments; diseases of animals; dairying. |
| Virginia, Blacksburg: J. M. McBryde | 10 | 6 | Chemistry; fertilizers; diseases of plants; feeding experiments; diseases of animals; entomology. |
| Washington, Pullman: E. A. Bryan | 11 | 9 | Chemistry; soils; bacteriology; field experiments; horticulture; diseases of plants; feeding experiments; entomology. |
| West Virginia, Morgantown: J. H. Stewart | 12 | 4 | Chemistry; analysis and control of fertilizers; field experiments; horticulture; feeding experiments; poultry experiments; entomology. |
| Wisconsin, Madison: W. A. Henry | 20 | -------- | Chemistry; soils; field experiments; horticulture; feeding experiments; diseases of animals; dairying; drainage and irrigation. |
| Wyoming, Laramie: E. E. Smiley | 8 | 6 | Geology; botany; meteorology; waters; soils; fertilizers; field experiments; food analysis; feeding experiments; entomology. |

## NOTES REGARDING DEPARTMENT PUBLICATIONS.

The publications of the U. S. Department of Agriculture are mainly of three general classes:

I. Publications issued annually, comprising the Yearbooks, the Annual Reports of the Department, the Annual Reports of the Bureau of Animal Industry, and the Annual Reports of the Weather Bureau.

II. Other Departmental reports, divisional bulletins, etc. Of these, each bureau, division, and office has its separate series in which the publications are numbered consecutively as issued. They comprise reports and discussions of a scientific or technical character.

III. Farmers' bulletins, divisional circulars, reprinted Yearbook articles, and other popular papers.

The publications in Class I are distributed by the Department and by Senators and Representatives in Congress. For instance, of the 500,000 copies of the Yearbook usually issued, the Department is only allotted 30,000, while the remaining 470,000 copies are distributed by Members of Congress. The Department's supply of the publications of this class is, therefore, limited and consequently has to be reserved almost exclusively for distribution to its own special correspondents, and in return for services rendered.

The publications of Class II are not for distribution by Members of Congress, and they are not issued in editions large enough to warrant free general distribution by the Department. The supply is used mainly for distribution to those who cooperate with the Department or render it some service, and to educational and other public institutions. A sample copy of this class of publications can usually be sent on application, but aside from this, the Department generally finds it necessary to refer applicants to the Superintendent of Documents, of whom further mention is made below.

The publications of Class III treat in a practical way of subjects of particular interest to farmers. They are usually issued in large editions, and are for free general distribution by the Department. The farmers' bulletins are also for distribution by Senators and Representatives in Congress, to each of whom is furnished annually, according to law, a quota of several thousand copies for distribution among his constituents.

A limited supply of nearly all the publications in Classes I and II is, in compliance with the law, placed in the hands of the Superintendent of Documents for sale at cost of printing. Application for these should be addressed to the Superintendent of Documents, Union Building, Washington, D. C., and should be accompanied by postal money order payable to him for the amount of the price. No postage stamps or private checks should be sent. The Superintendent of Documents is not permitted to sell more than one copy of any public document to the same person. The Public Printer may sell to one person any number not to exceed 250 copies if ordered before the publication goes to press.

The Secretary of Agriculture has no voice in designating the public libraries which shall be depositories of public documents. Of the distribution of documents to such depositories, including the publications of this and all other Departments of the Government, the Superintendent of Documents has full charge.

For publications of the Weather Bureau requests and remittances should be directed to the Chief of the Weather Bureau.

The Department has no list of persons to whom all publications are sent. A monthly list is issued on the first day of each month giving the titles of all publications issued during the previous month with all the explanations necessary to enable applicants to order intelligently. This list will be mailed regularly to all who apply for it. The Department also issues and sends out to all who apply for them a complete list of all publications of which the Department has a supply for free distribution, and a similar list of all the Department's publications for sale by the Superintendent of Documents.

## PUBLICATIONS ISSUED JANUARY 1, 1899, TO DECEMBER 31, 1899.

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| Pruning of Trees and Other Plants. Reprinted from Yearbook for 1898 | 2,500 |

LIBRARY.

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| Accessions to the Department Library, October–December, 1898. Bul. 26. 5 cents | 1,000 |
| Accessions to the Department Library, January–March, 1899. Bul. 27. 5 cents | 1,000 |
| Accessions to Department Library, April–June, 1899. Bul. 28. 5 cents | 1,000 |
| List of Publications Relating to Forestry in the Department Library. Bul. 24. 15 cents | 1,000 |
| Accessions to the Department Library, July–September, with reprint. Bul. 29. 5 cents | 1,000 |

DIVISION OF POMOLOGY.

| | Copies. |
|---|---|
| Utilizing Surplus Fruits. Reprinted from Yearbook for 1898 | 1,000 |
| Nut Culture in the United States, Embracing Native and Introduced Species. Special Report. Reprint. 30 cents | 1,000 |
| Revised Catalogue of Fruits Recommended for Cultivation in the Various Sections of the United States and the British Provinces by the American Pomological Society. Bul. 8. 5 cents | 15,000 |

DIVISION OF PUBLICATIONS.

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| Publications of the U. S. Department of Agriculture for sale by the Superintendent of Documents, Union Building, Washington, D. C. Corrected to February 1, 1899. No. 179, fifth edition | 25,000 |
| The Vegetable Garden. Farm. Bul. 94 | 30,000 |
| Notes on Some English Farms and Farmers. Reprinted from Yearbook for 1898 | 200 |
| A Directory for Farmers. Reprinted from Yearbook for 1898 | 2,000 |
| Index to the Annual Reports of the U. S. Department of Agriculture for the years 1837 to 1893, inclusive. Bul. 1. 15 cents | 500 |
| List of Bulletins and Circulars issued by the U. S. Department of Agriculture and available for Free Distribution. Corrected to June, 1899. No. 247, third edition | 20,000 |
| Suggestions to Southern Farmers. Farm. Bul. 98 | 20,000 |
| Asparagus Culture. Farm. Bul. 61 | 20,000 |
| Monthly List of Publications. January 1899, to December, 1899 | 426,000 |

OFFICE OF PUBLIC ROAD INQUIRIES.

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|---|---|
| An Act to Provide for the Construction of Roads by Local Assessment, County and State Aid. Cir. 15. Reprint | 10,000 |
| The Forces Which Operate to Destroy Roads, with Notes on Road Stones and Problems Therewith Connected. Cir. 29. Reprint | 10,000 |
| Improvement of Public Roads in North Carolina. Reprinted from Yearbook for 1894. Reprint | 1,000 |
| Information Regarding Road Materials and Transportation Rates in Certain States West of the Mississippi River. Bul. 5. Reprint. 5 cents | 1,000 |
| Progress of Road Construction in the United States. Bul. 19. Reprint. 5 cents | 1,000 |
| Report of Committee on Legislation, Adopted by the State Good Roads Convention, Richmond, Va., October 10 and 11, 1895. Cir. 18. Reprint | 10,000 |
| Highway Maintenance and Repairs. Cir. 24. Reprint | 10,000 |
| Steel-Track Wagon Roads. Reprinted from Yearbook for 1898 | 3,000 |
| Construction of Good Country Roads. Reprinted from Yearbook for 1898 | 3,000 |
| Agriculture in Puerto Rico. Reprinted from Yearbook for 1898 | 2,000 |
| Road Improvement in Governors' Messages. Cir. 33 | 10,000 |
| Good Roads for Farmers. Farm. Bul. 95, with reprint | 50,000 |

DIVISION OF SOILS.

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| An Electrical Method of Determining the Moisture Content of Arable Soils. Bul. 6. Reprint. 5 cents | 800 |
| An Electrical Method of Determining the Temperature of Soils. Bul. 7. Reprint. 5 cents | 800 |
| An Electrical Method of Determining the Soluble Salt Content of Soils, with Some Results of Investigations on the Effect of Water and Soluble Salts on the Electrical Resistance of Soils. Bul. 8. Reprint. 5 cents | 800 |
| Soil Moisture: A Record of the Amount of Water Contained in Soils during the Crop Season of 1896. Bul. 9. Reprint. 5 cents | 800 |
| The Mechanics of Soil Moisture. Bul. 10. Reprint. 5 cents | 800 |
| The Soils of the Pecos Valley, New Mexico. Cir. 3 | 11,000 |
| Tobacco Soils of the United States: A Preliminary Report Upon the Soils of the Principal Tobacco Districts. Bul. 11. 10 cents | 1,500 |
| The Culture of Tobacco. Farm. Bul. 82. Reprints | 30,000 |
| Methods of Curing Tobacco. Farm. Bul. 60. Reprint | 25,000 |
| Tobacco Soils. Farm. Bul. 83. Reprints | 20,000 |
| Methods of Mechanical Analysis of Soils and the Determination of the Amount of Moisture in Soils of the Field. Bul. 4. Reprint. 5 cents | 500 |

| | Copies. |
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| The Alkali Soils of the Yellowstone Valley, from a Preliminary Investigation of the Soils near Billings, Mont. Bul. 14. 15 cents | 5,000 |
| Texture of Some Important Soil Formations. Bul. 5. Reprint. 15 cents | 300 |
| Alkali Lands. Farm. Bul. 88. With Reprint | 30,000 |
| The Movement and Retention of Water in Soils. Reprinted from Yearbook for 1898 | 300 |
| The Soluble Mineral Matter of Soils. Reprinted from Yearbook for 1898 | 300 |
| Electrical Instruments for Determining the Moisture, Temperature, and Soluble Salt Content of Soils. Bul. 15. 5 cents | 2,500 |

DIVISION OF STATISTICS.

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|---|---|
| Changes in the Rate of Charge for Railway and Other Transportation Services. Bul. 15. Reprint. 5 cents | 3,500 |
| Agricultural Production and Prices. Reprinted from Yearbook, 1897 | 1,000 |
| The Brazos River (Texas) Flood of June–July, 1899, and Its Effect upon the Agriculture of the Submerged Region. Cir. 10 | 9,000 |
| The World's Grain Crops in 1899. Cir. 11 | 58,000 |
| The Cost of Cotton Production. (Misc.) Bul. 16. 5 cents | 27,000 |
| Report on the Condition of Winter Grain on April 1, 1899, and the Losses of Farm Animals During the Year Ending March 31, 1899, with Statistics of Foreign Crops. Report 156, new series | 80,000 |
| Agricultural Statistics Relating to Grain, Cotton, Sugar, Animals, etc., in the United States. Reprinted from Yearbook for 1898 | 25,000 |
| Monthly Crop Circulars. May to November, inclusive | 1,349,000 |
| Public Domain of the United States. Reprinted from Yearbook for 1898 | 10,000 |
| Keeping Goats for Profit. By Almont Barnes, of the Division of Statistics. Reprinted from Yearbook for 1898 | 10,000 |
| The Crop Reporter, Vol. 1, Nos. 1 to 8 | 362,500 |

DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

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|---|---|
| Legal Enactments for Restriction of Plant Diseases. A Compilation of the Laws of United States and Canada. Bul. 11. Reprint. 5 cents | 200 |
| Peach-Growing for Market. Farm. Bul. 33. Reprints | 20,000 |
| Spraying for Fruit Diseases. Farm. Bul. 38. Reprints | 30,000 |
| The Pineapple Industry of the United States. Reprinted from Yearbook for 1895. Reprint | 2,000 |
| How to Grow Mushrooms. Farm. Bul. 53. Reprint | 10,000 |
| The Black Rot of the Cabbage. Farm. Bul. 68. Reprint | 20,000 |
| Cereal Rusts of the United States. A Physiological Investigation. Bul. 16. 10 cents | 3,000 |
| New Spraying Devices. Cir. 17. Reprint | 1,000 |
| Wilt Disease of Cotton, Watermelon, and Cowpea. Bul. 17. 15 cents | 4,000 |
| New Spraying Devices. Cir. 17 | 3,000 |
| Fungous Diseases of the Grape and Treatment. Farm. Bul. 4. Reprint | 500 |
| Potato Diseases and Their Treatment. Farm. Bul. 91 | 30,000 |
| Pollination of Pomaceous Fruits. Reprinted from Yearbook for 1898 | 1,000 |
| Work in Vegetable Physiology and Pathology. Reprinted from Yearbook for 1898 | 200 |
| Improvement of Plants by Selection. From Yearbook for 1898 | 7,000 |
| Treatment of Smuts of Oats and Wheat. Farm. Bul. 5. Reprint | 500 |

WEATHER BUREAU.

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|---|---|
| Monthly Weather Review. A summary, by months, of weather conditions throughout the United States, based upon reports of nearly 3,000 regular and volunteer observers. Vol. XXVI, No. 13; Vol. XXVII, Nos. 1 to 10. 10 cents each | 48,800 |
| The Probable State of the Sky Along the Path of the Total Eclipse of the Sun, May 28, 1900 | 600 |
| Instructions for Voluntary Observers | 5,000 |
| Aneroid Barometers | 250 |
| Frost: When to Expect it and How to Lessen the Injury Therefrom. Weather Bureau Bul. 13 | 5,000 |
| Report of the Chief of Weather Bureau, 1897–98: Parts II to VII, Climatology | 2,000 |
| Proceedings of the Convention of Weather Bureau Officials held at Omaha, Nebr., October 13–14, 1898. Bul. 24 | 5,000 |

| | Copies. |
|---|---|
| Climate and Crop Report of 1898, Alaska Section | 300 |
| Measurement by Precipitation. Circular E, Instrument Division | 750 |
| Property Loss by Lightning, 1898, with Some General Directions as to the Erection of Lightning Rods. Weather Bureau Bul. 26 | 1,000 |
| Climatology of the Isthmus of Panama | 600 |
| An Advance in Measuring and Photographing Sounds. 202 | 600 |
| Variations in Lake Levels and Atmospheric Precipitation | 500 |
| Brazos River Flood Bulletin | 2,000 |
| Report of the Chief for 1899 | 5,000 |
| The Probable State of the Sky Along the Path of the Total Eclipse of the Sun, May 28, 1900, Observations of 1899 | 5,000 |
| Vertical Gradients of Temperature, Humidity, and Wind Direction. A Preliminary Report on the Kite Observations of 1898 | 2,000 |
| The West Indian Hurricane of August 7-14, 1899. Storm Bul 1 | 2,500 |
| Notes on Frost. Farm. Bul, 104 | 60,000 |
| Hydrology of the Lake Minnetonka Watershed | 750 |
| The use of Kites in the Exploration of the Upper Air. Reprinted from Yearbook for 1898 | 1,000 |
| Cyclones, Hurricanes, and Tornadoes. Reprinted from Yearbook for 1898 | 1,000 |
| Meteorological Chart of the Great Lakes | 2,500 |
| Weather Forecasting: Some Facts, Historical, Practical, and Theoretical. Bul. 25 | 5,000 |
| Lightning and Electricity of the Air. In Two Parts. Bul. 26 | 5,000 |
| Meteorological Chart of the Great Lakes. January, June-October, December | 18,000 |
| Climate and Crop Bulletin No. 31, December, 1898, and No. 1, January, 1899, to No. 30, November, 1899 | 124,000 |
| Snow and Ice Chart weekly, January 2 to March 27, and December 5-26 | 28,050 |
| Daily weather map, January to December, 1899 | 476,150 |

## STATE OFFICIALS IN CHARGE OF AGRICULTURE.

*Secretary of Agriculture.*

| | | |
|---|---|---|
| Pennsylvania | John Hamilton | Harrisburg. |

*Commissioners of Agriculture.*[1]

| | | |
|---|---|---|
| Alabama | Isaac F. Culver | Montgomery. |
| Arkansas | Frank Hill | Little Rock. |
| Florida | L. B. Wombwell | Tallahassee. |
| Georgia | O. B. Stephens | Atlanta. |
| Kentucky | I. B. Nall | Frankfort. |
| Louisiana | Leon Jastremski | Baton Rouge. |
| Mississippi | G. W. Carlisle | Jackson. |
| Montana | J. W. Calderhead | Helena. |
| New York | Chas. A. Wieting | Albany. |
| North Carolina | S. L. Patterson | Raleigh. |
| North Dakota | H. U. Thomas | Bismarck. |
| South Carolina | A. P. Butler | Columbia. |
| Tennessee | Thos. H. Paine | Nashville. |
| Texas | Jeff Johnson | Austin. |
| Virginia | Geo. W. Koiner | Richmond. |
| Washington | W. P. C. Adams | Olympia. |

*State Engineer.*

| | | |
|---|---|---|
| Idaho | F. J. Mills | Boise. |

*Secretaries of State Boards of Agriculture.*

| | | |
|---|---|---|
| California | Peter J. Shields | Sacramento. |
| Colorado | A. M. Hawley | Fort Collins. |
| Connecticut | T. S. Gold | West Cornwall. |
| Delaware | Manlove Hayes | Dover. |

[1] In several States the duties of the Commissioner of Agriculture are joined with the care of other interests also, as of mining and labor.

| | | |
|---|---|---|
| Illinois | W. C. Garrard | Springfield. |
| Indiana | Chas. F. Kennedy | Indianapolis. |
| Kansas | F. D. Coburn | Topeka. |
| Maine | B. Walker McKeen | Augusta. |
| Massachusetts | J. W. Stockwell | Boston. |
| Michigan | I. H. Butterfield | Agricultural College. |
| Missouri | J. R. Rippey | Columbia. |
| Nebraska | R. W. Furnas | Brownville. |
| Nevada | Louis Bevier | Carson City. |
| New Jersey | Franklin Dye | Trenton. |
| New Hampshire | N. J. Bachelder | Concord. |
| North Carolina | T. K. Bruner | Raleigh. |
| Ohio | W. W. Miller | Columbus. |
| Oregon | C. D. Gabrielson | Salem. |
| Rhode Island | George A. Stockwell | Providence. |
| South Dakota | Walter B. Dean | Yankton. |
| Utah | H. P. Folsom | Salt Lake. |
| Vermont | C. J. Bell | East Hardwick. |
| West Virginia | J. B. Garvin | Charleston. |
| Wisconsin | John M. True | Madison. |

*Commissioner of Agriculture and Forestry.*

| | | |
|---|---|---|
| Hawaii | Byron Clark | Honolulu. |

## SECRETARIES OF STATE AGRICULTURAL SOCIETIES.

| | | |
|---|---|---|
| Georgia | J. Pope Brown | Hawkinsville. |
| Iowa | G. H. Van Houten | Des Moines. |
| Louisiana | E. L. Woodside | Baton Rouge. |
| Maine | G. M. Twitchell | Augusta. |
| Minnesota | E. W. Randall | Hamline. |
| Montana | Francis Pope | Helena. |
| Nevada | Wm. Hy. Doane | Reno. |
| New York | James B. Docharty | Albany. |
| North Carolina | Joseph E. Pogue | Raleigh. |
| Pennsylvania | Hiram Young | York. |
| South Carolina | T. W. Holloway | Pomaria. |
| Vermont | Henry Clark | Rutland. |

## OFFICIALS IN CHARGE OF FARMERS' INSTITUTES.

| State. | Name of official. | Post office. |
|---|---|---|
| Alabama | I. F. Culver, Commissioner of Agriculture | Montgomery. |
| | C. A. Cary, Alabama Polytechnic Institute | Auburn. |
| Arizona | R. H. Forbes, Director Agricultural Experiment Station. | Tucson. |
| Arkansas | W. G. Vincenheller, Agricultural Experiment Station. | Fayetteville. |
| California | E. J. Wickson, University of California | Berkeley. |
| | D. T. Fowler, Conductor Farmers' Institutes for Central and Northern California. | Do. |
| | A. J. Cook, Conductor Farmers' Institutes for Southern California. | Claremont. |
| Colorado | B. O. Aylesworth, President State Agricultural College | Fort Collins. |
| Connecticut | T. S. Gold, Secretary State Board of Agriculture | West Cornwall. |
| | F. H. Stadtmueller, Secretary Connecticut Dairymen's Association. | Elmwood. |
| | J. H. Merriman, Secretary Connecticut Pomological Society. | New Britain. |
| Delaware | Wesley Webb, Superintendent Farmers' Institute for Kent County. | Dover. |
| | A. T. Neale (Director Agricultural Experiment Station), Superintendent Farmers' Institute for Newcastle County. | Newark. |
| | S. H. Messick, Secretary Farmers' Institute for Sussex County. | Bridgeville. |
| Florida | H. E. Stockbridge, Agricultural College | Lake City. |
| Georgia | H. C. White, President State College of Agriculture and Mechanic Arts. | Athens. |
| | Editor Atlanta Evening Journal | Atlanta. |
| Illinois | A. B. Hostetter, Secretary and Superintendent of Farmers' Institutes. | Springfield. |
| | E. Davenport, Dean College of Agriculture, University of Illinois. | Urbana. |

## OFFICIALS IN CHARGE OF FARMERS' INSTITUTES—Continued.

| State. | Name of official. | Post office. |
|---|---|---|
| Indiana | W. C. Latta, Agricultural Experiment Station | Lafayette. |
| Iowa | Geo. Van Houten, Secretary State Board of Agriculture. | Des Moines. |
| | W. M. Beardshear, President State College of Agriculture and Mechanic Arts. | Ames. |
| Kansas | J. T. Willard, Director Agricultural Experiment Station. | Manhattan. |
| Kentucky | L. Moore, Assistant Commissioner of Agriculture, Labor, and Statistics. | Frankfort. |
| | M. A. Scovell, Director Agricultural Experiment Station. | Lexington. |
| Louisiana | L. Jastremski, Commissioner of Agriculture | Baton Rouge. |
| Maine | B. W. McKeen, Secretary State Board of Agriculture | Augusta. |
| Maryland | W. L. Amoss, Director Farmers' Institutes | Benson. |
| Massachusetts | J. W. Stockwell, Secretary State Board of Agriculture. | Boston. |
| Michigan | C. D. Smith, Director Agricultural Experiment Station. | Agricultural College. |
| Minnesota | O. C. Gregg, Superintendent Farmers' Institutes | Lynd. |
| Mississippi | W. L. Hutchinson, Director Agricultural Experiment Station. | Agricultural College. |
| Missouri | J. R. Rippey, Secretary State Board of Agriculture | Columbia. |
| Montana | J. Reid, President College of Agriculture and Mechanic Arts. | Bozeman. |
| Nebraska | E. A. Burnett, University of Nebraska | Lincoln. |
| New Hampshire | N. J. Bachelder, Secretary State Board of Agriculture. | Concord. |
| New Jersey | F. Dye, Secretary State Board of Agriculture | Trenton. |
| New York | F. E. Dawley, Director of Institutes | Fayetteville. |
| North Carolina | S. L. Patterson, Commissioner of Agriculture | Raleigh. |
| North Dakota | E. E. Kaufman, Assistant Dairy Commissioner | Fargo. |
| Ohio | W. W. Miller, Secretary State Board of Agriculture | Columbus. |
| Oregon | J. Withycombe, Vice-director Agricultural Experiment Station. | Corvallis. |
| Pennsylvania | A. L. Martin, Deputy Secretary of Agriculture and Director Farmers' Institutes. | Harrisburg. |
| Rhode Island | G. A. Stockwell, Secretary State Board of Agriculture. | Providence. |
| South Carolina | H. S. Hartzog, President Clemson Agricultural College. | Clemson College. |
| South Dakota | S. A. Cochrane, Director Farmers' Institute | Brookings. |
| Tennessee | T. H. Paine, Commissioner of Agriculture | Nashville. |
| | F. H. Broome, Secretary Agricultural Experiment Station. | Knoxville. |
| Texas | J. H. Connell, Director Agricultural Experiment Station. | College Station. |
| Utah | ......, President Agricultural College | Logan. |
| Vermont | C. J. Bell, Secretary State Board of Agriculture | East Hardwick. |
| Virginia | G. W. Koiner, Commissioner of Agriculture | Richmond. |
| | J. M. McBryde, President Polytechnic Institute | Blacksburg. |
| Washington | E. A. Bryan, Director Agricultural Experiment Station. | Pullman. |
| West Virginia | D. M. Silliman, Institute Director | Charleston. |
| Wisconsin | G. McKerrow, Superintendent Farmers' Institutes | Madison. |

## NATIONAL LIVE STOCK ASSOCIATION.

[Organized January 25, 1898.]

President, John W. Springer, Denver; secretary, Charles F. Martin, Denver.

## DAIRY OFFICIALS.

National Association of Dairy and Food Departments.—Secretary, J. B. Noble, Hartford, Conn.

National Dairy Union.—Secretary, Charles Y Knight, 188 South Water Street, Chicago, Ill.

National Creamery Buttermakers' Association.—Secretary, E. Sudendorf, Elgin, Ill.

New England Milk Producers' Union.—Secretary, L. S. Hayward, Pomfret Center, Conn.

Five States Milk Producers' Association.—Secretary, H. T. Coon, Little York, N. Y.

Columbia River Dairy Association.—Secretary, H. T. French, Moscow, Idaho.

ALABAMA.

Alabama Dairymen's Association.—Secretary, F. H. Bates, Hamburg.

CALIFORNIA.

State Dairy Bureau.—Secretary and agent, William Vanderbilt, 114 California Street, San Francisco.

California Dairy Association.—Secretary, Samuel E. Watson, 421 Market Street, San Francisco.

Dairymen's Association of Southern California.—Secretary, James R. Boal, 126 West Twenty-fifth street, Los Angeles.

COLORADO.

Dairy Commission.—Commissioner, T. L. Monson, Denver.

State Dairymen's Association.—Secretary, A. M. Hunter, Boulder.

CONNECTICUT.

Dairy Commission.—Commissioner, John B. Noble, Hartford.

Connecticut Dairymen's Association.—Secretary, George E. Manchester, Station A, Winsted.

Connecticut Creamery Association.—Secretary, Frank Avery, Manchester.

GEORGIA.

Georgia Dairymen's Association.—Secretary, M. L. Duggan, Sparta.

ILLINOIS.

Food Commissioner.—Commissioner, Alfred M. Jones, Room 1623 Manhattan Building, Chicago.

Illinois State Dairymen's Association.—Secretary, George Caven, 188 South Water street, Chicago.

Chicago Milk Shippers' Union.—Secretary, S. Hill, 94 La Salle street, Chicago.

INDIANA.

State Dairy Association.—Secretary, H. E. Van Norman, Lafayette.

IOWA.

Dairy Commission.—Commissioner, B. P. Norton, Des Moines.

Iowa State Dairy Association.—Secretary, J. C. Daly, Charles City.

KANSAS.

Kansas State Dairy Association.—Secretary, A. L. Goble, Riley.

MAINE.

Maine Dairymen's Association.—Secretary, L. W. Dyer, Cumberland Center.

MASSACHUSETTS.

Dairy Bureau.—Assistant executive officer, George M. Whitaker, Box 1332, Boston.

Massachusetts Creamery Association.—Secretary, A. W. Morse, Belchertown.

MICHIGAN.

Dairy and Food Commission.—Commissioner, Elliot O. Grosvenor, Lansing.

Michigan Dairymen's Association.—Secretary, S. J. Wilson, Flint.

MINNESOTA.

Dairy and Food Commission.—Commissioner, J. M. Bowler, St. Paul.

Minnesota State Dairymen's Association.—Secretary, Robert Crickmore, Pratt.

Minnesota State Butter and Cheese Makers' Association.—Secretary, J. K. Bennett, Clinton Falls.

MISSOURI.

Missouri Dairymen's Association.—Secretary, Levi Chubbuck, 1214 Chemical Building, St. Louis.

NEBRASKA.

Food Commission.—Deputy Commissioner, F. B. Hibbard, Lincoln.
Nebraska Dairymen's Association.—Secretary, S. C. Bassett, Gibbon.

NEW HAMPSHIRE.

Granite State Dairymen's Association.—Secretary, J. L. Gerrish, Contoocook.

NEW JERSEY.

Dairy Commission.—Commissioner, George W. MacGuire, Trenton.
New Jersey State Dairy Union.—Secretary, G. L. Gillingham, Moorestown.

NEW YORK.

Department of Agriculture (including dairy).—Commissioner, Charles A. Wieting, Albany.
New York State Dairymen's Association.—Secretary, W. W. Hall, Gouverneur.

NORTH CAROLINA.

North Carolina State Dairymen's Association.—Secretary, C. W. Gold, Wilson.

NORTH DAKOTA.

Commission of Agriculture.—Commissioner (and ex officio State dairy commissioner), H. U. Thomas, Bismarck.
North Dakota State Dairymen's Association.—Secretary, E. E. Kaufman, Fargo.

OHIO.

Dairy and Food Commission.—Commissioner, Joseph E. Blackburn, Columbus.
Ohio State Dairymen's Association.—Secretary, L. P. Bailey, Tacoma.
Ohio Dairy Union.—Secretary, F. A. Stranahan, 30 Huron street, Cleveland.

OREGON.

State Dairy and Food Commission.—Commissioner, J. W. Bailey, Portland.
Oregon Dairymen's Association.—Secretary, F. L. Kent, Corvallis.

PENNSYLVANIA.

Dairy and Food Commission (of State department of agriculture).—Commissioner, Levi Wells, Harrisburg.
Pennsylvania State Dairy Association.—Secretary, A. L. Wales, Corry.
Pennsylvania Dairy Union.—Secretary, H. Hayward, State College.
Creamery Association of Eastern Pennsylvania.—Secretary, George R. Meloney, 1937 Market street, Philadelphia.

SOUTH DAKOTA.

South Dakota Dairy and Buttermakers' Association.—Secretary, C. P. Sherwood, Desmet.

TENNESSEE.

East Tennessee Dairy Association.—Secretary, Paul F. Kefauver, Madisonville.

TEXAS.

Dairymen's Association.—Secretary, J. E. Maguire, Waco.

UTAH.

Food and Dairy Commission.—Commissioner, H. J. Faust, Jr., Salt Lake City.
Utah Dairymen's Association.—Secretary, F. B. Linfield, Logan.

VERMONT.

Vermont Dairymen's Association.—Secretary, F. L. Davis, North Pomfret.

WASHINGTON.

Dairy and Food Commission.—Commissioner, E. A. McDonald, Seattle.
Washington State Dairymen's Association.—Secretary, D. S. Troy, Chimacum.

WISCONSIN.

Dairy and Food Commission.—Commissioner, H. C. Adams, Madison.
Wisconsin Dairymen's Association.—Secretary, George W. Burchard, Fort Atkinson.
Wisconsin Cheesemakers' Association.—Secretary, U. S. Baer, Madison.

## PROTECTION AGAINST CONTAGION FROM FOREIGN CATTLE.

An act of Congress of August 28, 1894, prohibits the importation of cattle and cattle hides, but by the act of March 2, 1895, making appropriations for the Department of Agriculture, it is provided that the prohibition may be suspended by the President whenever the Secretary of Agriculture shall certify to the President what countries or parts of countries are free from contagious or infectious diseases of domestic animals. The President, by proclamation of November 8, 1895, lifted the embargo with reference to Norway, Sweden, Holland, Great Britain, Ireland, the Channel Islands, and the countries of North, Central, and South America so as to admit cattle under sanitary regulations prescribed by the Secretary of Agriculture; also from all countries so as to admit hides under regulations prescribed by the Secretary of the Treasury.

## CATTLE BREEDERS' ASSOCIATIONS.[1]

American Aberdeen-Angus Breeders' Association.—Thomas McFarlane, Harvey, Ill., secretary. Number of registrations: 34,936; date of first entry, November, 1883. Registration fees: For animals under 1 year old, to members, $1.50; nonmembers, $2.50. Entries of ancestors to complete pedigrees, $1. Entries of native animals over 1 year old, $3 to members, $5 to nonmembers. Transfers free within 90 days, $1 after 90 days. Certified pedigrees, 50 cents; extended pedigrees, $1; duplicate certificates, 25 cents. Affiliated foreign society: Polled Cattle Society of Scotland, Dr. Alex Ramsay, secretary, Banff, Scotland. Eligible[2] to registry: American-bred animals whose sires and dams are recorded in American book, but application must be made within 2 years of birth; and imported animals recorded or tracing to the eighth or a prior volume of the affiliated Scotch book.

American Devon Cattle Club.—L. P. Sisson, Newark, Ohio, secretary.[3]

American Galloway Breeders' Association.—Frank B. Hearne, Independence, Mo., secretary. Number of registrations: 16,395; first herdbook printed in 1883. Registration fees: To members for animals under 1 year, $1; over 1 year, $2; to nonmembers double; transfers 25 cents if within 90 days; otherwise, 50 cents. Affiliated foreign book: The Galloway Herd Book of Scotland, Rev. John Gillespie, secretary, Mouswald Manse, Ruthwell, R. S. O., Dumfriesshire, Scotland. Eligible to registry: Animals having sires and dams in the herdbook of this association or in the affiliated Scotch herdbook.

American Guernsey Cattle Club.—William H. Caldwell, Peterboro, N. H., secre-

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[1] Under the provisions of paragraph 473 of the act of July 24, 1897, any animal imported specially for breeding purposes shall be admitted free, provided that no such animal shall be admitted free unless pure bred, of a recognized breed, and duly registered in the book of record established for that breed.

The Secretary of the Treasury, upon the advice of the Secretary of Agriculture, issued June 22, 1899, regulations for the importation of animals under this law, and designated the recognized breeds and the books of record established for these breeds.

[2] Requirements for eligibility to registration can not be given fully in these lists of breeders' associations. Only the more general conditions are stated; for particulars application must be made to the secretary of the association.

[3] In this and other cases in these lists of breeders' associations the lack of data as to registrations is due to failure to receive the necessary information from the association.

tary. Number of registrations: Bulls, 6,369; cows, 12,331; date of first entry, 1878. Registration fees: Home-bred, under 6 months, $2, over 6 months, $3; imported, within 6 months after landing, $2, after 6 months, $3; members pay, $1 less. All transfers, $1. Affiliated foreign societies: English Guernsey Cattle Society, England; Royal Guernsey Agricultural Society, Guernsey; General Herd Book, Guernsey. Eligible to registry: Animals imported, or tracing through both sire and dam to animals imported, from the island of Guernsey and registered in one of the affiliated herdbooks.

American Hereford Cattle Breeders' Association.—C. R. Thomas, Independence, Mo., secretary. Number of registrations: 90,000; date of first herdbook, 1879. Registration fees: To members, calves under 6 months, $1; over 6 months, $5; to nonmembers, double. Duplicate entries, 25 cents. Transfers within 6 months of sale free to members, 25 cents to nonmembers; after 6 months, 50 cents to all. Duplicate certificates, 25 cents. Affiliated foreign society: Hereford Herd Book Society, 20 East street, Hereford, England. Eligible to registry: Animals whose sires and dams are recorded in the American book or in Volume XIII or prior volumes of the affiliated English book.

American Jersey Cattle Club.—J. J. Hemingway, No. 8 West Seventeenth street, New York, N. Y., secretary. Number of registrations: 204,006; date of first entry, July, 1868. Registration fees: To members, for animals under 2 years, $1; nonmembers, $2. Animals over 2 years old, double. Entries of records of dead animals to complete pedigrees, $1. Transfers within 90 days, free; after 90 days, $1. Affiliated foreign society: Island of Jersey Royal Agricultural and Horticultural Society. Eligible to registry: American-bred animals whose sires and dams are recorded in the American book; to animals imported from the island of Jersey under certain regulations.

American Polled Durham Breeders' Association.—J. H. Miller, Mexico, Ind., secretary.

American Shorthorn Breeders' Association.—J. H. Pickrell, Springfield, Ill., secretary. Number of registrations: Over 400,000; date of first herdbook, 1846. Registration fees: For all animals under 4 years, $1 each; over 4 years, $25 each; for extended copies with seal, 25 cents extra. Affiliated foreign book: English Shorthorn herdbook. Eligible to registry: Animals that trace back to recorded ancestry.

American Sussex Association.—Overton Lea, Nashville, Tenn., secretary. Number of registrations, 187. Registration fees: To members, $1; nonmembers, $3; fees double if not registered within 6 months of birth or importation. Affiliated foreign society: Sussex Herdbook Society. Eligible to registry: Animals registered in the English Sussex herdbook, or the get of animals registered in the English or the American herdbook.

Ayrshire Breeders' Association.—C. M. Winslow, Brandon, Vt., secretary. Number of registrations: Bulls, 6,928; cows, 15,505; books revised at separation from Canadian book in 1876. Registration fees: To members, $1; nonmembers, $2; double rates for animals over 2 years old. Affiliated foreign book: Ayrshire Herdbook of Scotland. Eligible to registry: Animals that trace closely to animals recorded in the books of this association or to the Scotch book.

Brown Swiss Cattle Breeders' Association.—N. S. Fish, Groton, Conn., secretary. Number of registrations: 3,100; date of first entry, September 8, 1880. Registration fees: For animals under 1 year old, $1 to members, $2 to nonmembers; for animals over 1 year old, double fees. Affiliated foreign society: None. Eligible to registry: Animals descended from registered animals in direct line.

Dutch Belted Cattle Association.—H. B. Richards, Easton, Pa., secretary. Number of registrations: Males, 383; females, 904; date of first entry, April 12, 1886. Registration fees: To members, animals under 6 months, $1; over 6 months, $2; to nonmembers, $1 more. Transfers within 30 days, $1; after 30 days, $2. Affiliated foreign society: None. Eligible to registry: All offspring of registered animals unless disqualified by physical defects.

Holstein-Friesian Association of America.—Frederick L. Houghton, Brattleboro, Vt., secretary. Number of registrations: Bulls, 32,321; cows, 64,540; date of first entry, March 15, 1871. Registration fees: To members of association, for males, $3; for females, $1; to nonmembers, for males $5, for females $2. Fees for animals over 1 year old, double the ordinary. Affiliated foreign books: Friesch Rundvee-Stamboek; Nederlandsch Rundvee-Stamboek; North Holland Herd Book. Eligible to registry: Only such animals as are determined under the regulations of the association to be "pure bred."

Red Polled Cattle Club of America (incorporated).—J. McLain Smith, Dayton, Ohio, secretary. Number of registrations: Bulls, 6,753; cows, 14,419; date of first herdbook, new series, 1890. All cattle registered in the English book, as well as the American cattle, appear in these books. Registration fees: For animals under 1 year, $1 to members and $2 to nonmembers; over 1 year, 50 cents extra. Affiliated foreign society: The Red Polled Cattle Society of Great Britain and Ireland. Eligible to registry: Animals whose sires and dams are registered.

## HORSE BREEDERS' ASSOCIATIONS.

American Association of Importers and Breeders of Belgian Draft Horses.—J. D. Conner, jr., Wabash, Ind., secretary.

American Breeders' Association of Jacks and Jennets.—J. W. Jones, Columbia, Tenn., secretary. Number of registrations, about 750; date of first entry, 1891. Registration fees: To members, $2 for living animals; transfers and certificates, $1 each; fees to nonmembers, double. Affiliated foreign society: All similar associations are in Spain. The American association will cooperate with any foreign society recommended by American consul, if such society is found to have satisfactory rules. Eligible to registry: All animals when black with light points, as follows: Native, 15½ hands high; imported, 15 hands, if of unrecorded sire or dam; jacks of recorded ancestors if 14½ hands, jennets 14 hands.

American Cleveland Bay Breeders' Association.—R. P. Stericker, Attica, N. Y., secretary. Number of registrations, 1,524; date of first entry, November 10, 1885. Registration fees: To members, stallions $2, mares $1; nonmembers, stallions $5, mares $3. Fees are doubled if animals are not recorded within two years from date of birth or importation. Affiliated foreign societies: Cleveland Bay Society of Great Britain and Ireland; Yorkshire Coach Horse Society of Great Britain and Ireland. Eligible to registry: Mares bred in America, four crosses by registered sires; stallions bred in America, five crosses by registered sires; stallion or mare whose sire and dam are both recorded in the American book or one of the affiliated foreign books, and imported animals recorded in one of the affiliated foreign books.

American Clydesdale Association.—Alex. Galbraith, Janesville, Wis., secretary. Number of registrations, 9,440, about one-half being stallions and one-half mares; date of first entry, 1879. Registration fees: To members owning stud books 1 to 8, inclusive, $2; nonmembers owning these books, $3; members not owning books, $3; nonmembers not owning books, $5. Transfers for members, $1; nonmembers, $2. Extended pedigree certificates, same terms as transfers. Affiliated foreign society: The Clydesdale Horse Society of Great Britain and Ireland, 93 Hope street, Glasgow, Scotland. Eligible to registry: Animals whose sire and dam are recorded in the American or affiliated English book; animals recorded in the English book; stallions having five top crosses and mares having four top crosses by sires recorded in American book; but unsound or unworthy animals will not be admitted.

American Hackney Horse Society.—A. H. Godfrey, room 48, Astor Court Building, West Thirty-fourth street, New York City, secretary. Number of registrations: Stallions, 527; mares, 1,043; mares inspected and recorded, 117. Registration fees: Members' stallions, $3; members' mares, $2; nonmembers, double. Transfers for members, $2; nonmembers, $3. Inspection fees: Mare or filly certified to be sired by a "full-registered" hackney stallion, $2; other mares, $2 and actual expenses of inspectors. Affiliated foreign society: English Hackney Horse Society, London, England.

American Percheron Horse Breeders' Association.—S. D. Thompson, Chicago, Ill., secretary.

American Shetland Pony Club.—Mortimer Levering, Lafayette, Ind., secretary.

American Shire Horse Breeders' Association.—Charles Burgess, Wenona, Ill., secretary. Number of registrations, 5,460; date of first entry, November 1, 1886. Registration fees: To members, for each animal, $2; nonmembers, $5. Transfer, $1. Affiliated foreign society: The Shire Horse Society of Great Britain, J. Sloughgrove, secretary, Hanover Square, London, England. Eligible to registry: Stallions and mares whose sires and dams are recorded in the American book or the affiliated English book; stallions and mares recorded in the affiliated English book, and stallions having five top crosses and mares having four top crosses, in each case by sires recorded in the American book.

American Stud Book, Thoroughbred.—James E. Wheeler, 173 Fifth avenue, New York, N. Y., registrar. Number of registrations, 21,320. First stud book published about 1868, but systematic reports of foals began in 1893, when 1,506 were registered. Registration fees: $2 up to November 1 of the year in which the animal is foaled; after that date registration will be permitted upon a payment of a $50 fine, provided the failure to register is shown to have been unintentional or accidental. Affiliated foreign society: None. Eligible to registry: Only horses having either five uncontaminated thoroughbred crosses, or which authentically trace through or to animals recorded in the first six volumes of the American book, or in a recognized book of another country.

American Suffolk Punch Horse Association.—Alex. Galbraith, Janesville, Wis., secretary.

American Trotting Registry Association.—J. H. Steiner, room 1103, Ellsworth Building, 355 Dearborn street, Chicago, Ill., secretary. Number of registration: Last volume of registry contained about 18,000 registrations; previous volumes not so many; fourteen in all; first published in 1871. Registration fees: To stockholders, $1; nonstockholders, $2; double for animals over 2 years old. Certificates of registration, 50 cents; transfers, 25 cents. Affiliated foreign society: Not stated. Eligible to registry: Animals whose pedigrees are established under the rules of the association.

French Coach Horse Society of America.—S. D. Thompson, Chicago, Ill., secretary.

German, Hanoverian and Oldenburg Coach Horse Association of America.—J. Crouch, Lafayette, Ind., secretary. Number of registrations, 600 stallions, 120 mares; date of first entry, December 30, 1889. Registration fees: To members, $2.50; nonmembers, $5 for each animal if application is made within four months of importation or birth; after that time, double fees. Transfers, $1 to members, $2 to nonmembers. Affiliated foreign society: None. Eligible to registry: Imported animals of properly authenticated foreign registry; native animals whose sires and dams are registered; and stallions having five crosses and mares having four crosses.

National French Draft Association.—C. E. Stubbs, Fairfield, Iowa, secretary. Number of registrations, 10,137; association organized February 9, 1876. Registration fees: To members, $2, nonmembers, $4; for transfer, $1 to members, $2 to nonmembers. If application is not made within one year from importation or foaling the registration fee is $5. Affiliated foreign society: French Draft Horse Stud Book. Eligible to registry: Imported animals properly vouched for by the affiliated French society; animals whose sires and dams are registered in the American book; stallions having five top crosses, and mares having four top crosses by sires recorded in the American book.

Select Clydesdale Horse Society of America.—Charles Irwin, Topeka, Kans., secretary.

The American Morgan Register.—Joseph Battell, Middlebury, Vt., treasurer. Number of registrations, about 5,000; date of first volume, 1894. Registration fees: Stallions 1 year old or over, $2; mares, geldings, and colts under 1 year, $1. Affiliated foreign society: None. Eligible to registry: Any meritorious animal tracing in direct male line; also to any animal whose sire and dam are recorded in the Morgan register.

The American Saddle Horse Breeders' Association.—I. B. Nall, Louisville, Ky., secretary. Number of registrations: Stallions and geldings, 1,400; mares, 1,721; date of first entry, July 31, 1891. Registration fees: To members, $2; nonmembers, $4; if registered during the year foaled, one-half. Affiliated foreign society: None. Eligible to registry: Horses having recognized gaits and tracing to registered animals under prescribed conditions.

The Oldenburg Coach Horse Association of America.—C. E. Stubbs, Fairfield, Iowa, secretary. Number of registrations, 200; association incorporated March 5, 1892. Registration fees: To members, $2; nonmembers, $4. Transfers, $1 to members, $2 to nonmembers. If application is not made within one year from foaling or importation, the registration fee is $5. Affiliated foreign society: Gesellschaft Zuchter Oldenburger Kutschpferde, of Oldenburg, Germany. Eligible to registry: Any imported animal properly vouched for by the affiliated society; animals whose sires and dams are registered in the American book; stallions having five top crosses and mares having four top crosses by sires registered in the American book.

## SHEEP BREEDERS' ASSOCIATIONS.

National Cheviot Sheep Society.—Howard H. Keim, Ladoga, Ind., secretary. Number of registrations, 1,292; date of first entry, March 24, 1894. Registration fees: To members, 50 cents for lambs under 1 year; over 1 year, $1; nonmembers, double. Affiliated foreign society: The Cheviot Sheep Society of Great Britain, John Robson, Newton, Bellingham, Northumberland, England, secretary. Eligible to registry: Animals whose sires and dams are recorded in the books of the National Cheviot Sheep Society, the American Cheviot Sheep Breeders' Association, or the affiliated British book.

American Cotswold Association.—George Harding, Waukesha, Wis., secretary. Number of registrations, over 21,000. Registration fees: Prior to April 1 following year of birth, 50 cents; over this age, $1; transfer, 25 cents. Affiliated foreign book: English Cotswold Flock Book. Eligible to registry: American-bred animals whose sires and dams are registered; imported animals having certificate from affiliated English book.

American Leicester Breeders' Association.—A. J. Temple, Cameron, Ill., secretary. Number of registrations: 3,812; date of first entry, July 24, 1888. Registration fees: To members, 50 cents; nonmembers, $1; transfers, 25 cents. Affiliated foreign society: None. Eligible to registry: American-bred animals whose sires and dams are recorded in the American book; imported animals registered in the flock books of Great Britain, or from reputable British flocks.

American Lincoln Breeders' Association.—L. C. Graham, Cameron, Ill., secretary.

American Merino Sheep Register.—R. O. Logan, California, Mich., secretary.

American Oxford-Down Record Association.—W. A. Shafor, Middletown, Ohio, secretary. Number of registrations: 17,829; date of incorporation of association, January, 1882. Registration fees: To members, 50 cents for each animal recorded before July 1 of next year succeeding birth; recorded after that date, $1. To nonmembers, $1 for any age. Transfers, 25 cents each. Affiliated foreign society: Not stated. Eligible to registry: Animals imported from Europe if registered in the English flock book; native animals when approved by the board of directors.

American Southdown Association.—J. G. Springer, Springfield, Ill., secretary. Number of registrations: 12,977; date of first entry, May 4, 1883. Registration fees: To members, for animals up to July 1 following birth, 50 cents; older, $1.50; to nonmembers, 50 cents additional. Transfers within 6 months of sale, 25 cents; later, 50 cents. Affiliated foreign society: Southdown Sheep Society of England. Eligible to registry: American-bred animals that are immediate descendants of animals previously recorded in the association book; imported animals themselves recorded and numbered in English book, provided their sires and dams are also thus recorded and numbered.

American Shropshire Registry Association.—Mortimer Levering, Lafayette, Ind., secretary.

American Rambouillet Sheep Breeders' Association.—Dwight Lincoln, Milford Center, Ohio, secretary. Number of registrations: 10,000; date of first registration, 1889. Registration fees: 25 cents for ewes and 50 cents for rams. Transfers, to members free, nonmembers 10 cents; after 6 months 50 cents to all. Eligible to registry: Proof of pure blood satisfactory to committee.

American Suffolk Association.—F. A. Franklin, Atlantic, Iowa, secretary.

Black Top Spanish Merino Sheep Breeders' Association.—R. P. Berry, Clokey, Pa., secretary.

Delaine Merino Sheep Breeders' Association.—J. C. McNary, Houstonville, Pa., recording secretary; J. H. Hamilton, Cannonsburg, Pa., corresponding secretary.

Dickinson Merino Sheep Record Company.—H. G. McDowell, Canton, Ohio, secretary.

Dorset Horn Sheep Breeders' Association of America.—M. A. Cooper, Washington, Pa., secretary. Number of registrations: 1,000; date of first entry, June 23, 1891. Registration fees: Certificates, 50 cents; transfers, 25 cents. Affiliated foreign society: Not stated.

Hampshire-Down Breeders' Association of America.—J. I. Gordon, Mercer, Pa., secretary. Number of registrations: 8,712; date of first entry, December 30, 1889. Registration fees: Mature animals, $1; lambs, 50 cents up to January 1; fees to nonmembers, double. Affiliated foreign society: Hampshire-Down Sheep Breeders' Association (of England). Eligible to registry: Hampshire-down sheep imported from, or that can be traced in all their lines of descent to, the flocks of reliable breeders in England.

Improved Black-top Merino Sheep Breeders' Association.—L. M. Crothers, Crothers, Pa., secretary. Number of registrations: About 3,000. Registration fees: To members, for each animal 25 cents for registry, 15 cents transfer; nonmembers, 50 cents and 25 cents. Affiliated foreign society: Not stated.

Improved Delaine Merino Sheep Breeders' Association.—R. B. Barber, Cedarville, Ohio, secretary.

Michigan Merino Sheep Breeders' Association.—E. N. Ball, Hamburg, Mich., secretary. Number of registrations: About 50,000; date of first entry, 1880. Registration fees: For each flock of fifty or less, $5; over, 10 cents for each sheep. Affiliated foreign society: None. Eligible to registry (only for members of the association): Animals tracing to flocks of breeders of pure American Merino sheep. Each breeder must keep a register of his flock.

National Improved Saxony Sheep Breeders' Association.—John G. Clarke, Washington, Pa., R. D. 9, secretary.

National Lincoln Sheep Breeders' Association.—H. A. Daniels, Elva, Mich., secretary. Number of registrations: 6,873; date of first entry, December 20, 1891. Registration fees: For lambs, 50 cents; sheep, $1. Affiliated foreign society: Lincoln Long Wool Sheep Breeders' Association of England. Eligible to registry: Only animals having registered sires and dams in American or English book.

New York State American Merino Sheep Breeders' Association.—J. H. Earll, Skaneateles, N. Y., secretary. Number of registrations: Not given; date of first entry, 1879. Registration fees: For ordinary register of lambs, 20 cents; for entered pedigree, 40 cents; for recording stock ram in list, $1; for lambs not on file with secretary at time of annual meeting, 25 cents.

Ohio Spanish Merino Sheep Breeders' Association.—F. C. Stanley, Edison, Ohio, secretary.

Standard Delaine Spanish Merino Sheep Breeders' Association.—S. M. Cleaver, East Bethlehem, Pa., secretary. Number of registrations: —. Registration fees: For flock of 50, $10; for all over 50, 10 cents per head; to "others than members owning sheep records in this register," 25 cents per head. Affiliated foreign society: Not stated. Eligible to registry: Approved animals scaling 72 points or more. This minimum of 72 will be increased by one each year til' 80 is reached.

Standard American Merino Register Association.—J. P. Ray, Hemlock Lake, N. Y., secretary.

The Continental Dorset Club.—J. E. Wing, Mechanicsburg, Ohio, secretary. Number of registrations: 716 in 1898 and 523 in 1899; date of first entry, May 9, 1898. Registration fees: Native animals under 1 year, 50 cents; over 1 year, $1; imported, within 6 months of importation, 50 cents; after 6 months, $1; transfers, 10 cents. Affiliated foreign society: None. Eligible to registry: Imported Dorset sheep bred by reputable breeders, and sheep tracing directly to such imported animals.

United States Merino Sheep Breeders' Registry Association.—J. A. B. Walker, Enon Valley, Pa., secretary.

Vermont Atwood Club Register.—George Hammond, Middlebury, Vt., secretary.

Vermont Merino Sheep Breeders' Association.—L. H. Skiff, Middlebury, Vt., secretary.

## SWINE BREEDERS' ASSOCIATIONS.

American Berkshire Association.—C. F. Mills, 512 East Monroe street, Springfield, Ill., secretary. Number of registrations: 52,500; date of first entry, 1875. Registration fees: For native animals under 2 years, $1; over 2 years, $2; imported animals, within 6 months of importation, $1; after 6 months, $2. Transfers, 25 cents; certificates, 50 cents. Affiliated foreign society: Not stated. Eligible to registry: Animals that trace closely to ancestors recorded in the book of the association.

American Duroc-Jersey Swine Breeders' Association.—A. V. Bradrick, Shelbyville, Ind., secretary. Number of registrations: 9,480 females, 4,048 males; date of first entry, 1890. Registration fees: Animals under 2 years, $1; over 2 years, $2; transfers, 25 cents. Affiliated foreign society: Not stated.

American Essex Association.—F. M. Srout, McLean, Ill., secretary. Number of registrations: Boars, 1,685; sows, 2,632; date of first entry, September, 1887.

American Small Yorkshire Club.—G. W. Harris, 3409 Third avenue, New York, N. Y., secretary.

Cheshire Swine Breeders' Association.—B. B. Badger, Ouaquaga, N. Y., secretary. Number of registrations: 2,810.

Chester White Record Association.—W. H. Morris, Indianapolis, Ind., secretary.

American Chester White Record Association.—Carl Freigau, Dayton, Ohio, secretary. Number of registrations: Boars, 3,105; sows, 3,890; date of first entry, October, 1884. Registration fees: To members, 50 cents for each animal; nonmembers, $1; transfers, 25 cents. Affiliated foreign society: None. Eligible to registry: Chester White hogs on approval of the executive committee of the association.

American Poland-China Record Company.—W. M. McFadden, West Liberty, Iowa, secretary.

Central Poland-China Swine Association.—W. H. Morris, Indianapolis, Ind., secretary.

Ohio Poland-China Record Company.—Carl Freigau, Dayton, Ohio, secretary. Number of registrations: Boars, 24,432; sows, 58,980; date of first registration, March, 1877. Registration fees: Animals under 2 years, $1; over 2 years, $2. Affiliated foreign society: None. Eligible to registry: Animals whose pedigrees had already appeared in some reputable record previous to the fall of 1883, thus furnishing the evidence that the ancestors on both sides trace direct to pure Poland-China stock, as originated in southwestern Ohio.

Standard Poland-China Record Association.—George F. Woodworth, Maryville, Mo., secretary. Number of registrations: 79,688; date of first herdbook, 1887. Registration fees: To stockholders, 50 cents; nonstockholders, $1; transfers, 25 cents. Affiliated foreign society: None. Eligible to registry: All animals the direct offspring of animals recorded or eligible to record in existing reputable records; unrecorded ancestors must be recorded.

Victoria Swine Breeders' Association.—H. Davis, Dyer, Ind., secretary.

Suffolk Swine Association.—W. F. Watson, Winchester, Ind., secretary.

National Duroc-Jersey Record Association.—R. J. Evans, El Paso, Ill., secretary. Number of registrations: Males, 3,250; females, 7,500; date of first entry, October 15, 1891. Registration fees: To members, 50 cents; nonmembers, $1; for animals over 2 years old, one-half more. Affiliated foreign society: None. Eligible to registry: Animals whose sires and dams are recorded in either the National or the American Duroc-Jersey record and which are pure red, cherry being the choicest shade.

The American Tamworth Swine Record Association.—E. N. Ball, Hamburg, Mich., secretary. Number of registrations: 521; date of first entry, February 16, 1898. Registration fees: To members, 50 cents; to nonmembers, $1. Affiliated foreign book: The National Pig Breeders' Association Herdbook of England. Eligible to registry: Only animals whose sires and dams are recorded in the American book or the affiliated English book.

The American Yorkshire Club.—William F. Wilcox, Benson, Minn., secretary.

## ASSOCIATION OF BREEDERS OF DOGS.

American Kennel Club.—A. P. Vredenburg, 55 Liberty street, New York, N. Y., secretary.

## POULTRY ASSOCIATIONS.

*National and interstate organizations.*

| Name of association. | Secretary. | Post office. |
|---|---|---|
| American Dorking Club | F. H. Prentice | North Grafton, Mass. |
| American Buff Plymouth Rock Club | W. C. Denny | Rochester, N. Y. |
| American Black Minorca Club | John A. Gamewell | Hackensack, N. J. |
| American Cochin Club | Arthur R. Sharp | Taunton, Mass. |
| National Exhibition Game and Game Bantam Club. | J. C. Pratt | 170 Adams street, Chicago. |
| American Houdan Club | Thomas F. Rigg | Iowa Falls, Iowa. |
| American Leghorn Club | Geo. H. Burgott | Lawtons Station, N. Y. |
| American Plymouth Rock Club | A. P. Schwab | Rochester, N. Y. |
| Cornish Indian Game Club of America | Adam Thompson | Amity, Mo. |
| Eastern White Wyandotte Club | W. E. Mack | Woodstock, Vt. |
| Minorca Club of Northwest | Dr. H. B. Fay | Minneapolis, Minn. |
| National Bantam Association | E. Latham | Flatbush, Long Island, N. Y. |
| New England Light Brahma Club | G. W. Cromack | Stoneham, Mass. |
| National Poultry and Pigeon Association | Geo. E. Howard | Washington, D. C. |
| National Fanciers' Association | Fred L. Kinney | Morgan Park, Ill. |
| Boston Poultry Association | C. Minot Weld | 131 Devonshire st., Boston, Mass. |
| Wolverine P. P. and P. S. Association | Gus Williams | Bay City, Mich. |
| St. Louis Fanciers' Association | John A. Francisco | 1201 Lincoln Tr. Bld., St. Louis, Mo. |
| Mid-Continental Poultry Association | F. M. Slutz | Kansas City, Mo. |
| Interstate Poultry Association | R. Horrocks | Falls City, Nebr. |
| Buffalo Poultry Association | E. C. Pease | Buffalo, N. Y. |
| Madison Square Garden (New York) Poultry and Pig Association. | H. V. Crawford | Montclair, N. J. |
| Northern Ohio Poultry and Pet Stock Association. | F. R. Hunt | Cleveland, Ohio. |
| Buckeye Poultry Association | Geo. B. Wetzel | Dayton, Ohio. |
| Tri-State Poultry Association | J. A. McIntosh | East Liverpool, Ohio. |
| Pittsburg Fanciers' Club | A. P. Robinson | 110 Second avenue, Pittsburg, Pa. |
| Piedmont Poultry Association | B. W. Getsinger | Spartanburg, S. C. |
| Nashville Poultry Association | J. M. Hopkins | Nashville, Tenn. |
| Tacoma Poultry Association | C. C. Johns | 402 Berlin Bldg., Tacoma, Wash. |
| Western Bantam Breeders' Association | A. E. Brown | Morgan Park, Ill. |

POULTRY ASSOCIATIONS—Continued.

*Secretaries of State poultry associations.*

| State. | Secretary. | Post office. |
|---|---|---|
| District of Columbia | Geo. E. Howard | Washington. |
| Illinois | Edward Craig | Albion. |
| Michigan | John A. Grover | Concord. |
| Oklahoma | L. F. Laverty | Guthrie. |
| Rhode Island | H. S. Babcock | Providence. |
| Tennessee | M. D. Andes | Bristol. |

## STATE VETERINARIANS AND SECRETARIES OF SANITARY BOARDS.

ALABAMA.

Dr. Jerome Cochran, Montgomery, secretary State board of health.

ARIZONA.

H. Harrison, Phenix, secretary live-stock sanitary commission.
Dr. J. C. Norton, Phenix, veterinarian.

CALIFORNIA.

Dr. J. R. Lanie, Sacramento, secretary State board of health.
Dr. Charles H. Blemer, Sacramento, State veterinarian.

COLORADO.

B. H. Du Bois, Denver, president State veterinary sanitary board.
Dr. Henry Sewall, 23 Eighteenth avenue, Denver, secretary State board of health.
Dr. Solomon Bock, Denver, State veterinary surgeon.

CONNECTICUT.

Dr. C. A. Lindsley, New Haven, secretary State board of health.
George L. Fosket, Winsted, secretary of commissioners on diseases of domestic animals.

DELAWARE.

Dr. E. B. Frazer, Wilmington, secretary State board of health.

FLORIDA.

Dr. Joseph Y. Porter, Key West, secretary State board of health.

ILLINOIS.

Dr. J. W. Scott, Springfield, secretary State board of health.
Dr. C. P. Lovejoy, Princeton, State veterinarian.
C. P. Johnson, Springfield, secretary board of live stock commissioners.

INDIANA.

Dr. J. N. Hurty, Indianapolis, secretary State board of health.
Dr. F. A. Bolser, Newcastle, State veterinarian.
Mortimer Levering, Lafayette, secretary State live-stock sanitary commission.

IOWA.

Dr. J. I. Gibson, Denison, State veterinary surgeon.
Dr. J. F. Kennedy, Des Moines, secretary State board of health.

KANSAS.

Dr. H. Z. Gill, Topeka, secretary State board of health.
Taylor Riddle, Marion, secretary live-stock sanitary commission.

KENTUCKY.

Dr. J. N. McCormack, Bowling Green, secretary State board of health.
Dr. F. T. Eisenman, Louisville, State veterinarian.
A. G. Herr, St. Matthews, cattle commissioner.

LOUISIANA.

Dr. Will R. Harman, New Orleans, secretary State board of health.

MAINE.

Dr. A. G. Young, Augusta, secretary State board of health.
Dr. George H. Bailey, Deering, State veterinarian.
John M. Deering, Saco, and F. O. Beal, Bangor, cattle commissioners.

MARYLAND.

Dr. John S. Fulton, 10 South street, Baltimore, secretary State board of health.
Dr. A. W. Clements, 916 Cathedral street, Baltimore, State veterinarian.
C. W. Melville, Westminster, secretary live-stock sanitary board.

MASSACHUSETTS.

Dr. Samuel W. Abbott, Boston, secretary State board of health.
Dr. Austin Peters, Boston (Commonwealth Building), president cattle commissioners.

MICHIGAN.

Dr. Henry B. Baker, Lansing, secretary State board of health.
Dr. George W. Dunphy, Quincy, State veterinarian.
Henry H. Hinds, Stanton, president State live-stock sanitary commission.

MINNESOTA.

Dr. M. H. Reynolds, St. Anthony Park, St. Paul, director veterinary department of State board of health.
Dr. H. M. Bracken, St. Paul (Pioneer Press Building), secretary State board of health.

MISSISSIPPI.

Dr. John F. Hunter, Jackson, secretary State board of health.
Dr. J. C. Robert, Agricultural College, professor of veterinary science.

MISSOURI.

Dr. Willis P. King, Kansas City (Fountain place), secretary State board of health.
Dr. B. F. Luckey, Columbia, State veterinarian.
J. R. Rippey, Columbia, secretary State board of agriculture.

MONTANA.

Dr. M. E. Knowles, Helena, State veterinarian.

NEBRASKA.

H. R. Corbet, Lincoln, secretary State board of health.
Dr. A. T. Peters, Lincoln, secretary State veterinary association.

NEVADA.

Dr. W. H. Patterson, Reno, secretary State board of health.

NEW HAMPSHIRE.

Dr. Irving A. Watson, Concord, secretary State board of health.
N. J. Bachelder, Concord, secretary board of cattle commissioners.

NEW JERSEY.

Dr. Henry Mitchell, Trenton, secretary State board of health.
Franklin Dye, Trenton, secretary tuberculosis commission.

NEW MEXICO.

Dr. J. M. Cunningham, East Las Vegas, secretary State board of health.
J. H. La Rue, East Las Vegas, secretary cattle sanitary board.
Harry F. Lee, Albuquerque, secretary sheep sanitary board.

NEW YORK.

Dr. Baxter T. Smelzer, Albany, secretary board of health.
F. W. Smith, 700 South West street, Syracuse, secretary tuberculosis committee.

NORTH CAROLINA.

Dr. Richard H. Lewis, Raleigh, secretary board of health.
Dr. Cooper Curtice, Raleigh, consulting veterinarian, State board of agriculture.

NORTH DAKOTA.

Dr. J. W. Dunham, Fargo, chief State veterinarian.
Dr. John Montgomery, Ardoch, secretary board of health.

OHIO.

Dr. C. O. Probst, Columbus, secretary board of health.
Dr. H. J. Detmers, Columbus, veterinary surgeon, State University.
Dr. D. N. Kinsman, Columbus, secretary live-stock commission.

OKLAHOMA.

Dr. C. D. Arnold, Kingfisher, superintendent board of health.
W. E. Bolton Woodward, secretary live-stock sanitary commission.

OREGON.

Dr. William McLean, Portland, State veterinarian.

PENNSYLVANIA.

Dr. Benjamin Lee, 1532 Pine street, Philadelphia, secretary State board of health.
Dr. Leonard Pearson, 3608 Pine street, Philadelphia, State veterinarian.

RHODE ISLAND.

Dr. Arthur L. Parker, Providence, veterinarian to State board of health.
Dr. Gardner T. Swarts, Providence, secretary State board of health.
John S. Pollard, veterinarian State board of agriculture.

SOUTH CAROLINA.

Dr. James Evans, Florence, secretary board of health.
Dr. G. E. Nesom, Clemson College, State veterinarian.

SOUTH DAKOTA.

J. L. Harris, Webster, secretary board of health.
Dr. J. W. Elliot, Aberdeen, State veterinarian.

TENNESSEE.

Dr. J. A. Albright, Somerville, secretary State board of health.
Dr. J. W. Scheiber, Memphis, State veterinarian.

TEXAS.

Dr. R. M. Swearingen, Austin, State health officer.
Robert J. Kleberg, Corpus Christi, secretary live-stock sanitary commission.

UTAH.

Dr. T. B. Beatty, Salt Lake City, secretary State board of health.

VERMONT.

Dr. J. H. Hamilton, Richford, secretary board of health.
C. J. Bell, East Hardwick, secretary cattle commission.

VIRGINIA.

Dr. Paulus A. Irving, Richmond, secretary board of health.
Dr. Charles McCulloch, Blacksburg, State veterinarian.

WASHINGTON.

Dr. Elmer E. Heg, North Yakima, secretary board of health.
Dr. S. B. Nelson, Pullman, veterinarian agricultural experiment station.

WEST VIRGINIA.

Dr. A. R. Barbee, Point Pleasant, secretary State board of health.
D. M. Sullivan, Charleston, secretary board of agriculture.

WISCONSIN.

Dr. H. P. Clute, Milton, State veterinarian.
Dr. U. O. B. Wingate, Milwaukee, secretary board of health.

WYOMING.

Dr. George T. Seabury, Cheyenne, State veterinarian.
George East, president, board of live-stock commissioners.

## CENTRAL COMMITTEE, NATIONAL ROAD PARLIAMENT.[1]

| State or Territory. | Committeemen. | Post office. |
|---|---|---|
| Alabama | Maj. W. W. Screws | Montgomery. |
| Alaska | Governor John G. Brady | Sitka. |
| Arizona | Governor L. C. Hughes | Tucson. |
| Arkansas | G. W. Sappington | Little Rock. |
| California | J. A. Woodson | Sacramento. |
| Colorado | Louis G. Carpenter | Fort Collins. |
| Connecticut | Col. Chas. L. Burdett | Hartford. |
| Delaware | William Cooch | Newark. |
| District of Columbia | Gen. Roy Stone, acting president of league | Washington. |
| Florida | J. W. White | Jacksonville. |
| Georgia | Col. G. W. Harrison | Atlanta. |
| Idaho | James Mullany | Glenns Ferry. |
| Illinois | S. T. K. Prime, general western secretary of league. | Dwight. |
| do | W. C. Garrard | Springfield. |
| Indiana | Mason J. Niblack | Vincennes. |
| Iowa | E. H. Thayer, chairman conference committee. | Clinton. |

[1] These persons are also the co-workers of Office of Public Road Inquiries, Department of Agriculture. They are supplied with the publications of that office as issued, and in return furnish information of progress in road making in their respective States.

CENTRAL COMMITTEE, NATIONAL ROAD PARLIAMENT—Continued.

| State or Territory. | Committeemen. | Post office. |
|---|---|---|
| Kansas | F. D. Coburn | Topeka. |
| Kentucky | Maj. M. H. Crump | Bowling Green. |
| Louisiana | Guy Samuels | Baton Rouge. |
| Maine | F. J. Ilsley | Portland. |
| Maryland | D. C. Wharton Smith | Darlington. |
| Massachusetts | George A. Perkins | Boston. |
| Michigan | W. L. Webber | Saginaw, East Side. |
| Minnesota | A. B. Choate | Minneapolis. |
| Mississippi | Capt. James H. Duke | Scooba. |
| Missouri | John R. Rippey | Columbia. |
| Montana | F. H. Ray | Helena. |
| Nebraska | Curtis Turner | Omaha. |
| Nevada | Gen. John E. Jones | Carson City. |
| New Hampshire | Ex-Governor David H. Goodell | Antrim. |
| New Jersey | E. G. Harrison, general eastern secretary of league. | Asbury Park. |
| New Mexico | E. S. Stover | Albuquerque. |
| New York | J. A. C. Wright | Rochester. |
| North Carolina | John C. Tipton | Shelby. |
| North Dakota | W. W. Barrett | Churchs Ferry. |
| Ohio | Hon. Martin Dodge | Cleveland. |
| Oklahoma | A. N. Spencer | Yukon. |
| Oregon | Jefferson Myers | Salem. |
| Rhode Island | C. H. Handy | Warren. |
| South Carolina | W. D. Evans | Bennettsville. |
| South Dakota | O. S. Basford | Redfield. |
| Tennessee | Maj. C. A. Locke | Nashville. |
| Texas | J. S. Dougherty | Dallas. |
| Vermont | J. W. Votey | Burlington. |
| Virginia | Thomas Whitehead | Richmond. |
| Washington | J. Hannum Jones | Nooksack. |
| Wisconsin | Otto Dorner, general press agent of league | Milwaukee |
| Wyoming | C. P. Hill | Cheyenne. |

## STATES HAVING OFFICES FOR FOREST WORK.

Kansas.—Forest commissioner, E. D. Wheeler, Ogallah.

Maine.—Forest commissioner, Charles E. Oak, Augusta.

Michigan.—Forest commission, Arthur Hill, president, Saginaw.

Minnesota.—Fire warden, Gen. C. C. Andrews, St. Paul.

New Hampshire.—Forest commission, George H. Moses, secretary, Concord.

New Jersey.—Geological survey, Prof. John C. Smock, director, Trenton.

New York.—Fisheries, game, and forest commission, Austin W. Wadsworth, president, Albany.

North Carolina.—Geological survey, Prof. J. A. Holmes, director, Chapelhill.

North Dakota.—State superintendent of irrigation and forestry, W. W. Barrett, Bismarck.

Pennsylvania.—Forest commissioner, Dr. J. T. Rothrock, chief, Harrisburg.

Wisconsin.—Forest commission, Ernest Bruncken, secretary, Milwaukee.

West Virginia.—Geologic and economic survey, Dr. I. C. White, superintendent, Morgantown.

## FORESTRY ASSOCIATIONS.

American Forestry Association.—President, James Wilson, Secretary of Agriculture; secretary, F. H. Newell, United States Geological Survey, Washington, D. C.

California Society for Conserving the Waters and Forests.—President, Hon. J. M. Gleaves; secretary, E. H. Benjamin.

Sierra Club.—President, John Muir, Martinez, Cal.; secretary (corresponding), Prof. W. R. Dudley, Stanford University, Cal.

Forest and Water Society of Southern California, having a branch in each southern county.—President, Abbot Kinney, Los Angeles; secretary, William H. Knight, Los Angeles.

Colorado Forestry Association.—President, W. N. Byers, Denver; secretary, D. W. Working, Denver.

Connecticut Forestry Association.—President, Maj. Edward V. Preston, Travelers' Insurance Company, Hartford; secretary (corresponding), Miss Mary Winslow, Weatogue.

Indiana Forestry Association.—President, A. Lieber, Indianapolis; secretary, J. P. Brown, Connersville.

Massachusetts Forestry Association.—President, Henry P. Walcott, Cambridge; secretary, Allen Chamberlain, Tremont Building, Boston.

Minnesota State Forestry Association.—President, W. W. Prendergast, Hutchison; secretary, George W. Strand, Taylors Falls.

New Jersey Forestry Association.—President, S. Bayard Dod, Hoboken; secretary-treasurer, J. F. Hall, Atlantic City.

North Carolina Forestry Association.—President, W. E. Petty, Seaboard Air Line; secretary, W. W. Ashe, Chapelhill.

North Dakota, The Sylvaton Society.—W. W. Barrett, Bismarck.

Mazamas, The.—President, W. G. Steel, Portland, Oreg.; secretary, Frank E. Donaldson, 264 Stark street, Portland.

Pennsylvania Forestry Association.—President, John Birkinbine, 1012 Walnut street, Philadelphia; secretary, Dr. Joseph T. Rothrock, commissioner of forestry, Harrisburg; corresponding secretary, Mrs. John P. Lundy, 245 South Eighteenth street, Philadelphia.

Franklin Forestry Society, The.—President, Alvin B. Kuhn; secretary, W. G. Bowers, Chambersburg, Pa.

Chester County, S. C., The Forestry Association of.—President, Judge J. J. McClure; secretary and treasurer, Prof. H. A. Green, Chester.

Utah Forestry Association.—President, Dr. J. R. Park; secretary, Prof. C. A. Whiting, Salt Lake City.

Washington Forestry Association.—President, Prof. Edmund S. Meany, Seattle; secretary, Albert Bryan.

## SCHOOLS OF FORESTRY.

ALABAMA.—State Agricultural and Mechanical College, Auburn: One term, two hours a week; lectures and occasional field work.

ARKANSAS.—Arkansas Industrial University, Fayetteville: One term, twice a week; with horticulture.

CALIFORNIA.—University of Southern California, Los Angeles: Full course.

COLORADO.—The State Agricultural College of Colorado, Fort Collins: Portion of junior term in horticulture.

CONNECTICUT.—Yale Forest School: A two years' graduate course.

Storrs Agricultural College, Storrs: Touched on in horticultural course.

GEORGIA.—Georgia State College of Agriculture and Mechanic Arts, Athens: Junior year in horticulture concludes with short course in forestry.

IDAHO.—College of Agriculture of the University of Idaho, Moscow: General practical course.

ILLINOIS.—College of Agriculture of the University of Illinois, Urbana: One term, twice a week; general.

INDIANA.—Purdue University, Lafayette: Elective in senior year; general instruction.

IOWA.—Iowa State College of Agriculture and Mechanic Arts, Ames.

KANSAS.—Kansas State Agricultural College, Manhattan: One term, three times a week; general instruction.

KENTUCKY.—Berea College, Berea: General instruction.

Ogden College, Bowling Green: Just introduced.

Probably also at the Agricultural and Mechanical College of Kentucky, Lexington.

MAINE.—The University of Maine, Orono: With horticulture and botany only.

MARYLAND.—Maryland Agricultural College, College Park: Only incidentally.

MASSACHUSETTS.—Massachusetts Agricultural College, Amherst: With horticulture.

Harvard University, Cambridge: Arboriculture taught.

MICHIGAN.—Michigan Agricultural College, Agricultural College: One term, three times a week, and daily lectures during half of another term; general instruction.

State University, Ann Arbor: Some instruction.

State Normal School, Ypsilanti: Some instruction.

MINNESOTA.—College of Agriculture of the University of Minnesota, St. Anthony Park, St. Paul: Four times a week for two terms. Course 1, lectures covering general principles and Minnesota conditions. Course 2, lectures and field work; practical conditions.

MISSISSIPPI.—Mississippi Agricultural and Mechanical College, Agricultural College: Touched on in botany.

MISSOURI.—College of Agriculture and Mechanic Arts of the University of Missouri, Columbia: One semester, two hours a week; general instruction.

MONTANA.—The Montana College of Agriculture and Mechanic Arts, Bozeman: Lectures and field work, with agriculture.

NEBRASKA.—The Industrial College of the University of Nebraska, Lincoln: One semester, twice a week; general instruction, including dendrology.

NEVADA.—School of Agriculture of the Nevada State University, Reno: One year, three hours a week; with horticulture.

NEW HAMPSHIRE.—New Hampshire College of Agriculture and the Mechanic Arts, Durham: Two terms, twenty exercises each; general instruction.

NEW YORK.—New York State College of Forestry at Cornell University, Ithaca: Four years' course; practical instruction afforded by a demonstration area of 30,000 acres of State forest.

NORTH CAROLINA.—Biltmore School of Forestry, Biltmore: One-year course, comprising practical work in the forest, theoretical instruction, and forest research. No botany or other auxiliary sciences.

The North Carolina College of Agriculture and Mechanic Arts, West Raleigh: One term, one hour a week; lectures only.

North Carolina State University, Chapel Hill: Short course of lectures on forest conditions and need of management.

NORTH DAKOTA.—North Dakota Agricultural College, Agricultural College: Four weeks, five hours a week; confined chiefly to forest influences on climate and soil conditions.

OHIO.—Ohio State University, Columbus: One term, twice a week; general instruction.

OKLAHOMA.—Oklahoma Agricultural and Mechanical College, Stillwater: One term in connection with horticulture; general instruction, including demonstration on experiment station farm.

OREGON.—Oregon State Agricultural College, Corvallis: One term; optional in botany course.

PENNSYLVANIA.—University of Pennsylvania, Philadelphia: General course.

The Pennsylvania State College, State College: One term; lectures on general principles. Other schools.

RHODE ISLAND.—Rhode Island College of Agriculture and Mechanic Arts, Kingston: One term, three times a week; elective in horticulture course.

SOUTH DAKOTA.—South Dakota Agricultural College, Brookings: Three to four hours a week; general instruction and field work.

TENNESSEE.—University of the South, Sewanee: General course.

TEXAS.—State Agricultural and Mechanical College of Texas, College Station: Ten weeks, twice a week; general instruction.

VERMONT.—University of Vermont and State Agricultural College, Burlington: One half year, two hours a week; general instruction with some field work.

WASHINGTON.—Washington Agricultural College and School of Science, Pullman; One semester; attention chiefly devoted to plantations, with considerable field work.

University of Washington, Seattle: Some instruction.

WEST VIRGINIA.—West Virginia University, Morgantown: Twelve weeks, five times a week; lectures on general principles.

WISCONSIN.—College of Agriculture of the University of Wisconsin, Madison: One year, twice a week; general instruction.

WYOMING.—College of Agriculture of the University of Wyoming, Laramie: With horticulture.

## OFFICERS OF HORTICULTURAL AND KINDRED SOCIETIES.

### AMERICAN ASSOCIATION OF NURSERYMEN, 1900.

President, W. J. Peters, Troy, Ohio; vice-president, E. Albertson, Bridgeport, Ind.; secretary, George C. Seager, Rochester, N. Y.; treasurer, C. L. Yates, Rochester, N. Y.

### AMERICAN CARNATION SOCIETY, 1900.

President, William P. Craig, Philadelphia, Pa.; vice-president, William F. Kastings, Buffalo, N. Y.; secretary, Albert M. Herr, Lancaster, Pa.; treasurer, Fred Dorner, jr., Lafayette, Ind.

AMERICAN CRANBERRY GROWERS' ASSOCIATION, 1900.

President, E. H. Durell, Woodbury, N. J.; first vice-president, Joshua S. Wills, Medford, N. J.; second vice-president, C. L. Holman, Toms River, N. J.; secretary and treasurer, A. J. Rider, Trenton, N. J.

AMERICAN POMOLOGICAL SOCIETY, 1899-1900.

President, C. L. Watrous, Des Moines, Iowa; vice-president, Thomas Meehan, Germantown, Pa.; secretary, William A. Taylor, 55 Q street NE., Washington, D. C.; treasurer, L. R. Taft, Agricultural College, Michigan.

AMERICAN ROSE SOCIETY, 1900.

President, Benjamin Dorrance, Dorrancetown, Pa.; treasurer, John N. May, Summit, N. J.; secretary, Leonard Barron, 136 Liberty street, New York, N. Y.

CIDER AND CIDER-VINEGAR ASSOCIATION OF THE NORTHWEST, 1900.

President, F. C. Johnson, Kishwaukee, Ill.; first vice-president, G. W. Hilliard, Brighton, Ill.; second vice-president, George Keightley, Clarksville, Mo.; secretary and treasurer, George Miltenberger, No. 213 North Second street, St. Louis, Mo.

EASTERN NURSERYMEN'S ASSOCIATION, 1900.

President, W. C. Barry, Rochester, N. Y.; vice-president, R. G. Chase, Geneva, N. Y.; secretary and treasurer, William Pitkin, Rochester, N. Y.

MISSOURI VALLEY HORTICULTURAL SOCIETY, 1900.

President, Homer Reed, Tenth and Broadway, Kansas City, Mo.; vice-president, Edwin Taylor, Edwardsville, Kans.; secretary, A. Chandler, Argentine, Kans.; treasurer, G. F. Espenlaub, Rosedale, Kans.

NORTHWEST FRUIT GROWERS' ASSOCIATION, 1900.

President, Dr. N. G. Blalock, Wallawalla, Wash.; vice-presidents, L. A. Porter, Lewiston, Idaho; E. L. Smith, Hood River, Oreg.; Frank L. Wheeler, North Yakima, Wash.; E. Hutcheson, Landers, B. C.; secretary, H. E. Dosch, Portland, Oreg.; treasurer, W. S. Offner, Wallawalla, Wash.

PENINSULA HORTICULTURAL SOCIETY, 1900.

President, Joseph E. Carter, Smyrna, Del.: vice-president, Orlando Harrison, Berlin, Md.; secretary-treasurer, Wesley Webb, Dover, Del.

SOCIETY OF AMERICAN FLORISTS AND ORNAMENTAL HORTICULTURISTS, 1900.

President, Edmund M. Wood, Natick, Mass.; vice-president, F. R. Pierson, Tarrytown, N. Y.; secretary, William J. Stewart, Boston, Mass.; treasurer, H. B. Beatty, Oil City, Pa.

WESTERN ASSOCIATION OF WHOLESALE NURSERYMEN, 1900.

President, A. L. Brooke, North Topeka, Kans.; vice-president, R. H. Blair, Kansas City, Mo.; secretary and treasurer, U. B. Pearsall, Leavenworth, Kans.

STATE SOCIETIES.

Arkansas State Horticultural Society, 1900.—President S. H. Nowlin, Little Rock; vice-president, W. J. Patton, Springdale; secretary, W. K. Tipton, Little Rock; treasurer, Joseph Vestal, Little Rock.

California State Floral Society, 1900.—President, Emory E. Smith, Palo Alto; secretary, Mrs. H. P. Tricou, San Francisco.

Pomological Society of California, 1900.—President, Abbot Kinney, Los Angeles; vice-president, D. Edson Smith, Santa Ana; secretary and treasurer, G. H. A. Goodwin, Los Angeles.

Colorado State Horticultural Society, 1900.—President, W. S. Coburn, Hotchkiss; secretary, W. B. Osborn, Denver.

Connecticut Pomological Society, 1900.—President J. H. Merriman, New Britain; vice-president, G. S. Butler, Cromwell; secretary, H. C. C. Miles, Milford; treasurer, R. A. Moore, Kensington.

Florida State Horticultural Society, 1900.—President, G. L. Taber, Glen St. Mary; secretary, Stephen Powers, Jacksonville; treasurer, W. S. Hart, Hawks Park.

Georgia State Horticultural Society, 1900.—President, P. J. Berckmans, Augusta; vice-president, First district, G. M. Ryals, Savannah; secretary, G. H. Miller, Rome; treasurer, Louis A. Berckmans, Augusta.

Idaho State Horticultural Society, 1900.—President, Charles P. Hartley, Caldwell; vice-president, Robert Schleicher, Lewiston; secretary, Robert Milliken, Nampa; treasurer, G. T. Hamill, Nampa.

Illinois State Horticultural Society, 1900.—President, Henry M. Dunlap, Savoy; vice-president, H. A. Aldrich, Neoga; secretary, L. R. Bryant, Princeton; treasurer, J. W. Stanton, Richview.

Indiana Horticultural Society, 1900.—President, C. M. Hobbs, Bridgeport; secretary, James Troop, Lafayette; treasurer, Sylvester Johnson, Irvington.

Iowa State Horticultural Society, 1900.—President, Charles F. Gardner, Osage; vice-president, M. J. Wragg, Waukee; secretary, Wesley Greene, Des Moines; treasurer, W. M. Bomberger, Harlan.

Kansas State Horticultural Society, 1900.—President, Fred Wellhouse, Topeka; vice-president, J. W. Robison, Eldorado; secretary, William H. Barnes, Topeka; treasurer, Frank Holsinger, Rosedale; entomologist, Perry J. Parrott, Manhattan.

Kentucky State Horticultural Society, 1900.—President, M. F. Johnson, Fern Creek; secretary, J. C. Hawes, Fern Creek.

Maine State Pomological Society, 1900.—President, W. M. Munson, Orono; first vice-president, S. H. Dawes, Harrison; second vice-president, D. P. True, Leeds Center; secretary-treasurer, Charles S. Pope, Manchester.

Maryland State Horticultural Society, 1900.—President, James S. Harris, Coleman; vice-president, J. P. Blessing, Brownsville; secretary and treasurer, W. G. Johnson, College Park.

Massachusetts Fruit Growers' Association, 1900.—President, George Cruickshanks, Fitchburg; vice-president, H. O. Mead, Lunenburg; secretary; S. T. Maynard, Amherst; treasurer, Ethan Brooke, West Springfield.

Massachusetts Horticultural Society, 1900.—President, Francis H. Appleton, Boston; vice-president, Charles H. B. Breck, Boston; secretary, Robert Manning, 101 Tremont street, Boston; treasurer, Charles E. Richardson, 101 Tremont street, Boston.

Michigan State Horticultural Society, 1900.—President, C. J. Monroe, South Haven; vice-president, R. D. Graham, Grand Rapids; secretary, C. E. Bassett, Fennville; treasurer, Asa W. Slayton, Grand Rapids.

Minnesota State Horticultural Society, 1900.—President, W. W. Pendergast, Hutchison; vice-president, F. W. Kimball, Austin; secretary, A. W. Latham, 207 Kasota Block, Minneapolis; treasurer, H. M. Lyman, Excelsior.

Missouri State Horticultural Society, 1900.—President, N. F. Murray, Oregon; vice-president, D. A. Robnett, Columbia; secretary, L. A. Goodman, Westport; treasurer, A. Nelson, Lebanon.

Montana State Horticultural Society, 1900.—President, S. M. Emery, Bozeman; secretary and treasurer, C. H. Edwards, Missoula.

Nebraska State Horticultural Society, 1900.—President, George A. Marshall, Arlington; vice-president, J. H. Hadkinson, Omaha; secretary, C. H. Barnard, Table Rock; treasurer, Peter Youngers, jr., Geneva.

New Hampshire Horticultural Society, 1900.—President, C. C. Shaw, Milford; vice-president, J. W. Farr, Littleton; secretary, W. D. Baker, Quincy; treasurer, T. E. Hunt, Lakeport.

New Jersey State Horticultural Society, 1900.—President, Henry E. Hale, Princeton; vice-president, William H. Reed, Tennent; secretary, Henry I. Budd, Mount Holly; treasurer, Charles L. Jones, Newark.

New Mexico Horticultural Society, 1900.—President, L. Bradford Prince, Santa Fe; vice-president, W. S. Harroun, Santa Fe; secretary, Jose D. Sena, Santa Fe; treasurer, Soloman Spiegelberg, Santa Fe.

North Carolina State Horticultural Society, 1900.—President, J. Van. Lindley, Pomona; vice-president, W. F. Massey, Raleigh; secretary and treasurer, Thomas L. Brown, Greensboro.

Ohio State Horticultural Society, 1900.—President, E. H. Cushman, Euclid; vice-president, W. N. Scarff, New Carlisle; secretary, W. W. Farnsworth, Waterville; treasurer, N. Ohmer, Dayton.

Oregon State Horticultural Society, 1900.—President, Dr. J. R. Cardwell, Portland; first vice-president, William Galloway, Oregon City; second vice-president, H. M. Williamson, Portland; secretary and treasurer, E. R. Lake, Corvallis.

Pennsylvania State Horticultural Association, 1900.—President, Howard A. Chase, 1430 South Penn Square, Philadelphia; vice-president, Daniel D. Herr, Lancaster; M. C. Dunlevy, Carnegie; recording secretary, E. B. Engle, Waynesboro; corresponding secretary, W. T. Brinton, Christiana; treasurer, Samuel C. Moon, Morrisville.

Pennsylvania Horticultural Society, 1900.—President, James M. Rhodes, Third and Chestnut streets, Philadelphia; vice-president, Robert Craig, Forty-ninth and Market streets, Philadelphia; secretary, David Rust, Horticultural Hall, Philadelphia; treasurer, Sidney W. Keith, Land Title Building, Philadelphia.

Rhode Island Horticultural Society, 1900.—President, J. E. C. Farnham, Providence; vice-presidents, R. H. I. Goddard, Providence, Royal C. Taft, Providence, Joseph D. Fitts, Providence; secretary and treasurer, Charles W. Smith, 61 Westminster street, Providence.

South Dakota State Horticultural Society, 1900.—President, H. C. Warner, Forestburg; vice-president, L. R. Alderman, Hurley; secretary, N. E. Hansen, Brookings; treasurer, G. H. Whiting, Yankton.

Texas State Horticultural Society, 1900.—President, F. T. Ramsey, Austin; vice-presidents, P. I. Burch, Rockport, S. D. Thompson, Bowie; secretary, Samuel H. Dixon, Pauli; treasurer, D. O. Lively, Fort Worth.

Vermont Horticultural Society, 1900.—President, T. L. Kinney, South Hero; secretary and treasurer, F. A. Waugh, Burlington.

Virginia State Horticultural Society, 1900.—President, Samuel B. Woods, Charlottesville; vice-president, A. F. Mosby, Richmond; recording secretary, George E. Murrell, Fontella; corresponding secretary and treasurer, Walter Whately, Crozet.

West Virginia State Horticultural Society, 1900.—President, R. C. Burkhart, Martinsburg; vice-president, J. H. Crawford, Organ Cave; secretary L. C. Corbett, Morgantown.

Wisconsin State Horticultural Society, 1900.—President, Franklin Johnson, Baraboo; vice-president, T. E. Loope, Eureka; secretary, J. L. Herbst, Sparta; treasurer, R. J. Coe, Fort Atkinson.

Wisconsin State Cranberry Growers' Association, 1900.—President, Charles Briers, Grand Rapids; vice-president, S. M. Whittlesey, Cranmoor; secretary, W. H. Fitch, Cranmoor; treasurer, Melvin Potter, Centralia.

OFFICERS AND MEMBERS OF STATE BOARDS OF HORTICULTURE.

California State Board of Horticulture, 1900.—President, Ellwood Cooper, Santa Barbara; vice-president, Frank H. Buck, Vacaville; secretary and chief horticultural officer, B. M. Lelong, Sacramento; treasurer, William B. Gester, Newcastle; auditor, R. D. Stephens, Sacramento; quarantine officer and entomologist, Alexander Craw, Sacramento; clerk, E. F. Hallahan, Sacramento; district commissioners, Thomas A. Rice, H. Weinstock, Benjamin M. Maddox, A. Block, W. T. Hotchkiss.

Indiana State Board of Horticulture, 1900.—President, C. M. Hobbs, Bridgeport; vice-presidents, Mrs. W. W. Stevens, George P. Campbell, Amos Garretson, J. C. Grossman; secretary, J. Troop, Lafayette; treasurer, Sylvester Johnson, Irvington; executive committee, E. Y. Teas, L. B. Custer, J. C. Stevens.

Montana State Board of Horticulture, 1900.—President, I. D. O'Donnell, Billings; secretary, C. H. Edwards, Missoula; district committeemen, S. M. Emery, W. H. Campbell, D. E. Bandmann, J. H. Edwards; Governor R. B. Smith, ex officio, Helena.

Oregon State Board of Horticulture, 1900.—President, H. B. Miller; secretary, Henry E. Dosch; treasurer, Lloyd T. Reynolds; commissioners, Wilbur K. Newell, Lloyd T. Reynolds, A. H. Carson, Emile Schanno, and Judd Geer.

Utah State Board of Horticulture, 1900.—President, Thomas Judd; vice-president, H. E. Carey; secretary, J. A. Wright, Ogden.

LOCAL HORTICULTURAL SOCIETIES.

Horticultural Society of Central Illinois, 1900.—President, H. Augustine, Normal; vice-president, G. J. Foster, Bloomington; secretary, J. C. Blair, Champaign.

Horticultural Society of Northern Illinois, 1900.—President, J. L. Hartwell, Dixon; vice-president, O. W. Barnard, Manteno; secretary, A. W. Bryant, Princeton; treasurer, L. Woodard, Marengo.

Horticultural Society of Southern Illinois, 1900.—President, J. W. Stanton, Richview; vice-president, L. N. Beal, Mount Vernon; secretary and treasurer, E. G. Mendenhall, Kinmundy.

Northeastern Iowa Horticultural Society, 1900.—President, Charles F. Gardner, Osage; vice-president, Elmer Reeves, Waverly; secretary, Charles H. True, Edgewood; treasurer, G. A. Ivins, Iowa Falls.

Northwestern Iowa Horticultural Society, 1900.—President, P. F. Kinne, Storm Lake; vice-president, J. C. Winsett, Fostoria; treasurer, Ben Shoultz, Correctionville; secretary, W. B. Chapman, Washta.

Southeastern Iowa Horticultural Society, 1900.—President, W. S. Fultz, Muscatine; vice-president, W. T. Richey, Albia; secretary, C. W. Burton, Cedar Rapids; treasurer, F. R. Harrington, York Center.

Southwestern Iowa Horticultural Society, 1900.—President, J. P. Jackson, Glenwood; vice-president, Silas Wilson, Atlantic; secretary, W. M. Bomberger, Harlan; treasurer, I. M. Needles, Atlantic.

Horticultural Association of Western Maryland, 1900.—President, Charles C. Biggs, Sharpsburg; vice-president, Caleb Long, Downsville; secretary and treasurer, Arthur L. Towson, Smithsburg.

Cape Cod Cranberry Growers' Association, 1900.—President, Emulus Small, Harwick Port, Mass.; vice-president, Luther Hall, Dennis, Mass.; secretary and treasurer, Franklin Crocker, Hyannis.

West Michigan Horticultural Society, 1900.—President, R. M. Kellogg, Three Rivers; secretary, C. A. French, Grand Rapids; treasurer, A. Hamilton, Bangor.

Southern Minnesota Horticultural Society, 1900.—President, J. C. Hawkins, Austin; vice-presidents, O. L. Gregg, Austin, and O. W. Moore, Spring Valley; secretary and treasurer, Robert Parkhill, Chatfield.

Central Missouri Horticultural Association, 1900.—President, D. F. Nixon, Harriston; vice-president, D. Edwards, Boonville; secretary, C. C. Bell, Boonville; treasurer, W. A. Smiley, Boonville.

South Missouri Horticultural Association, 1900.—President, D. J. Nichols, West Plains; secretary and treasurer, J. T. Snodgrass, West Plains.

Eastern New York Horticultural Society, 1900.—President, James Wood, Mount Kisco; vice-president, W. F. Taber, Poughkeepsie; secretary and treasurer, Edwin C. Powell, Ghent.

Western New York Horticultural Society, 1900.—President, W. C. Barry, Rochester; vice-presidents, S. D. Willard, Geneva; J. S. Woodward, Lockport; Albert Wood, Carlton Station; T. B. Wilson, Halls Corners; secretary, John Hall, Rochester.

West Tennessee Horticultural Institute, 1900.—President, J. W. Rosaman, Gadsden; vice-president, L. C. James, Gibson; secretary and treasurer, J. D. Johnson, Henderson.

East Tennessee Horticultural Society.—President, E. F. Wetmore, Ogden; secretary and treasurer, H. Lightfoot, Chattanooga.

## NATIONAL, SECTIONAL, AND STATE BEE KEEPERS' ASSOCIATIONS.

### UNITED STATES.

National Bee Keepers' Association.—President, E. R. Root, Medina, Ohio; secretary, A. B. Mason, Toledo, Ohio; general manager and treasurer, Eugene Secor, Forest City, Iowa.

### CALIFORNIA.

California Bee Keepers' Exchange.—Secretary, J. H. Martin, Riverside, Cal.

California State Bee Keepers' Association.—President, R. Wilkin, Ventura, Cal.; secretary, J. F. McIntyre, Sespe, Cal.

Central California Bee Keepers' Association.—Secretary, F. E. Brown, San Francisco.

### COLORADO.

Colorado State Bee Keepers' Association.—President, R. C. Aikin, Loveland, Colo.; secretary, Frank Rauchfuss, Denver, Colo.

### CONNECTICUT.

Connecticut Bee Keepers' Association.—Secretary, Mrs. W. C. Riley, Waterbury, Conn.

### ILLINOIS.

Illinois State Bee Keepers' Association.—President, C. C. Miller, Marengo, Ill.; secretary, James A. Stone, Bradfordton, Ill.

Northern Illinois Bee Keepers' Association.—Secretary, B. Kennedy, New Milford, Ill.

### INDIANA.

Indiana State Bee Keepers' Association.—President, E. S. Pope, Indianapolis, Ind.; secretary, W. S. Pouder, Indianapolis, Ind.

### IOWA.

Eastern Iowa Bee Keepers' Association.—Secretary, W. A. Hay, Anamosa, Iowa.

### KANSAS.

Southeastern Kansas Bee Keepers' Association.—President, J. P. Ralston, Uniontown, Kans.; secretary, J. C. Balch, Bronson, Kans.

### MICHIGAN.

Michigan State Bee Keepers' Association.—President, George E. Hilton, Fremont, Mich.; secretary, William G. Voorheis, South Frankfort, Mich.

### MINNESOTA.

Minnesota Bee Keepers' Association.—President, J. P. West, Hastings, Minn.; secretary, L. D. Leonard, Minneapolis, Minn.

Southern Minnesota Bee Keepers' Association.—President, E. B. Huffman, Homer, Minn.

### NEBRASKA.

Nebraska Bee Keepers' Association.—President, E. Whitcomb, Friend, Nebr.; secretary, L. D. Stilson, York, Nebr.

### NEW YORK.

New York State Association of Bee Keepers' Societies.—President, W. F. Marks, Chapinville, N. Y.; secretary-treasurer, C. B. Howard, Romulus, N. Y.

New York State Bee Keepers' Association.—President, I. L. Scofield, Chenango Bridge, N. Y.; secretary, J. H. Knickerbocker, Pleasant Valley, N. Y.

### OHIO-PENNSYLVANIA.

Northeastern Ohio and Northwestern Pennsylvania Bee Keepers' Association.—Secretary, Ed Jolley, Franklin, Pa.

### TENNESSEE.

Southern East Tennessee Bee Keepers' Association.—President, M. T. Fouts, Parksville, Tenn.; secretary, W. J. Copeland, Fetzerton, Tenn.

### TEXAS.

Central Texas Bee Keepers' Association.—President, E. Y. Terral, Cameron, Tex.; secretary, E. R. Jones, Milano, Tex.

South Texas Bee Keepers' Association.—President, M. M. Faust, Floresville, Tex.; secretary, G. W. Huffstedler, Beeville, Tex.

Texas State Bee Keepers' Association.—President, W. R. Graham, Greenville, Tex.; secretary and treasurer, J. N. Hunter, Leonard, Tex.

### UTAH.

Utah Bee Keepers' Association.—President, E. S. Lovesy, Salt Lake City, Utah; secretary and treasurer, J. B. Fagg, Mill Creek, Utah.

VERMONT.

Vermont Bee Keepers' Association.—Secretary, M. F. Cram, West Brookfield, Vt.

WASHINGTON.

Washington State Bee Keepers' Association.—Secretary, L. R. Freeman, North Yakima, Wash.

WISCONSIN.

Southwestern Wisconsin Bee Keepers' Association.—President, N. E. France, Platteville, Wis.; secretary, F. L. Murray, Calamine, Wis.

Wisconsin State Bee Keepers' Association.—Secretary, Miss Ada Pickard, Richland Center.

## STATE OFFICIALS CONCERNED WITH THE PROTECTION OF BIRDS AND GAME.[1]

CALIFORNIA.

*Board of fish commissioners.*[2]

President, Alexander T. Vogelsang, Mills Building, San Francisco; Charles B. Gould, Oakland; H. W. Keller, Santa Monica; chief deputy, John P. Babcock, San Francisco.

COLORADO.

*Department of game and fish.*

Commissioner, Thos. H. Johnson, 35 Capitol Building, Denver; chief wardens, first district, Frank Fenn, Denver; second district, James Lyttle, Meeker; third district, W. A. Lee, Glenwood Springs; fourth district, B. F. Jay, Grand Junction; fifth district, E. H. Norton, Montrose.

CONNECTICUT.

*Commission of fisheries and game.*

President, George T. Mathewson, Thompsonville; secretary, Alden Solmans, South Norwalk.

ILLINOIS.

*State game commissioner.*

Henry W. Loveday, Springfield; suboffice, 816 Schiller Building, Chicago.

INDIANA.

*Commissioner of fisheries and game.*

Z. T. Sweeney, Columbus.

IOWA.

*Fish and game warden.*

George E. Delavan, Estherville.

MAINE.

*Commissioners of inland fisheries and game.*

Chairman, L. T. Carleton, Augusta; Henry O. Stanley, Dixfield; Charles E. Oak, Caribou.

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[1] Corrected to April 1, 1900. [2] Has jurisdiction over matters relating to game.

MARYLAND.

*Game warden.*

Robert H. Gilbert, Calvert and Lombard streets, Baltimore.

MASSACHUSETTS.

*Commissioners of fisheries and game.*

Chairman, Joseph W. Collins, Boston; secretary, Edward A. Brackett, Winchester; Elisha D. Buffington, Worcester.

MICHIGAN.

*Game and fish warden department.*

Warden, Grant M. Morse, Portland; chief deputy, Charles E. Brewster, Portland.

MINNESOTA.

*Fish and game commissioners.*

President, A. T. Williams, Minneapolis; vice-president, Jacob Danz 2d, St. Paul; secretary, W. W. Ward, Fairmont; treasurer, A. L. Cramb, St. Cloud; executive agent, John Beutner, Proctorknott.

MISSOURI.

*Game and fish warden.*

A. J. D. Burford, Burfordville.

MONTANA.

*Board of game and fish commissioners.*

Chairman, Prof. M. J. Elrod, Missoula; secretary, R. A. Waagner, Bozeman; State warden, H. Percy Kennett, Victor.

NEW HAMPSHIRE.

*Fish and game commission.*

Chairman, N. Wentworth, Hudson Center; financial agent, W. H. Shurtleff, Lancaster; secretary, F. L. Hughes, Ashland.

NEW JERSEY.

*Fish and game commissioners.*

President and treasurer, Howard P. Frothingham, Mount Arlington; William A. Halsey, Newark; Benj. P. Morris, Long Branch; J. Frank Budd, Burlington City; fish and game protector, George Riley, 190 Broad street, Newark.

NEW YORK.

*Commissioners of fisheries, game, and forests.*

President, W. Austin Wadsworth, Livingston County; Percy Lansdowne, Buffalo, Erie County; Delos H. Mackey, Delaware County; B. Frank Wood, Queens County; De Witt C. Middleton, Watertown, Jefferson County; chief protector, J. Warren Pond, Albany.

NORTH DAKOTA.

*Game warden.*

Geo. E. Bowers, Fargo.

OHIO.

*Commissioners of fish and game.*

President, George Falloon, Athens; J. C. Burnett, Sabina; Albert Brewer, Tiffin; James W. Owens, Newark; A. J. Hazlett, Bucyrus; secretary and chief warden, L. H. Reutinger, Athens.

OREGON.

*Game warden.*

L. P. W. Quimby, Portland.

PENNSYLVANIA.

*Board of game commissioners.*

President, William M. Kennedy, Allegheny City; C. K. Sober, Lewisburg; James H. Worden, Harrisburg; E. B. Westfall, Williamsport; Dr. Charles B. Penrose, Philadelphia; I. A. Stearns, Wilkesbarre; secretary, Dr. Joseph Kalbfus, Harrisburg.

RHODE ISLAND.

*Commissioners of birds.*

Chairman, F. H. Peckham, jr., Providence County; E. R. Lewis, Washington County; William H. Thayer, Bristol County; A. O'D. Taylor, Newport County; secretary, Thomas W. Penney, Kent County.

UTAH.

*Fish and game warden.*

John Sharp, Salt Lake City.

VERMONT.

*Fish and game commissioners.*

John W. Titcomb, St. Johnsbury; Horace W. Bailey, Newbury.

WASHINGTON.

*Fish commissioner and game warden.*

A. C. Little, 210-212 Berlin Building, Tacoma.

WISCONSIN.

*Fish and game warden*

James T. Ellarson, Madison.

WYOMING.

*Game warden.*

Albert Nelson, Jackson.

MANITOBA.

*Game guardian.*

W. M. Ingram, Winnipeg.

NEW BRUNSWICK.

*Crown land department.*[1]

Surveyor-general, A. T. Dunn, Fredericton; chief game commissioner, L. B. Knight, St. John; commissioner of fisheries, D. G. Smith, Chatham.

[1] Has jurisdiction over matters relating to protection of game.

NEWFOUNDLAND.

*Department of marine and fisheries.*[1]

Deputy minister, E. C. Watson, St. Johns; secretary, M. Harvey, St. Johns.

NOVA SCOTIA.

*Nova Scotia Game and Inland Fishery Protection Society.*

President, Col. Clerke; vice-presidents, H. N. Wallace, L. G. Power; secretary, Geo. Piers, Halifax; treasurer, H. N. Wallace; chief game commissioner, C. S. Harrington; commissioners, A. O. Pritchard, New Glasgow, Donald Ross, Margaree, Cape Breton Island; W. S. Crooker, Queens County; Albert Bigney, Cumberland.

ONTARIO.

*Game commission.*

Chairman, Dr. G. A. MacCallum, Dunnville; James Dickson, Fenelon Falls; W. G. Parrish, Athens; W. B. Wells, Chatham; H. S. Osler, Toronto; chief game warden, E. Tinsley, Parliament Building, Toronto.

QUEBEC.

*Department of lands, forests, and fisheries—Fisheries and game branch.*

Commissioner, S. N. Parent; assistant commissioner, E. E. Paine; superintendent, L. Z. Joncas; general inspector and assistant superintendent, H. de Puyjalon, Quebec; provincial game keepers, N. E. Cormier, Aylmer East; Joseph Riendeau, Montreal.

## NATIONAL ORGANIZATIONS FOR PROTECTION OF BIRDS AND GAME.

AMERICAN ORNITHOLOGISTS' UNION—COMMITTEE ON PROTECTION OF NORTH AMERICAN BIRDS.

Chairman, Witmer Stone, Academy Natural Sciences, Philadelphia, Pa.; E. H. Forbush, Malden, Mass.; William Dutcher, 525 Manhattan avenue, New York, N. Y.; Mrs. Olive Thorne Miller, 628 Hancock street, Brooklyn, N. Y.; Mrs. Edward Robins, 114 South Twenty-first street, Philadelphia, Pa.; Mrs. Florence Merriam Bailey, Washington, D. C.; T. S. Palmer, Department of Agriculture, Washington, D. C.; Ruthven Deane, 24 Michigan avenue, Chicago, Ill.; O. Widmann, Old Orchard, Mo.; Mrs. E. Irene Rood, Fort Worth, Tex.; Leverett M. Loomis, California Academy of Sciences, San Francisco, Cal.; A. W. Anthony, Taylorsville, Cal.; Mrs. Louise McGowen Stephenson, Helena, Ark.

LEAGUE OF AMERICAN SPORTSMEN.

President, G. O. Shields, 23 West Twenty-fourth street, New York, N. Y.
Secretary, Arthur F. Rice, 155 Pennington avenue, Passaic, N. J.
Treasurer, F. S. Hyatt, National Exchange Bank, 90 West Broadway, New York, N. Y.
Chief wardens of State divisions:
California—Dr. David Starr Jordan, Stanford University.
Colorado—A. Whitehead, 17 Bank Block, Denver.
Connecticut—Ralph B. Lawton, Bridgeport.
Illinois—H. W. Loveday, 816 Schiller Building, Chicago.
Massachusetts—Dr. Heber Bishop, 4 Post-Office square, Boston.
Michigan—J. Elmer Pratt, Grand Rapids.
Minnesota—S. A. Smart, St. Paul.
Montana—Prof. M. J. Elrod, Missoula.
New Jersey—A. W. Van Saun, Pompton Plains.
New York—A. E. Pond, 148 Fifth avenue, New York City.

[1] Has jurisdiction over matters relating to protection of game.

Chief wardens of State divisions—Continued.
Ohio—L. H. Reutinger, Athens.
Oregon—Robert F. Kelly, Box 188, The Dalles.
Pennsylvania—C. F. Emerson, 189 North Perry street, Titusville.
Utah—John Sharp, Salt Lake City.
Vermont—W. E. Mack, Woodstock.
Virginia—Franklin Stearns, 13 North Eleventh street, Richmond.
Washington—J. S. Stangroom, New Whatcom.
Wisconsin—James T. Drought, Milwaukee.
Wyoming—Dr. Frank Dunham, Lander.

NATIONAL GAME, BIRD, AND FISH PROTECTIVE ASSOCIATION.

President, A. L. Lakey, Kalamazoo, Mich.
Secretary, C. E. Brewster, Grand Rapids, Mich.
Treasurer, J. P. Barnum, Prairie du Chien, Wis.

NATIONAL SPORTSMEN'S ASSOCIATION.

President, Charles Tatham, New York, N. Y.
Secretary-treasurer, J. A. H. Dressel, 280 Broadway, New York, N. Y.

NORTH AMERICAN FISH AND GAME PROTECTION ASSOCIATION.

President, S. N. Parent, Commissioner Lands, Forests, and Fisheries, Quebec.
Joint secretaries, L. Z. Joncas, Quebec; Rene Dupont, Quebec; D. J. Smith, Chatham, N. B.

## STATE ORGANIZATIONS FOR PROTECTION OF BIRDS AND GAME.

ARKANSAS STATE SPORTSMEN'S ASSOCIATION.

President, W. A. Leach, Fort Smith.
Secretary, Paul R. Litzke, Little Rock.

CONNECTICUT ASSOCIATION OF FARMERS AND SPORTSMEN FOR THE PROTECTION OF FISH AND GAME.

President and treasurer, Abbott C. Collins, 18 Preston street, Hartford.
Secretary, George P. McLean, Simsbury.

DELAWARE GAME PROTECTIVE ASSOCIATION.

President, A. D. Poole, Wilmington.
Secretary and treasurer, I. N. Mills, Clayton.

GAME AND FISH PROTECTIVE ASSOCIATION, DISTRICT OF COLUMBIA.

President, Capt. Robley D. Evans, U. S. N.
Secretary, Dr. W. P. Young, 1333 F street NW., Washington.
Warden, Maj. Richard Sylvester, Washington.

ILLINOIS STATE SPORTSMEN'S ASSOCIATION.

President, E. S. Rice, Chicago.
Secretary-treasurer, Wm. B. Leffingwell, Room 1524 Masonic Temple, Chicago.

ILLINOIS FISH AND GAME PROTECTIVE ASSOCIATION.

President, H. W. Loveday, 816 Schiller Building, Chicago.
Secretary, H. A. Sullivan, Room 912, Ashland Block, Chicago.

IOWA STATE ASSOCIATION FOR THE PROTECTION OF FISH AND GAME.

President, W. B. Kibbey, Marshalltown.
Secretary, L. C. Abbott, Marshalltown.

KENTUCKY FIELD TRIAL CLUB.

President, Geo. L. Danforth, Louisville.
Secretary and treasurer, Herman Newcomb, Louisville.

KENTUCKY FISH AND GAME CLUB.

President, Frank Pragoff, 422 West Main street, Louisville.
Secretary, Hamilton Griswold, Louisville.

MARYLAND STATE GAME AND FISH PROTECTIVE ASSOCIATION.

President, George Dobbin Penniman, Baltimore.
Secretary and treasurer, Frank C. Kirkwood, 1500 Bolton street, Baltimore.

MASSACHUSETTS CENTRAL COMMITTEE FOR THE PROTECTION OF FISH AND GAME.

Chairman, A. B. F. Kinney, Worcester.
Secretary and treasurer, Henry H. Kimball, 5 Park square, Boston.

MASSACHUSETTS FISH AND GAME PROTECTIVE ASSOCIATION.

President, George W. Wiggin, Tremont Building, Boston.
Secretary and treasurer, Henry H. Kimball, 5 Park square, Boston.

ROD AND GUN CLUB OF MASSACHUSETTS.

President, C. P. Curtis, Boston.
Secretary and assistant treasurer, W. C. Thairlwall, 45 High street, Boston.

MICHIGAN STATE GAME AND FISH PROTECTIVE LEAGUE.

President, A. L. Lakey, Kalamazoo.
Secretary, C. E. Brewster, Grand Rapids.

NORTH DAKOTA STATE SPORTSMAN'S ASSOCIATION.

President, C. A. Hall, Grand Forks.
Secretary, E. C. Carruth, Grand Forks.

OREGON FISH AND GAME ASSOCIATION.

President, J. N. Teal, Portland.
Secretary, A. E. Gebhardt, Portland.

PENNSYLVANIA STATE SPORTSMEN'S ASSOCIATION.

President, J. O'H. Denny, Ligonier.
Secretary, Will K. Park, 34 South Third street, Philadelphia.

[SOUTH CAROLINA] WESTERN CAROLINA GAME PROTECTION ASSOCIATION.

President, C. F. Dill, Greenville.
Secretary and treasurer, Charles F. Schwing, Greenville.

TEXAS STATE SPORTSMEN'S ASSOCIATION.

President, B. S. Pillow, Austin.
Secretary and treasurer, Fred Petmecky, Austin.

UTAH STATE FISH AND GAME PROTECTIVE ASSOCIATION.

President, T. J. Almy, Salt Lake City.
Secretary, George D. Adler, Salt Lake City.

[VIRGINIA] EASTERN SHORE GAME PROTECTIVE ASSOCIATION.

President, J. W. Bowdoin, Bloxom.
Secretary and treasurer, T. W. Blackstone, Accomac, C. H.

VIRGINIA FIELD SPORTS ASSOCIATION.

President, Polk Miller, Richmond.
Secretary and treasurer, William H. Colquitt, Richmond.

FISH AND GAME PROTECTION CLUB, PROVINCE OF QUEBEC.

President, F. L. Wanklyn, Montreal.
Secretary, Wm. J. Cleghorn, 107 Board of Trade Building, Montreal.

## AUDUBON SOCIETIES.

(Organized for the study and protection of birds.)

California:
- President, Albert K. Smiley, Redlands.
- Secretary, Mrs. George S. Gay, Redlands.

Connecticut:
- President, Mrs. Mabel Osgood Wright, Fairfield.
- Secretary, Mrs. William Brown Glover, Fairfield.

Delaware:
- President, A. R. Spaid, 2311 West Eighteenth street, Wilmington.
- Secretary, Mrs. Florence Bayard Hilles, Delaware place, Wilmington.

District of Columbia:
- President, Gen. George M. Sternberg, U. S. A., Washington.
- Secretary, Mrs. John Dewhurst Patten, 3033 P street, Washington.

Florida:
- President, Rt. Rev. H. B. Whipple, Faribault, Minn.
- Secretary, Mrs. C. F. Dommerich, Maitland, Fla.

Illinois:
- President, Ruthven Deane, 30 Michigan avenue, Chicago.
- Secretary, Miss Mary Drummond, Wheaton.

Indiana:
- President, R. W. McBride.
- Secretary, Amos W. Butler, Statehouse, Indianapolis.

Iowa:
- President, Mrs. James B. Diver, Keokuk.
- Secretary, Mrs. T. L. Wales, Keokuk.

Schaller [Iowa] Audubon Society:
- President, Mrs. T. J. Andre, Schaller.
- Secretary, Miss J. E. Hamand, Schaller.

Maryland:
- President, Wm. C. A. Hammel, State Normal School, Baltimore.
- Secretary, Miss Anne Weston Whitney, 715 St. Paul street, Baltimore.

Massachusetts:
- President, William Brewster, Cambridge.
- Secretary, Miss Harriet E. Richards, Society of Natural History, Boston.

Minnesota:
- President, John W. Taylor, St. Paul.
- Secretary, Mrs. J. P. Elmer, 314 West Third street, St. Paul.

New Hampshire:
- President, Mrs. Arthur E. Clarke.
- Secretary, Mrs. F. W. Batchelder, Manchester.

New Jersey:
- President, Alexander Gilbert.
- Secretary, Miss Anna Haviland, 53 Sandford avenue, Plainfield.

New York:
- President, Morris K. Jesup, New York City.
- Secretary, Miss Emma H. Lockwood, 243 West Seventy-fifth street, New York City.

Ohio:
- President, William Hubbell Fisher, 13 Wiggins Block, Cincinnati.
- Secretary, Mrs. D. Z. McClelland, 5265 Eastern avenue, Cincinnati.

Pennsylvania:
- President, Witmer Stone, Academy Natural Sciences, Philadelphia.
- Secretary, Mrs. Edward Robins, 114 South Twenty-first street, Philadelphia.

Rhode Island:
- President, Prof. H. C. Bumpus, Providence.
- Secretary, Mrs. H. T. Grant, jr., 187 Bowen street, Providence.

South Carolina:
- President, Miss Christie H. Poppenheim, Charleston.
- Secretary, Miss S. A. Smyth, Legare street, Charleston.

Tennessee:
President, P. T. Glass, Ripley.
Secretary, Mrs. C. C. Conner, Ripley.
Texas:
President, Mrs. J. W. Hertford.
Secretary, Miss Cecile Seixas, 2008 Thirty-ninth street, Galveston.
West Virginia (branch of Pennsylvania Society):
President, Witmer Stone, Academy Natural Sciences, Philadelphia, Pa.
Secretary, Elizabeth I. Cummins, 1314 Chapline street, Wheeling.
Wisconsin:
President, Edward A. Birge.
Secretary, Mrs. George W. Peckham, 646 Marshall street, Milwaukee.

## FARMERS' READING COURSES.

Farmers' reading courses constitute one of the most important agents in the diffusion of knowledge among farmers and are rapidly growing in popularity. The idea of these reading courses is to systematize in a few definite lines the general home reading of the farmer, and to make the knowledge thus acquired a permanent mental endowment fund, to be used in making farm life more attractive and more profitable. The work is generally conducted on the Chautauqua plan. The agency having charge of it (usually the agricultural college) lays out certain courses of reading on such subjects as "soils and crops," "feeding and breeding of farm animals," "dairying," "fruit culture," "gardening," "farm economics," "domestic economy," and similar topics; selects sets of books for reading which most clearly set forth the principles underlying these subjects; provides for superintending the work; makes arrangements for supplying prospective readers with books, examination papers, etc.; and acts as a sort of bureau of information.

The method followed in any particular case is simple: A book on a chosen topic is sent to a reader, who is asked to read carefully a certain subject. Printed questions bearing on this subject are then sent to him and full answers, without recourse to the book, requested.

No expense is attached except for books and a small enrollment fee, seldom exceeding for the whole course more than $1 in amount. Sometimes diplomas signed by the college authorities are given upon the completion of a course. A course usually covers about two years' reading. Anyone wishing to take up the work of the reading course has but to apply for membership to the manager of the reading course in his own State, or in another State. Details regarding the courses offered, books required, enrollment fees, etc., will be sent him. Upon subscribing to the rules of the society, he is at once admitted as a member, and can begin reading without delay. No entrance examinations are required. Courses are provided for women and technical courses for special students.

The following is a list of States which have organized reading courses and of the officials in charge of these courses:

| | | |
|---|---|---|
| Connecticut | Prof. A. B. Peebles | Storrs. |
| Michigan | Prof. Clinton D. Smith | Agricultural College. |
| New Hampshire | Prof. C. W. Burkett | Durham. |
| New York | Prof. L. H. Bailey | Ithaca. |
| Pennsylvania | Prof. George C. Watson | State College. |
| South Dakota | Mr. S. A. Cochrane | Brookings. |
| West Virginia | Prof. T. C. Atkeson | Morgantown. |

## FARMERS' NATIONAL CONGRESS.

President, Hon. W. D. Hoard, Fort Atkinson, Wis.; secretary, John Stahl, No. 4328 Langley avenue, Chicago, Ill.

## PATRONS OF HUSBANDRY.

### NATIONAL OFFICERS.

Master, Aaron Jones, South Bend, Ind.; overseer, O. Gardner, Rockland, Me.; lecturer, N. J. Bachelder, Concord, N. H.; treasurer, Mrs. E. S. McDowell, Columbus, Ohio; secretary, John Trimble, No. 514 F street NW., Washington, D. C.; executive committee, E. B. Norris, Sodus, N. Y.; J. J. Woodman, Paw Paw, Mich.; S. H. Messick, Bridgeville, Del.; Aaron Jones, ex officio, South Bend, Ind.

OFFICERS OF STATE GRANGES.

*List of masters and other officers for 1900, so far as reported on April 1.*

| State. | Master. | Post office. | Lecturer. | Post office. | Treasurer. | Post office. | Secretary. | Post office. | Date of meeting. |
|---|---|---|---|---|---|---|---|---|---|
| Alabama | H. Hawkins | Hawkinsville | Rev. A. Daugherty. | Dothen | W. J. Roundtree. | Valegrande | F. Shackelford, jr. | Colquitt | Wednesday after second Monday in July. |
| California | G. W. Worthen | San Jose | John L. Beecher | Stockton | A. D. Logan | 108 Davis street, San Francisco. | Miss L. S. Woodhams. | Santa Clara | First Tuesday in October. |
| Colorado | J. A. Newcomb | Golden | Wm. B. Roberts. | Boulder | W. W. Graves | Goberville | Will T. Wilson. | Niwot | Second Tuesday in January. |
| Connecticut | B. C. Patterson | Torrington | Frank S. Hopson. | Station 3, Bridgeport. | Norman S. Platt. | New Haven | H. E. Loomis | Glastonbury | Do. |
| Dakota *a* | | | | | | | | | |
| Delaware | Arnold Naudain, jr. | Stanton | A. T. Neale | Newark | Thos. H. Riggin. | Laurel | W. W. Seeders | Farmington | Second Tuesday in December. |
| Georgia | T. H. Kimbrough. | Cataula | J. D. Gunnels | Banksville | S. H. Roberts. | Dawson | E. Taylor | Popes Ferry | Do. |
| Illinois | Oliver Wilson | Magnolia | E. H. Clarke | Dunlap | D. Q. Trotter. | Piasa | Thos. Keady. | Dunlap | Do. |
| Indiana | Aaron Jones | South Bend | W. W. Stevens. | Salem | J. W. Holmes. | Cortland | Taylor B. Frazier. | Frankfort | Do. |
| Iowa | A. B. Judson | Silver City | Geo. Van Houden. | Lenox | W. H. Hollister | Manchester | John Turner | Lenox | Second Tuesday in October. |
| Kansas, including Oklahoma. | Henry Rhoades | Gardner | A. P. Reardon | McLouth | Wm. Henry | Olathe | Geo. Black | Olathe | Second Tuesday in December. |
| Kentucky | J. D. Clardy | Newstead | W. G. Myers. | Wingo | J. M. Clark | Hopkinsville. | J. A. Browning. | Church Hill | Do. |
| Maine | Obadiah Gardner | Rockland | Elijah Cook | Vassalboro | M. B. Hunt | Center Belmont. | E. H. Libby | Dirigo | Third Tuesday in December. |
| Maryland | Joseph B. Ager | Hyattsville | J. Enos Ray, sr. | Chillum | Geo. H. Merryman. | Bosley | Wm. B. Sands | Lake Roland | Second Tuesday in December. |
| Massachusetts | W. C. Jewett | Worcester | Geo. W. Ladd | Sturbridge | F. A. Harrington. | Worcester | Wm. N. Howard. | South Easton | Do. |
| Michigan | Geo. B. Horton | Fruitridge | Mrs. Frank Saunders. | Edgerton | E. A. Strong. | Vicksburg | Miss Jennie Buell. | Ann Arbor | Do. |
| Minnesota | Mrs. S. G. Baird | Edina Mills | A. R. Hammargren. | Stark | Mrs. Corolin Schofield. | Bloomington. | Mrs. A. J. Adams. | Box 447, Minneapolis. | Second Tuesday after December 4. |
| Mississippi | S. L. Wilson | Okolona | H. F. Simrall. | Glass | Mrs. Joe Bailey. | Conehatta | T. J. Aby | Fayette | Second Tuesday in December. |
| Missouri | C. O. Raine | Benjamin | E. H. Long | Deerridge | W. E. Harbaugh. | Liberty | R. L. Harbaugh. | Liberty | Second Tuesday in October. |
| Nebraska | J. M. Williams | Culbertson | A. M. Bovee | Vacoma | B. S. Gitchel. | Butler | J. R. Cantlin. | Webster | Second Tuesday in December. |
| New Hampshire | N. J. Bachelder | Concord | Henry H. Metcalf. | Concord | J. D. Roberts. | Salmon Falls. | E. C. Hutchinson. | Milford | Third Tuesday in December. |
| New Jersey | Edmund Braddock. | Medford | George L. Gillingham. | Moorestown. | C. Collins | Moorestown. | M. D. Dickinson. | Woodstown | First Thursday in December. |

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|---|---|---|---|---|---|---|---|---|---|
| New York | Elliot B. Norris | Sodus | F. P. Cole | Ovid | P. A. Welling | Hannibal | W. N. Giles | Skaneateles | First Tuesday in February. |
| North Carolina | W. R. Williams | Falkland | M. B. Pitt | Old Sparta | W. H. Powell | Battleboro | H. T. J. Ludwig. | Mount Pleasant. | Second Tuesday in December. |
| Ohio | S. H. Ellis | Waynesville | S. E. Strode | Westland | W. W. Miller | Columbus | Frank A. Akins. | Sandusky | Do. |
| Oregon, including Idaho. | W. M. Hilleary | Turner | S. H. Hatch | Turner | J. C. White | Crowley | Mrs. Mary S. Howard. | Mulino | Fourth Tuesday in May. |
| Pennsylvania | W. F. Hill | Westford | Wm. Packard | Windfall | S. E. Niven | Landenburg | J. T. Ailman | Thompsontown. | Second Tuesday in December. |
| Rhode Island | Joseph A. Tillinghast. | Kingston | P. H. Wilbur | Little Compton. | B. Martin | E. Providence. | N. T. Reynolds. | E. Greenwich. | Do. |
| South Carolina | W. K. Thompson | Liberty Hill | C. J. Rollins | Bishopville | H. Boykin | Ionia | W. A. James, jr. | Bishopville | First Tuesday in February. |
| Tennessee | W. L. Richardson. | Brownsville | J. M. McCorkle. | White Haven | D. A. Stewart | Brownsville | E. L. Allen | Brownsville | Third Tuesday in August. |
| Texas, including Indian Territory. | R. D. McGee | O'Daniel | J. C. Isbell | McGregor | J. L. Howell | Dublin | J. J. Ray | Dublin | Second Tuesday in August. |
| Vermont | C. J. Bell | E. Hardwick | R. B. Galusha | Jericho | F. B. Pier | Rawsonville | A. A. Priest | Randolph | Second Wednesday in December. |
| Virginia | A. J. Wedderburn. | Washington, D. C. | Thos. F. Rives. | Gunnshill | E. C. Powell | San Marino | T S. Stadden | Wadesville | Second Tuesday in January. |
| Washington | Augustus High | Vancouver | Nicholas Ennis. | La Center | Wm. Smiley | Vancouver | F. C. Briggs | La Center | First Tuesday in June. |
| West Virginia | Prof. T. C. Atkeson. | Morgantown | Jas. George | Ashton | C. T. Perry | Cuba | M. V. Brown | Buffalo | Second Wednesday in January. |
| Wisconsin | H. E. Huxley | Neenah | S. C. Carr | Milton Junction. | George Harwood. | Chippewa Falls. | A. C. Powers | Beloit | Second Tuesday in December. |

*a* Annexed to Minnesota; also Idaho is included with Oregon, Oklahoma with Kansas, and Indian Territory with Texas.

## OFFICIALS CHARGED WITH AGRICULTURAL INTERESTS IN SEVERAL COUNTRIES.

Argentina.—Minister of agriculture. Official address: Su excelencia el ministro de agricultura, ministerio de agricultura, Buenos Aires.

Austria-Hungary.—Minister of agriculture at Vienna and minister of agriculture at Budapest. Official addresses: K. K. Ackerbau-Minister in Wien, and K. Ungarischer Ackerbau-Minister in Budapest.

Belgium.—Baron Maurice van der Brueggen, ministère de l'agriculture, Bruxelles.

Brazil.—Minister of industry, etc. Official address: Ministro da industria, viação e obras publicas, Rio de Janeiro.

Chile.—Minister of industry, etc. Official address: Ministro de industrià y obras públicas, Santiago.

China.—No officer of central government. Provincial officers: His excellency the viceroy of Liang-Kiang, Nan-King. His excellency the viceroy of Hu-Kuang, Wuchang. His excellency the viceroy of Liang-Kwang, Canton.

Costa Rica.—Minister of Public Promotion. Official address: Ministro de fomento, San Jose.

Denmark.—Mr. Alfred Hage, Landbrugsminister, 6 Slotholmsgade, Copenhagen.

France.—Minister of agriculture. Official address: Monsieur le ministre de l'agriculture, No. 78 rue de Varennes, Paris.

Germany.—Count von Posadowsky-Wehner, secretary of the interior, Berlin.

Great Britain.—The Right Honorable Walter Hume Long, M. P., president of the board of agriculture, 4 Whitehall Place, London S. W.

Guatemala.—Minister of public promotion. Official address: Ministro de fomento, Guatemala City.

Haiti.—Secretary of state for agriculture. Official address: Secrétaire d'etat de l'agriculture, Port-au-Prince.

Italy.—Director-general of agriculture, etc. Official address: Direttore generale dell' agricoltura, industria e commercio, Roma.

Japan.—Mr. Arasuke Sone, minister of agriculture and commerce, Tokio.

Korea.—Mr. Ye Ching Kun, Seoul, Korea, minister of agriculture.

Mexico.—Señor Manuel Fernandez Leal, secretario de fomento, City of Mexico.

Nicaragua and Salvador.—Dr. Leopoldo Ramirez Mairena, ministro de fomento, Palace of the Executive, Managua.

Russia —His Excellency A. S. Yermolow, minister of agriculture and State domains, St. Petersburg.

Spain.—Director-general of agriculture, etc. Official address: Director-general de agricultura, industrià y comercio; Ministerio de Fomento, Madrid.

Sweden and Norway.—Count A. Wachtmeister, general direktö and chef för kongl. domänstyrelsen, Stockholm; M. M. Selmer, skogdirektor, Christiania.

Switzerland.—M. le conseiller fédéral, Dr. Adolphe Deucher, chef du departement fédéral du commerce, de l'industrie, et de l'agriculture, Palais Fédéral, Berne.

Turkey.—Selim Melhamé Pasha, Constantinople, minister of agriculture.

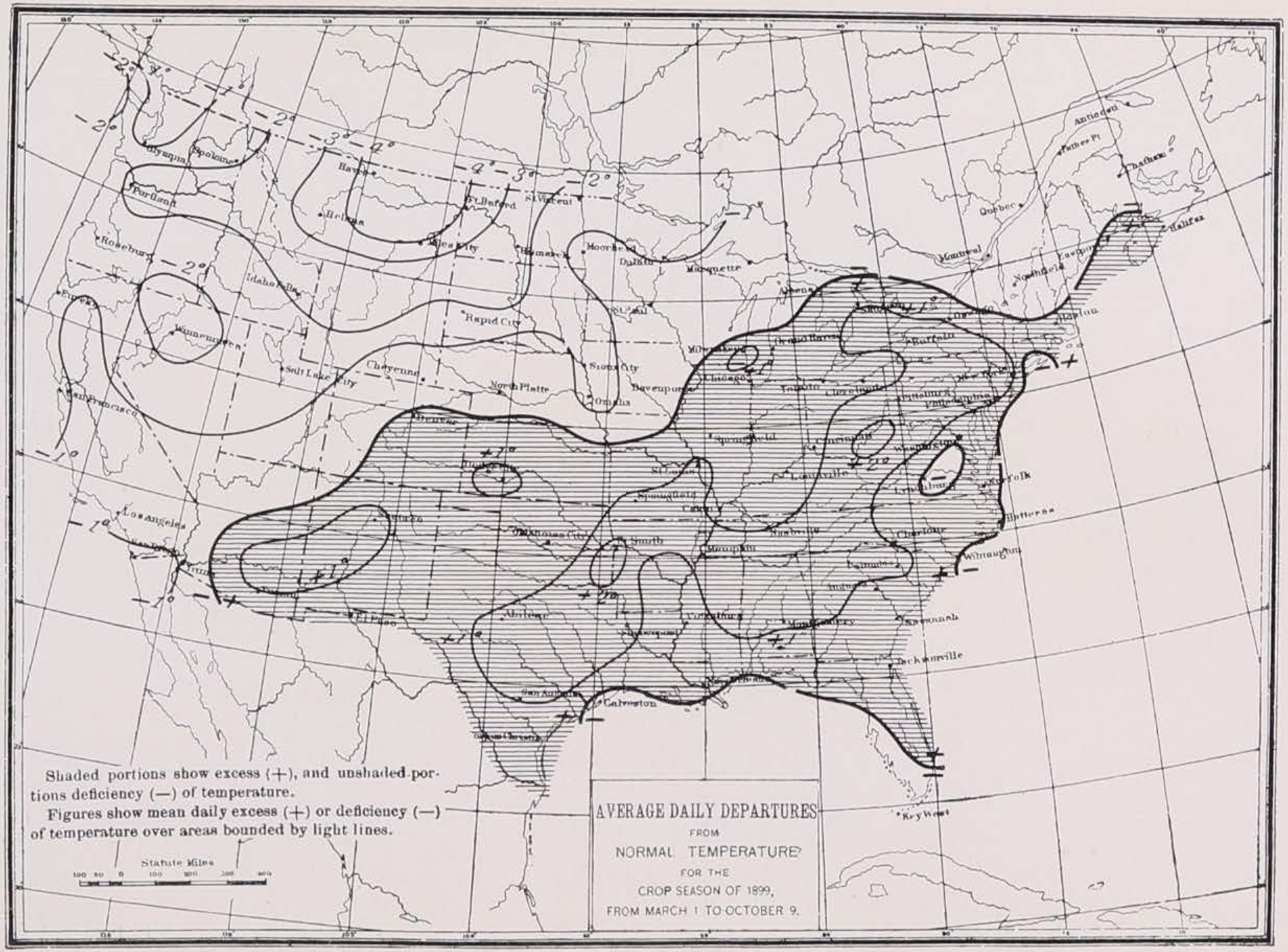
Venezuela.—Mr. Federico Fortique, dirección de agricultura y cria, Caracas.

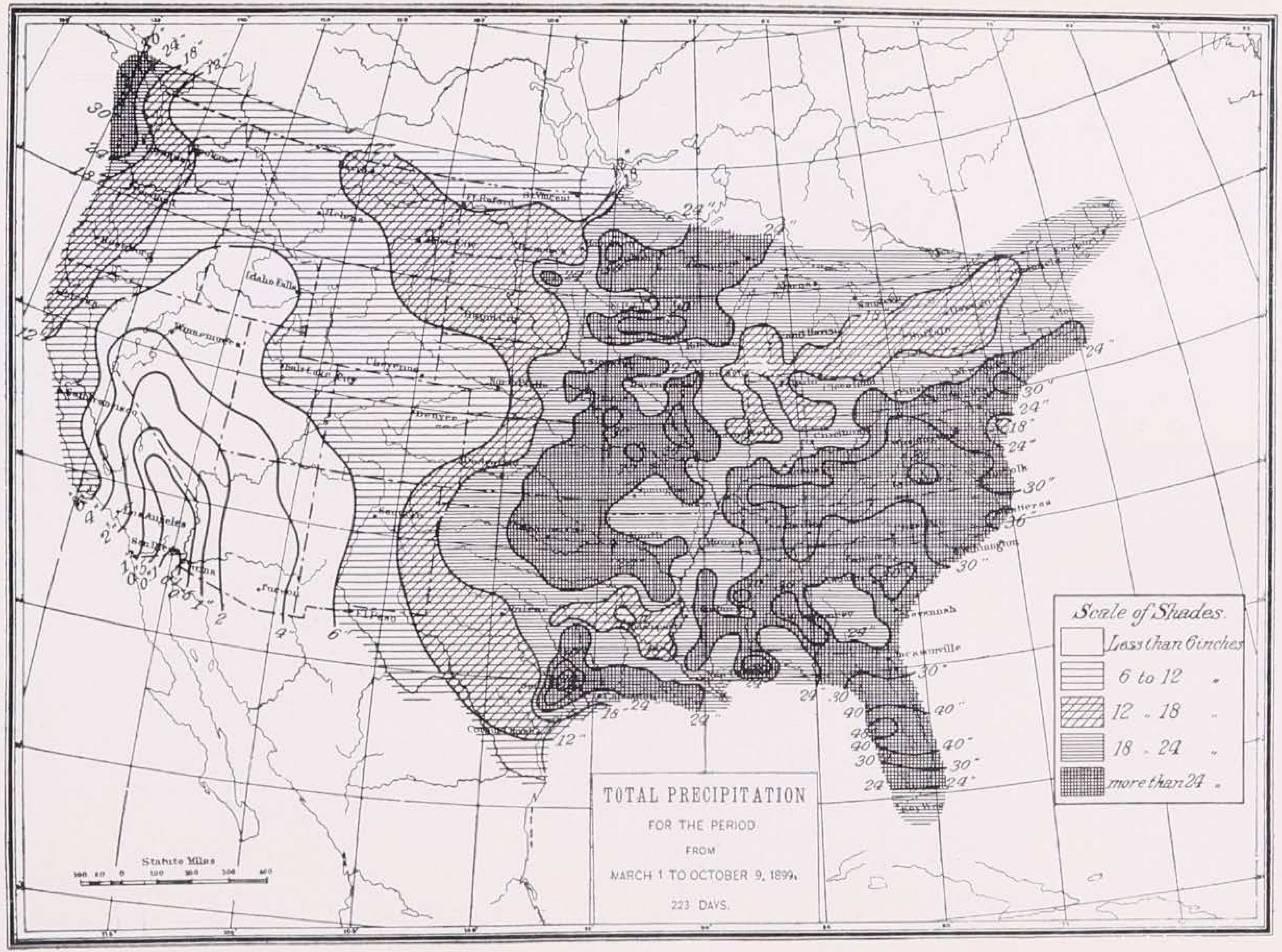
## REVIEW OF WEATHER AND CROP CONDITIONS, SEASON OF 1899.

The accompanying tables and diagrams (see figs. 32 and 33 [pp. 722, 723] and Plates LXI-LXIII) show how the temperature and rainfall over the United States during the crop season of 1899 varied from week to week from normal conditions of corresponding periods of former years. The large tables show departures from normal temperature and precipitation (in degrees Fahrenheit and in inches and hundredths, respectively) for Weather Bureau stations, by months from January 1 to March 1, and by weeks ending Mondays at 8 a. m., seventy-fifth meridian time, from April 10 to October 9. The diagrams exhibit by curves the departures from normal, by districts, for the same period, and the three plates show, respectively, the departures from normal temperature and the total precipitation for the United States during the crop season and the departures from normal precipitation.

### CONDITIONS FROM JANUARY TO APRIL.

In the Gulf States and interior portions of the Middle and South Atlantic States and over the southeastern Rocky Mountain slope, January was rather colder than the average, but the month was much milder than usual throughout the Ohio, Upper Mississippi, and Missouri valleys, northern and central Rocky Mountain region, and on the Pacific coast, the average temperature excess ranging from 6° to 9° per day from the central plateau region eastward to the Upper Missouri


Shaded portions show excess (+), and unshaded portions deficiency (—) of temperature.
Figures show mean daily excess (+) or deficiency (—) of temperature over areas bounded by light lines.
Statute Miles
AVERAGE DAILY DEPARTURES
FROM
NORMAL TEMPERATURE
FOR THE
CROP SEASON OF 1899,
FROM MARCH 1 TO OCTOBER 9.
Portland
Spokane
Helena
Roseburg
Idaho Falls
Eureka
Winnemucca
Salt Lake City
Cheyenne
Denver
San Francisco
Los Angeles
El Paso
Rapid City
North Platte
Omaha
Sioux City
St. Paul
Duluth
Moorhead
Marquette
Milwaukee
Chicago
Davenport
Springfield
St. Louis
Louisville
Cincinnati
Cleveland
Toledo
Buffalo
Pittsburg
New York
Boston
Montreal
Quebec
Halifax
Norfolk
Hatteras
Charlotte
Wilmington
Savannah
Jacksonville
Key West
Montgomery
Memphis
Nashville
Abilene
San Antonio
Galveston
Corpus Christi
New Orleans



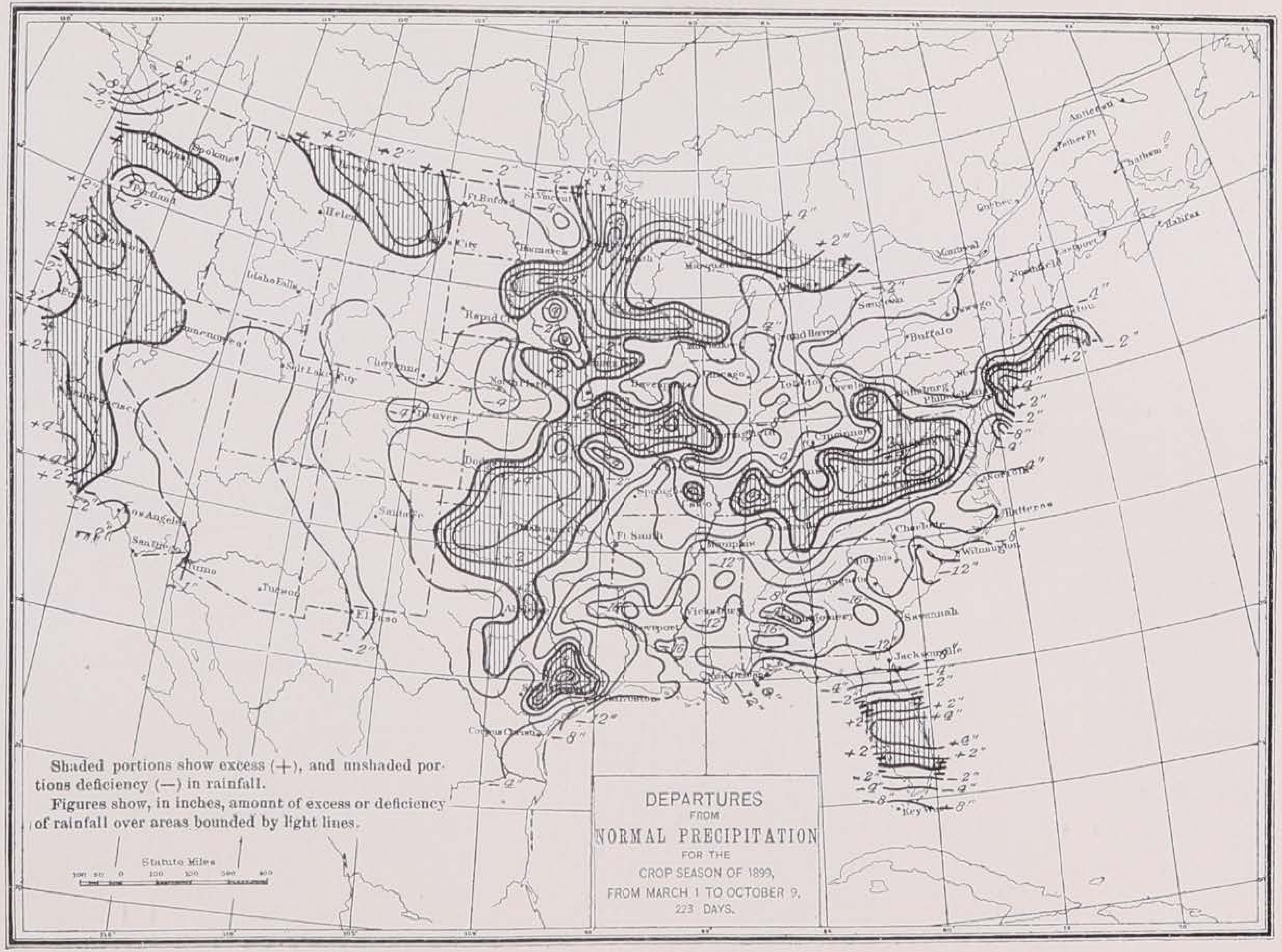

TOTAL PRECIPITATION

FOR THE PERIOD

FROM

MARCH 1 TO OCTOBER 9, 1899.

223 DAYS.




Shaded portions show excess (+), and unshaded portions deficiency (—) in rainfall.

Figures show, in inches, amount of excess or deficiency of rainfall over areas bounded by light lines.

DEPARTURES FROM NORMAL PRECIPITATION FOR THE CROP SEASON OF 1899, FROM MARCH 1 TO OCTOBER 9. 223 DAYS.

Valley. There was much rain in the Southern States, particularly in the region from the west Gulf coast northeastward over Louisiana and portions of Mississippi, Tennessee, and Arkansas, where amounts ranging from 6 to more than 10 inches were reported. Throughout the Rocky Mountain districts, Upper Mississippi, and Missouri valleys, Lake region, and northern New England there was less than the usual precipitation, portions of Kansas, Nebraska, Iowa, and Missouri receiving less than .25 inch. Notwithstanding the fact that comparatively little protection was afforded winter wheat by snow covering, its general condition at the close of the month was promising. The crop was, however, subjected to a period of extreme cold in the latter part of January in the central valleys.

Except over portions of the middle Pacific coast region, where there was a slight excess in temperature, February was an exceptionally cold month throughout the United States. From the middle Atlantic coast westward to the eastern Rocky Mountain slope, and from the Gulf northward to the lake region, the average daily temperature deficiency generally ranged from 8° to 14°. There was much more than the average precipitation in the Atlantic coast districts south of New England, over portions of the central Rocky Mountain region, the greater part of Oregon, and along the immediate coast of Washington, while generally throughout the central valleys and lake region and from the central Gulf States westward to the south Pacific coast there was less than the usual amount, the month being exceptionally dry over nearly the whole of California, and thence eastward to Oklahoma and western Texas. During February the wheat crop experienced very unfavorable temperature conditions over a large part of the winter-wheat area, zero temperatures extending as far southward as central Texas and nearly to the eastern Gulf coast.

March averaged warmer than usual in the Gulf and Atlantic coast districts, but was very cold throughout the central valleys, Lake region, Rocky Mountain regions, and on the Pacific coast, the average daily deficiency in temperature from the Upper Mississippi Valley westward to Idaho ranging from 6° to more than 20°. Over the northern portions of Alabama, Georgia, and eastern Tennessee the precipitation was exceptionally heavy, and more than the average amount fell over the greater part of the Pacific coast, northern and central Rocky Mountain districts, and from the Upper Mississippi Valley eastward to the Atlantic coast. The month was drier than the average over the greater part of the Gulf States and in portions of the Missouri and Red River of the North valleys and on the north Pacific coast. At the close of the month the general condition of winter wheat was less favorable than at the end of February, except in Oregon and California, where the condition of the crop was promising. Preparations for cotton planting were well advanced in Texas, some having been planted in the southern part of that State, and in portions of Georgia and South Carolina. Corn planting had made some progress as far north as Tennessee, and in the more southerly sections a large part of the crop had been planted. The seeding of spring oats was in progress as far north as the Missouri and Ohio valleys.

## SUMMARY OF THE SEASON BY WEEKS.

By weeks ending with Monday, from April 10 to September 25, the crop conditions may be summarized as follows:

*April 10.*—At this date the season was unusually late in all districts east of the Rocky Mountains, except over southern and western Texas. The ground was frozen to a considerable depth in the States of the Upper Missouri valley, frost being still in the ground as far south as northern Missouri, with considerable snow over portions of the upper Lake region and New England. From the middle Rocky Mountain slope eastward to the Atlantic coast the season was variously estimated to be from two to four weeks late, and as a result farming operations were much delayed. Some corn had been planted as far north as Tennessee and in the extreme southern portions of Missouri and Kansas, planting being nearly completed in Louisiana and Texas. Much cotton was planted in southern Texas, and some in northern Texas, but in the central and eastern portions of the cotton belt but little had been planted. The general condition of winter wheat continued unpromising in the principal wheat-producing States of the central valleys, but in California and Oregon the condition of this crop was very favorable. In Washington much wheat was winter-killed.

*April 17.*—The general weather conditions of this week were exceptionally favorable for farming operations and crops throughout the country, with the exception of the extreme north Pacific coast region, where the week was cold and wet, and over Arizona and the southern portions of California and Utah, where drought prevailed. Frost was leaving the ground rapidly in the States of the Upper Mississippi and Upper Missouri valleys, and considerable progress was made with

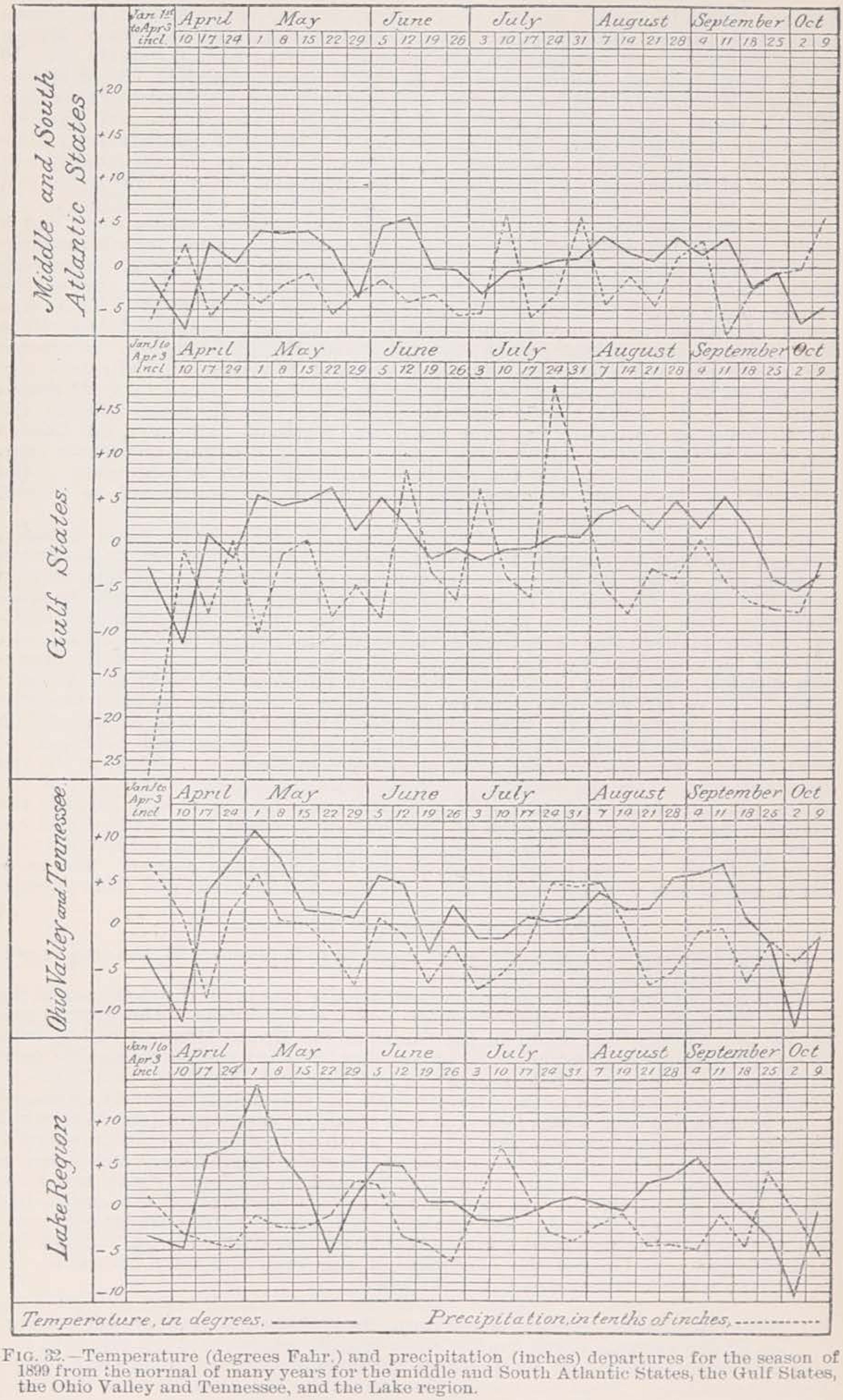



FIG. 32.—Temperature (degrees Fahr.) and precipitation (inches) departures for the season of 1899 from the normal of many years for the middle and South Atlantic States, the Gulf States, the Ohio Valley and Tennessee, and the Lake region.

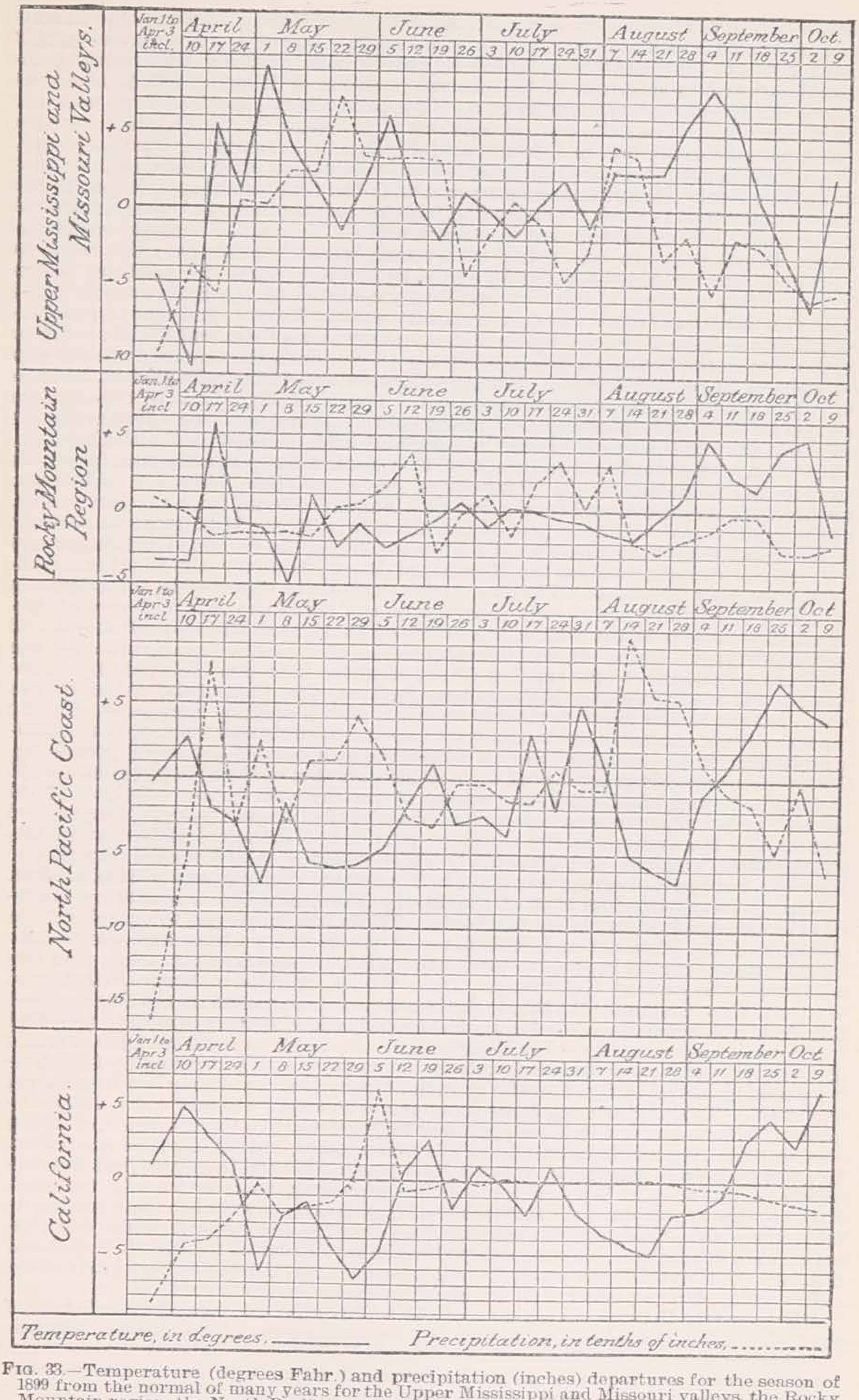



FIG. 33.—Temperature (degrees Fahr.) and precipitation (inches) departures for the season of 1899 from the normal of many years for the Upper Mississippi and Missouri valleys, the Rocky Mountain region, the North Pacific coast, and California.

farm work in the more southerly portions of these sections. Light to heavy frosts occurred as far south as northern Georgia, causing some injury to corn and garden truck. In the Gulf States, including Arkansas, corn planting was nearly completed and was in progress in the central portions of Missouri and Kansas, but east of the Mississippi practically no corn has been planted north of Tennessee and North Carolina. Over the central portions of the Gulf States the stand of corn was generally good, but in Georgia and Texas much replanting was necessary. The reports generally showed a decided improvement in winter wheat in the States east of the Rocky Mountains as compared with the unfavorable conditions at the close of the previous week. On the Pacific coast the condition of wheat continued unfavorable in Washington, but in Oregon and California the outlook was promising. Rapid progress was made with spring-wheat seeding over the southern portion of the spring-wheat region and a little was sown as far north as North Dakota. Oat seeding which was previously confined to the States south of the Ohio and Missouri rivers was now well advanced in Illinois, and was in progress in Indiana and the Middle Atlantic States, a general improvement in the condition of the crop in the Southern States being reported. Over the central and southern portions of the cotton belt the planting of cotton was vigorously pushed, and the early planted was coming up over the southern portions of the east Gulf States. In southern Texas cotton planting was nearly completed and was well advanced in the northern part of the State. Some tobacco had been planted in South Carolina.

*April 24.*—The weather conditions of this week were generally less favorable than in the preceding week. Portions of eastern Kansas, Missouri, Oklahoma, and western Arkansas, and local areas in Alabama suffered from excessive rains, while light rains would have proved beneficial in southern Michigan and portions of the Upper Ohio Valley and Middle Atlantic States. In the west Gulf States and generally to the eastward of the Mississippi River, however, the weather conditions were very favorable. Further improvement was reported in the condition of winter wheat, although it was apparent that much of the crop had been winter-killed, especially over the northern portions of Missouri, Illinois, and Indiana, and in northwestern Ohio. Spring-wheat seeding was nearly completed over the southern portions of the spring-wheat region, but was delayed by unfavorable soil conditions over the northern portion. The bulk of the oat crop was sown, except in the more northerly sections, where seeding continued. In the central valleys the early sown oats were coming up well and the crop was beginning to head in the Southern States, where the outlook was generally promising. Cotton planting was general over the northern portion of the cotton region, except in Oklahoma and northern Texas, where it was delayed by wet weather. West of the Mississippi, corn was being planted as far north as southern Nebraska, and east of the Mississippi, in the southern portions of Illinois, Indiana, and Ohio, and in West Virginia and Maryland. Wet weather retarded corn planting in Missouri, but rapid progress was made in Tennessee, Virginia, and North Carolina.

*May 1.*—In the districts east of the Rocky Mountains the temperature conditions of this week were highly favorable. There was, however, too much rain in portions of the Missouri and Red River of the North valleys; and destructive local storms occurred in portions of Kansas, Missouri, and Georgia, while rain was needed in the central Gulf States, Ohio Valley, Middle Atlantic States, and southern New England. In the Rocky Mountain districts and on the Pacific coast the week was unfavorable owing to unseasonably low temperatures and frequent frosts, which were more or less destructive. In the States of the Ohio, Central Mississippi, and Lower Missouri valleys the weather was exceptionally favorable for planting, germination, and the growth of corn, and rapid progress in planting was made. In the Southern States corn made good growth and was being cultivated. Where not winterkilled, general improvement in the condition of wheat was reported, especially in the Ohio Valley, Tennessee, and Middle Atlantic States. In California and Oregon the outlook for wheat continued favorable, but the condition of the crop in Washington was less promising than previously reported. In the southern portion of the spring-wheat region early sown wheat was coming up to good stands. Seeding was about finished over the southern portions of Minnesota and North Dakota, but was delayed in the Red River of the North Valley and Oregon. Cotton made favorable growth over the central and southern parts of the cotton belt, planting being well advanced over the northern part.

*May 8.*—Over the eastern portions of the country the temperature conditions of this week were favorable, but it was too dry in portions of the Middle Atlantic and Gulf States. In the Rocky Mountain and Pacific coast districts the week was much too cool, and frosts in the Rocky Mountain region were destructive to fruit. In the Middle Atlantic States, and generally in the central valleys, excellent progress was made with corn planting, which was in progress as far north as

New York, Michigan, and South Dakota. Early corn was being cultivated in North Carolina, Tennessee, and the southern portions of Missouri and Kansas. The general condition of winter wheat continued to improve, the outlook in California being very promising. This week marked the completion of oat seeding in the more northerly sections and, with the exception of the west Gulf States, where the crop was suffering for rain, the outlook was generally promising. Early planted cotton made favorable progress over the southern and central portions of the cotton belt, but the crop was suffering for rain in portions of South Carolina, Florida, and Louisiana. In northern Texas considerable replanting was made necessary by reason of heavy washing rains. Tobacco plants were scarce in some sections of Virginia and Maryland, but were abundant in other portions of the Middle Atlantic States and in the Ohio Valley.

*May 15.*—The most unfavorable features of this week were the unseasonably low temperatures on the North Pacific coast, the continued absence of rain over the greater part of the Gulf States, and excessive rains in the Ohio and Mississippi valleys. Except on the North Pacific coast, however, the temperature conditions were decidedly favorable and crops generally made good growth except in portions of the Gulf States where drought prevailed. While frosts were frequent in portions of the lake region, Upper Mississippi, and Upper Missouri valleys, no serious damage resulted. Heavy rains delayed corn planting in Missouri, Iowa, Illinois, and Indiana; but elsewhere over the northern portions of the country planting progressed favorably, and about half the intended acreage was planted in Illinois and Ohio. Winter wheat made rapid growth in the States of the central valleys. In Washington an improved condition was reported; but in California dry northerly winds proved injurious in some sections. Spring-wheat seeding was still unfinished in Minnesota and North Dakota, but over the southern portions of the spring-wheat region the crop made good growth and was stooling well. Oats were injured by frosts in South Dakota but generally made rapid growth, except where suffering from drought in the central Gulf States, South Carolina, and Nebraska. The oat harvest began this week in Florida. In the Carolinas and Georgia cotton made favorable progress, but in the central portion of the cotton belt it suffered from insects and drought. Replanting of cotton continued in the washed-out regions of northwest Texas, the bulk of the crop in that State being up to good stands and growing rapidly, but was badly in need of cultivation in the northern and central portions. Some tobacco was planted in Kentucky, Ohio, and Virginia, but farther north no planting had been done.

*May 22.*—In the Pacific coast and Rocky Mountain regions and in the northern districts east of the Missouri Valley this week was unseasonably cool and unfavorable for germination and growth, and while there was ample warmth in the Southern States the continued absence of rain over a large part of that section proved very unfavorable. Too much rain in western Kentucky and portions of Missouri and Arkansas retarded the cultivation of crops in those States. Winter wheat sustained considerable damage from insects in the central valleys and Middle Atlantic States, and the general condition of the crop in the States east of the Rocky Mountains was less encouraging than in the previous week; the crop was also unfavorably affected by cool weather on the North Pacific coast. In the central portions of the cotton belt insects caused serious damage to cotton, which, over the southern portions of the Gulf States and in Florida, was suffering seriously for rain. In Texas the weather was especially favorable for clearing the crop of grass and weeds.

*May 29.*—In the Middle and South Atlantic States this week was much too cool, but elsewhere east of the Rocky Mountains the temperature conditions were very favorable. In the Gulf States the protracted drought was largely relieved by ample moisture, and portions of Wisconsin, Illinois, Iowa, Missouri, and Arkansas suffered from excessive rains. The weather continued unseasonably cool on the North Pacific coast where excessive moisture continued to retard farming operations. In Washington, however, this week was the most favorable of the season to date. Corn was generally reported backward and made slow growth from the Missouri and Central Mississippi valleys eastward to the Middle Atlantic coast, but in Kansas and in the east Gulf States it made decided advancement. The general condition of winter wheat in the States of the Ohio, Central Mississippi, and Lower Missouri valleys was probably less favorable than in the previous week, the crop having suffered considerable damage from rust and insects. Some improvement, however, was reported in Nebraska, Iowa, Pennsylvania, New York, and in portions of Oklahoma and Arkansas. Harvesting began this week in some of the Southern States. The week was highly favorable for spring wheat in the Dakotas and Minnesota, and the crop did well in Nebraska and Iowa. Cotton improved over the eastern portion of the cotton belt except in the Carolinas, where it was too cool, but made slow growth in portions of Louisiana and Mississippi, where it suffered from drought. In Texas cotton grew rapidly and was well cultivated, except in some localities in the northern portion of the State. For lack of rain tobacco setting was not general, but much ground was prepared.

*June 5.*—From the Rocky Mountains eastward very favorable temperature conditions were experienced; but on the Pacific coast the season continued very backward and unseasonably low temperature prevailed. In the principal corn States the weather was more favorable for this staple than in the preceding week, although cultivation was extensively retarded as a result of general rains in the Missouri, Central Mississippi, and Ohio valleys, planting being delayed in portions of Illinois, Iowa, and North Dakota. Over the greater part of the Southern States corn was suffering for rain, but in Nebraska, Kansas, Oklahoma, Kentucky, and Tennessee and over the greater part of the Middle Atlantic States its condition was generally promising. The harvesting of winter wheat was quite general in the Southern States, some having been cut as far north as Tennessee and Arkansas. Reports indicated no improvement in this crop in Missouri, but as a rule the reports from the Ohio Valley and Middle Atlantic States were favorable. In the Dakotas, Minnesota, and Iowa, spring wheat made rapid growth and was in promising condition. In the Carolinas and Georgia the condition of cotton was, as a whole, satifactory; but in the central portion of the cotton belt rain was greatly needed, especially for germination, and, while the crop was generally doing well in Texas, the southern portions of the State needed rain also. With rains in the Ohio Valley, Maryland, and Virginia, transplanting tobacco was rapidly pushed.

*June 12.*—The rains of this week largely relieved the drought in the Southern States, although portions of northern Louisana and eastern Texas continued to suffer. There was too much rain in Kansas, over the southern portions of Missouri, Illinois, and Indiana, and portions of the upper lake region and Minnesota. Unseasonably cool weather continued on the north Pacific coast and in the northern Rocky Mountain districts. In the central valleys corn made good growth and its condition generally improved, but cultivation was much retarded. In portions of the Southern States corn suffered for rain, especially in Georgia, Florida, and southern Texas. Winter wheat harvest was now in progress as far north as the Ohio and central Mississippi valleys and about finished in the east Gulf and South Atlantic States. On the north Pacific coast wheat made rapid growth under the most favorable conditions that had been experienced to date, and although the wheat crop in California was subjected to excessively high temperatures, it escaped injury, owing to the absence of high winds. The reports respecting spring wheat were less favorable than in the preceding week, as the result of excessive moisture, especially on the lowlands of Minnesota and North Dakota; on uplands in these States, however, it made luxuriant growth, and lodging was threatened in portions of Minnesota. Oat harvest was nearly completed this week in the Southern States, and over the northern sections the general condition of the crop was more promising, although damage from rust and too rank growth was reported from portions of the Mississippi Valley. Cotton improved in the Carolinas, Georgia, Alabama, Mississippi, and Tennessee, although the stands in Tennessee and Alabama were reported as poor; in Texas it was well cultivated and made good growth. Rapid progress continued in transplanting tobacco in the Ohio Valley and Middle Atlantic States; in Florida and portions of Tennessee and the Carolinas the crop suffered from drought. Haying was in general progress in the central valleys, Middle Atlantic States, Oregon, and California.

*June 19.*—On the Pacific coast this was the best week of the season to date, affording ample warmth and sunshine, conditions much needed in Oregon and Washington. While heavy rains delayed cultivation and caused damage to crops in portions of the Mississippi and Missouri valleys, and drought continued over portions of New England, the Middle Atlantic States, Tennessee, and the central and southern Rocky Mountain region, the week, as a whole, was favorable for crop growth. Corn made good progress in all districts, and a part of the crop received its final cultivation as far north as Missouri and southern Illinois. Winter wheat harvest was interrupted by rains in portions of the central Mississippi and Lower Ohio valleys. Damage from rust was reported from Michigan and Pennsylvania, and from drought in New York, while grain in shock sustained injury in portions of Texas. Heavy rains in Minnesota caused injury to spring wheat in that State and also in Iowa, but elsewhere a general improvement in the condition of the crop was reported. The reports from nearly all sections of the cotton belt indicated a general improvement in cotton, but in portions of eastern Texas, Arkansas, and Oklahoma, it needed cultivation.

*June 26.*—Over much the greater part of the country the weather conditions of this week were highly favorable, particularly in the Middle Atlantic States and central valleys and on the north Pacific coast. Local storms, however, caused damage in portions of the lake region and upper Ohio Valley, while drought continued in portions of New England, the South Atlantic and Gulf States, and in central Tennessee. Corn made marked progress in the principal corn States, and in those States where cultivation had been retarded the fields were cleaned. A considerable part of the crop had received its final cultivation in Kansas, Missouri, Illinois, and Indiana. Winter-wheat harvest continued under favorable weather conditions, and was in progress in the more northerly sections of the winter-wheat region. A large crop of excellent quality was being harvested in California, and, in Oregon and Washington, wheat made rapid advancement. The outlook for spring wheat continued promising, with less danger from rank growth and lodging. Except over portions of southern Texas, Louisiana, and Mississippi cotton made favorable progress, and as a whole was well cultivated.

*July 3.*—This was a cool week on the north Pacific coast and over most of the country east of the Rocky Mountains. As in the previous week corn made favorable progress in the principal corn States, although suffering for rain in Missouri. The harvesting of late winter wheat continued under favorable weather conditions in the more northerly sections and in California. Spring wheat continued promising and the crop was heading in the southern portions of the spring-wheat region. Cool nights retarded the growth of cotton to some extent over the eastern part of the cotton belt, while in portions of the Carolinas, Tennessee, and Arkansas it was suffering for rain, but the crop generally made good growth. The heavy rains in Texas, however, inundated a large acreage. Tobacco suffered from drought and insects in Kentucky and Tennessee, but the reports from the other tobacco States were generally favorable. The most noteworthy feature of the weather of this week was the phenomenally heavy rains which fell on June 28 and 29 over the drainage basin of the Brazos River in the central portion of Texas, and which were followed by heavy rains for four or five days in succession. On June 29 all the tributaries of the Brazos River from McClennan County south to Brazos County were higher than ever before. This water with that of succeeding rains caused a flood in the Brazos which covered all low lands from 2 to 12 feet deep. It is said that in places the river was more than 12 miles wide. The flood moved southward very slowly, and it was fourteen days from the time the crest of the flood was noted in central Texas until it passed out into the Gulf of Mexico.

*July 10.*—This week was marked by absence of high temperatures in the districts east of the Rocky Mountains, in which the weather conditions were generally favorable for farming operations and crop growth, especially in the States of the Upper Mississippi and Missouri valleys and on the Atlantic coast. Excessive rains, however, caused some damage to grain in shock in Kansas and Texas, while drought continued in the Gulf States, Tennessee, and portions of the Ohio Valley. Rainfalls amounting to from 0.50 to 0.75 inch occurred over a considerable portion of the drainage basin of the Brazos River, but the conditions on the whole were favorable for the subsidence of the waters in the inundated districts. Generally, corn made rapid growth in the principal corn States, but suffered from drought in portions of Ohio, Kentucky, and central Tennessee. This week marked the completion of the winter-wheat harvest, except in the extreme northerly sections, where it was well advanced. In Kansas and Texas some damage resulted from sprouting in shock. In the eastern and central portions of the cotton belt and outside the flooded region in Texas cotton made good progress, the sea island crop in South Carolina being very promising. Tobacco suffered much from drought in Tennessee and in portions of Kentucky and Ohio, but in the Carolinas, Middle Atlantic States, and New England the general outlook was much improved.

*July 17.*—The absence of rain over a large part of the Gulf and South Atlantic States in this week intensified the previously existing drought conditions in that section, more particularly over the interior portions of the central and east Gulf States, middle Tennessee and the western portions of the Carolinas, while excessive and continuous rains in central Wisconsin proved unfavorable. The eastern portions of Oregon and Washington experienced high temperatures with drying winds that were detrimental to the grain crops of those States. Over a large part of Texas, including the greater part of the inundated region, there was an almost total absence of rain, but the bottom lands of the Brazos basin were not yet dry enough for cultivation. The weather conditions of this week were favorable for the growth and development of crops and for general farming operations in the central valleys, New England, Middle Atlantic States, and generally throughout the central and southern plateau region and in southern California. Corn suffered from drought in the South Atlantic, central and east Gulf States, central Tennessee, southern Missouri and in portions of Kentucky and Virginia, but in the Middle Atlantic States and generally throughout the central valleys the week was very favorable for corn, which made excellent growth in these districts. The harvesting of spring wheat began in Iowa, the reports respecting this crop being generally favorable throughout the greater part of the spring wheat region. The general condition of cotton in the eastern portion of the cotton belt was less favorable than in the preceding week, due principally to the continuation of drought, but in part to the ravages of insects. The crop in Missouri, Arkansas, Mississippi, Oklahoma, and Texas, except in the flooded region, however, generally improved. The first picking of the season was reported this week from southern Texas. In Kentucky the tobacco crop was greatly improved and the outlook continued promising in the Middle Atlantic States, New England, and portions of Ohio and Indiana.

*July 24.*—Much-needed rains fell this week in Tennessee and in the central and east Gulf States, although portions of Mississippi continued to suffer. Rain was also needed in southern Texas, Nebraska, the Dakotas, portions of Illinois, Indiana, the Middle Atlantic States, and New England, but upon the whole the general weather conditions were favorable for crops in the States of the central valleys and Lake Region, and on the middle Atlantic coast. Crops experienced a marked improvement in the middle Rocky Mountain States. Over the greater part of the central and western portions of the cotton belt, the condition of cotton was somewhat more favorable than at the close of the previous week, the crop being well cultivated; but over the eastern portion shedding was reported, with complaints of drought in portions of the Carolinas. Rains caused marked improvement in tobacco in Kentucky and Tennessee, and the general condition of the crop in the Ohio Valley, Middle Atlantic States, and New England was very promising, except in portions of Pennsylvania and Virginia.

*July 31.*—The drought was relieved this week in the South Atlantic and east Gulf States, and beneficial rains fell in Ohio and Indiana; but rain was needed in portions of New York and Pennsylvania, the central portions of Illinois and Missouri, and in Louisiana, Arkansas, the Dakotas, western Nebraska, and central Colorado. Local storms with very heavy rains proved damaging in Alabama, western Florida, and southern New Jersey; but, notwithstanding these conditions, the week may be said to have been generally favorable. While corn would have been benefited by rains in central Illinois and portions of Missouri, Iowa, Nebraska, and South Dakota, the crop made satisfactory progress in the principal corn States, the outlook in Kansas being considered the best in years. At this date early corn was matured as far north as Missouri and southern Illinois. High winds, with temperatures exceeding 100° in South Dakota, caused injury to spring wheat, and, while the heat in North Dakota was not so excessive, the crop was more or less damaged in that State. Over the eastern portion of the spring-wheat region the crop was more promising. Spring wheat also sustained some injury from hot winds in Oregon and portions of Washington. While rains improved the condition of cotton in the Carolinas, the excessively heavy rains in North Carolina proved injurious. Good growth was, however, generally reported, especially in the eastern sections of the cotton belt, although complaints of shedding were numerous. Picking was well advanced in portions of southern Texas. Tobacco suffered from drought in New York and on low lands in Tennessee by heavy rains, but elsewhere the crop experienced marked improvement, especially in the States of the Ohio Valley. Considerable progress was made with plowing for fall seeding in the central valleys and Middle Atlantic States.

*August 7.*—As a whole, crops generally made satisfactory advancement this week in the States of the central valleys, as well as over the greater part of the Atlantic coast and east Gulf States, Lake region, central and southern Rocky Mountain regions, and on the Pacific coast. Drought prevailed, however, over the greater part of Texas and Oklahoma, and in portions of the Dakotas, Minnesota, Wisconsin, New York, New England, Pennsylvania, Virginia, and the Carolinas, while excessive rains delayed work in southern Minnesota and upper Michigan, and local hailstorms proved destructive in portions of the Middle Atlantic States. The general condition of corn was further improved, an abundant crop being promised in the great corn States of the central valleys, as well as in the Middle Atlantic States. The spring-wheat harvest was interrupted by rains in southern Minnesota, and thrashing retarded in Nebraska and Iowa. Severe hailstorms caused much injury to spring wheat in northeastern North Dakota. In Washington and Oregon good harvesting weather prevailed. While rust and shedding in cotton were quite generally reported, the condition of the crop over the central and eastern portion of the cotton belt was somewhat improved. In portions of Louisiana and Arkansas and over the greater part of Texas, rain was badly needed and the condition of cotton less promising than at the close of the previous week. Picking was now in progress in central Texas and over the southern portions of the central and eastern districts, first bales having been marketed in Alabama and South Carolina. In the principal tobacco States the weather conditions were highly favorable for tobacco, which was reported as much improved in Kentucky, Tennessee, and North Carolina. The soil was in fine condition for plowing for fall seeding in the central valleys and Middle Atlantic States.

*August 14.*—Very favorable weather prevailed during this week in the Ohio Valley, and generally in the Middle and South Atlantic and east Gulf States, throughout the central and southern Rocky Mountain districts and on the Pacific coast, while drought prevailed in the lower Lake region, southern New England, and portions of the central and west Gulf States. The lower Missouri, Red River of the North, and central Mississippi valleys suffered from excessive rains, and in Wisconsin, Minnesota, and North Dakota destructive hailstorms occurred. Rainfalls of from 0.50 to more than 1 inch, remarkable for the season, occurred in Washington and Oregon, and, although retarding harvesting in Oregon and causing some damage to oats in Washington, were generally beneficial. This was another very favorable week for corn. Except over southern Missouri, central Kansas, and in central and western Nebraska, where it needed rain, the crop generally made further advancement. Stacking and thrashing of spring wheat was generally delayed by rains, and violent hailstorms in the Red River Valley caused the loss of about 50 per cent of the expected yield of 50,000 acres in Minnesota, while high winds lodged and shelled considerable ripe grain in North Dakota. In nearly all sections cotton opened rapidly, and picking was in general progress. While complaints of shedding continued, they were somewhat less numerous than in the previous week over the eastern half of the cotton belt. Rust was, however, prevalent and increasing in the central and eastern districts. In the north-central and western portions of the cotton belt the condition of cotton was decidedly less promising than at the close of the previous week. The condition of tobacco continued favorable except some damage from storms in New York, from too much rain in southern Indiana, and from drought in Pennsylvania. Cutting was now in progress in the Ohio Valley and middle Atlantic States. Plowing for fall seeding was exceptionally well advanced.

*August 21.*—While there was an entire absence of rain over a large part of the country east of the Rocky Mountains, very heavy rains fell in the Red River of the North Valley, on the Virginia and North Carolina coasts, and over portions of the central Gulf States. In the Pacific coast States the week was too cool, and rains in Washington and Oregon interrupted harvest. In the principal corn States favorable temperature conditions and general absence of rain advanced the maturity of corn, the general condition of which was very satisfactory, although late corn needed rain in portions of the Ohio and upper Mississippi valleys, in Oklahoma, and parts of Nebraska and Kansas, cutting being general in the last-named State. Spring-wheat harvesting was delayed in the Dakotas and Minnesota by heavy rains, which caused injury to stacked grain in Minnesota. Over the central and eastern portions of the cotton belt the condition of cotton continued practically as at the close of the preceding week, rust and shedding being prevalent. Cotton opened rapidly and picking was in progress in the northern portions of the cotton belt. Drought proved very damaging to cotton in Oklahoma and Texas, but the weather was very favorable for picking. Tobacco suffered from drought in Ohio, but in other tobacco States the general outlook continued favorable, although some damage was caused by high winds in North Carolina, and moist weather proved unfavorable for curing in Maryland.

*August 28.*—The drought was relieved locally in the South Atlantic States, but continued with increased severity in Texas, Oklahoma, southern Missouri, and Michigan. Very favorable weather conditions prevailed in Iowa, northern Missouri, Nebraska, and Kansas, but, as in the previous weeks, reports of damaging effects of excessive moisture were received from the Dakotas and Minnesota. Abnormally cool weather continued on the Pacific coast, with rains unusual for the season in Washington and Oregon. In California the persistent prevalence of low temperatures proved injurious to raisin grapes. The general condition of corn in the States of the central Mississippi and Ohio valleys was less satisfactory than in the previous week, owing to continued absence of moisture, which conduced to too rapid maturity. In Iowa, northern Missouri, Kansas, Nebraska, the Dakotas, Minnesota, and the Middle Atlantic States the weather was more favorable to corn, and the crop generally made good progress, although late corn was somewhat less promising in portions of Nebraska and Kansas. The reports of injury to grain in shock and stack continued from the Dakotas and Minnesota principally, however, as a result of the rains of the previous weeks. Grain in shock was also injured by rains in Washington and Oregon, but in the last-named

State the rains were of material benefit to late spring grain and other crops. While complaints of rust and shedding in cotton were somewhat less numerous in the eastern portion of the cotton belt, they continued undiminished in the western districts, where there was quite a general deterioration in the condition of the crop. Favorable progress was made in cutting and housing tobacco, which work was quite well advanced.

*September 4.*—At the close of this week a very large part of the country was suffering from drought of greater or less severity, high temperatures having prevailed with no rain in nearly all districts suffering from the lack of rain at the close of the preceding week. Very favorable weather conditions, however, prevailed on the Atlantic coast, except in portions of New England and North Carolina, which were suffering from drought. The weather continued cool over the greater part of the Pacific coast, but generally was more favorable than in the preceding weeks. Under the prevailing high temperatures corn made rapid progress toward maturity, the late corn having ripened too rapidly. Reports of injury from excessive moisture to grain in shock and stack continued from portions of Minnesota, South Dakota, and Washington. Cotton picking was retarded by rains in portions of the east Gulf States and on the Texas coast, but in other portions of the cotton belt picking made rapid progress. Reports of rust and shedding, as a rule, were less numerous, and were confined principally to the central portion of the cotton belt. In portions of South Carolina, Georgia, and Florida, cotton sustained injury from rain and sprouting and rotting of bolls in places; in Georgia, however, the crop improved. Tobacco matured rapidly, and favorable progress was made in cutting and housing the crop. The condition of the soil was very favorable for plowing and seeding in the Middle Atlantic States, but in the central valleys and southwest this work was largely suspended owing to dryness.

*September 11.*—While the first half of this week was excessively hot and dry over the greater part of the country east of the Rocky Mountains, there were beneficial rains during the latter part which partially relieved the droughty conditions in portions of Texas and Oklahoma, the central Mississippi and Ohio valleys, and generally throughout the Middle and South Atlantic States. Drought continued, however, in portions of New York, Pennsylvania, Ohio, Wisconsin, Kentucky, and over the greater part of Tennessee, Arkansas, Mississippi, Oklahoma, and Texas. The cutting of early corn, the greater part of which was now safe from frost, was general in all sections, the maturing of the crop having been rapidly advanced by hot and dry weather of the previous weeks. Late corn was materially injured by heat and drought in portions of Ohio, Indiana, Illinois, Nebraska, and southern Missouri, but in Iowa it was not as badly injured as the previous reports indicated. In the Dakotas and Minnesota the conditions were favorable for spring wheat harvesting and thrashing, although thrashing was prevented to some extent by local showers in Minnesota. In Washington and Oregon harvesting was vigorously pushed, the absence of rain being especially favorable. Reports of premature opening of cotton were general in the eastern and central portions of the cotton belt and picking progressed rapidly in all sections. The crop sustained damage from local storms in South Carolina and Georgia and drought in Arkansas. The prospects for the top crop were generally very poor. The bulk of the tobacco crop was cut and housed in the more northerly tobacco States.

*September 18.*—Rain was very generally needed, more particularly for plowing and fall seeding, from the east Gulf coast northward over Tennessee, the upper Ohio Valley, interior portions of the Middle and South Atlantic States, lower Lake region, and northern New England, over much the greater portion of which area practically no rain fell during the week. Drought continued over a large part of Texas, and rain was needed in Nebraska and portions of Iowa, Wisconsin, and Michigan. Some late corn in northern Michigan and portions of Wisconsin, New York, and northern New England was injured by frost, but on the whole the weather conditions were favorable for the unmatured portion of the crop. Late corn in the central valleys suffered material injury in consequence of drought. In the Dakotas and Minnesota, where the thrashing of spring wheat had been much delayed, the weather conditions were favorable for this work. The north Pacific coast region also experienced favorable weather for the completion of harvesting and thrashing, the reports from Oregon indicating that the injury resulting from the rains of August was less serious than was anticipated. The weather was very favorable for cotton picking over the greater part of the cotton belt. Premature opening continued in all districts and the reports generally indicated that the crop would be gathered at a much earlier date than usual, and that the top crop would be very short, in some sections almost a failure. The weather was also favorable for finishing the tobacco harvest and for curing.

*September 25.*—As no rain fell over a large part of the Southern States the drought of the previous week continued, and rain was needed over portions of Illinois, Iowa, Nebraska, and in the southern Rocky Mountain regions. Throughout the central and northern portions of the country and on the Pacific coast the weather was generally favorable for maturing crops and for farm work. The corn crop experienced generally favorable weather conditions. In the States of the Ohio Valley and lake region a large part of the crop had been cut and some husking had been done. Reports continued to show that late corn had failed to develop well in the central valleys and Southern States. The absence of rain on the Pacific coast was favorable for the completion of the grain harvest and for thrashing in Washington and Oregon, where the damage from the August rains was much less than had been expected. Cotton picking made rapid progress under favorable weather conditions. Nearly the whole crop was open and the bulk was gathered over a large part of the cotton region. Except over limited areas in Virginia and North Carolina, the tobacco crop was practically cut and housed, the weather of this week proving generally favorable for curing. Excellent progress was made with plowing and fall seeding in the Ohio Valley, Middle Atlantic States, and New England, but generally throughout the Southern States and in the upper Mississippi Valley the soil was too dry. In the Ohio Valley and Middle Atlantic States early sown grain was germinating finely.

## CLOSE OF THE SEASON IN OCTOBER.

The monthly climate and crop bulletin for October, 1899, showed that in the districts east of the Rocky Mountains the month was very mild and the first half generally dry. These conditions proved very favorable for maturing and gathering late crops, but were not favorable for plowing, fall seeding, and germination of sown grain over a large part of the winter-wheat region. During the latter part of October the drought conditions were largely relieved, although Iowa and portions of eastern Nebraska, northern Missouri, and the central Gulf States were suffering for rain at the close of the month. Under exceptionally favorable weather conditions cutting, husking, and cribbing of corn made rapid progress. Only a small part of the cotton crop remained ungathered at the close of the month. Although the top crop was very light, the absence of frost, especially over the eastern part of the cotton belt, permitted much to mature.

## TEMPERATURE FOR THE SEASON IN THE SEVERAL REGIONS.

Plate LXI shows that for the period from March 1 to October 9 (223 days) the Southern States, Ohio Valley, and lower Lake region received more than the usual amount of heat, the average daily excess ranging from 1° to 2° over an area extending from central Texas northeastward to New York. Along the Middle Atlantic and Gulf coasts the average seasonal temperature was nearly normal. From the upper Mississippi Valley westward to the Pacific coast, including the middle plateau region and California, the season averaged cooler than usual, the deficiency in temperature being very marked from the upper Missouri Valley westward to Idaho, Oregon, and northern Nevada, where it ranged from 2° to 4° per day.

## RAINFALL FOR THE SEASON IN THE SEVERAL REGIONS.

Plate LXII shows the total rainfall for the period from March 1 to October 9; and Plate LXIII the excess or deficiency as compared with the normal. Except over eastern Texas and southern Florida, the seasonal rainfall in the Southern States was was much lighter than usual, the deficiency ranging from 4 to 16 inches. There was also a marked deficiency over the northern portion of the Ohio Valley, the greater part of the Lake region and New England, and throughout the central and southern Rocky Mountain districts. The total rainfall over the greater part of the Middle and South Atlantic and east Gulf States generally ranged from 24 to 40 inches, like amounts occurring over portions of the central Gulf coast and eastern Texas, while the region from Arkansas and northern Texas northward to Lake Superior received from 24 to 30 inches. Over much of the lower Lake region and northern New England the total rainfall amounted to less than 18 inches. The normal seasonal rainfall over a large portion of the central and southern plateau regions is less than an inch, but during the present season even this small amount did not fall, the total for Yuma, Ariz., for 223 days, being only 0.01 inch.

*Average daily temperature departures (in degrees Fahrenheit) for the season of 1899 from the normal, based upon observations for many years, by sections.*

| Sections. | From Jan. 1 to Apr. 3, inclusive. | For weeks ending— | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | April— | | | May— | | | | | June— | | | |
| | | 10. | 17. | 24. | 1. | 8. | 15. | 22. | 29. | 5. | 12. | 19. | 26. |
| Middle and South Atlantic States | −1.3 | − 7.2 | +2.6 | +0.2 | + 4.0 | +3.8 | +4.0 | +1.8 | −3.7 | +4.6 | +5.7 | −0.2 | −0.3 |
| Gulf States | −2.7 | −11.4 | +1.1 | −1.6 | + 5.5 | +4.2 | +4.9 | +6.5 | +1.5 | +5.2 | +2.2 | −1.7 | − .4 |
| Ohio Valley and Tennessee | −3.7 | −11.4 | +3.4 | +7.0 | +11.0 | +7.5 | +1.6 | +1.1 | + .8 | +5.6 | +4.6 | −3.1 | +2.1 |
| Lake region | −3.3 | − 4.8 | +5.8 | +7.1 | +14.3 | +5.9 | +2.5 | −5.5 | + .4 | +4.9 | +4.8 | + .3 | + .5 |
| Upper Mississippi and Missouri valleys | −4.6 | −10.5 | +5.4 | +1.2 | + 9.3 | +4.0 | +1.5 | −1.4 | +1.8 | +6.1 | + .4 | −2.0 | +1.1 |
| Rocky Mountain region | −3.3 | − 3.4 | +5.6 | − .8 | − 1.2 | −5.0 | + .9 | −2.4 | − .8 | −2.3 | −1.5 | − .5 | + .5 |
| North Pacific coast | − .3 | + 2.7 | −2.0 | −3.0 | − 7.0 | −1.7 | −5.7 | −6.0 | −5.7 | −4.7 | −1.7 | +1.0 | −3.0 |
| California | + .8 | + 4.8 | +2.8 | +1.0 | − 6.2 | −2.6 | +1.6 | −4.6 | −6.6 | −4.8 | + .6 | +2.8 | −1.8 |

| Sections. | For weeks ending— | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July— | | | | | August— | | | | September— | | | | October— | |
| | 3. | 10. | 17. | 24. | 31. | 7. | 14. | 21. | 28. | 4. | 11. | 18. | 25. | 2. | 9. |
| Middle and South Atlantic States | −3.0 | −0.6 | 0.0 | +0.8 | +1.0 | +3.5 | +1.6 | +0.7 | +3.3 | +1.4 | +3.2 | −2.1 | −0.4 | − 6.5 | −4.6 |
| Gulf States | −1.9 | − .7 | − .5 | + .9 | + .8 | +3.5 | +4.5 | +1.7 | +5.0 | +1.9 | +5.3 | +1.8 | −4.1 | − 6.4 | −3.3 |
| Ohio Valley and Tennessee | −1.5 | −1.5 | + .9 | + .4 | + .9 | +3.9 | +1.8 | +1.9 | +5.3 | +5.8 | +6.8 | + .5 | −2.3 | −12.0 | −1.6 |
| Lake region | −1.5 | −1.6 | − .9 | + .3 | +1.1 | + .3 | − .4 | +2.9 | +3.8 | +5.8 | +2.3 | − .5 | −3.4 | −10.3 | − .5 |
| Upper Mississippi and Missouri valleys | − .2 | −1.8 | + .2 | +2.0 | −1.1 | +2.5 | +2.4 | +2.5 | +5.8 | +7.9 | +5.8 | + .5 | −3.0 | − 6.4 | +2.3 |
| Rocky Mountain region | −1.0 | + .2 | .0 | − .4 | − .7 | −1.4 | − .7 | − .5 | + .9 | +4.9 | +2.4 | +1.4 | +4.1 | + 5.0 | −1.3 |
| North Pacific coast | −2.3 | −3.7 | +3.0 | −2.0 | +5.0 | + .7 | −5.0 | −6.0 | −6.7 | −1.0 | + .7 | +3.3 | +6.7 | + 5.0 | +4.0 |
| California | +1.0 | − .2 | −2.2 | +1.0 | −2.0 | −3.4 | −4.2 | −5.0 | −2.2 | −2.0 | −1.0 | +2.8 | +4.2 | + 2.4 | +6.2 |

*Average daily temperature departures (in degrees Fahr.) for season of 1899 from normal, based upon observations for many years, by stations.*

| Stations. | From Jan. 1 to Apr. 3, inclusive. | For weeks ending— April— 10. | 17. | 24. | May— 1. | 8. | 15. | 22. | 29. | June— 5. | 12. | 19. | 26. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New England: | | | | | | | | | | | | | |
| Eastport, Me | −0.4 | + 1 | + 3 | + 2 | + 4 | + 4 | + 4 | − 3 | − 1 | + 2 | + 2 | 0 | + 1 |
| Portland, Me | −1.5 | − 1 | − 1 | + 1 | + 7 | + 4 | + 2 | − 6 | − 1 | + 7 | + 3 | − 2 | 0 |
| Boston, Mass | + .2 | 0 | + 2 | + 2 | +10 | + 5 | + 4 | − 6 | − 1 | + 7 | + 7 | + 2 | + 2 |
| Middle Atlantic States: | | | | | | | | | | | | | |
| Albany, N. Y | −1.3 | − 2 | 0 | + 4 | +12 | + 5 | − 1 | − 6 | + 1 | + 5 | + 6 | + 1 | 0 |
| New York City | − .9 | − 4 | + 4 | + 2 | + 7 | + 6 | + 3 | − 4 | 0 | + 6 | + 8 | + 2 | + 1 |
| Philadelphia, Pa | −1.3 | − 3 | + 6 | + 4 | + 9 | + 6 | + 3 | − 6 | − 1 | + 6 | + 8 | + 1 | + 1 |
| Washington, D. C | −2.5 | − 8 | + 5 | + 3 | + 8 | + 4 | + 2 | − 4 | − 4 | + 5 | + 6 | − 2 | 0 |
| Lynchburg, Va | −2.7 | −11 | + 3 | + 2 | + 5 | + 3 | + 3 | + 3 | − 5 | + 5 | + 5 | − 3 | + 1 |
| Norfolk, Va | −1.1 | − 8 | + 4 | + 1 | + 3 | + 1 | + 2 | 0 | − 6 | + 5 | + 7 | 0 | − 2 |
| South Atlantic States: | | | | | | | | | | | | | |
| Charlotte, N. C | −2.6 | −11 | + 2 | + 1 | + 1 | + 3 | + 4 | + 7 | − 5 | + 6 | + 7 | − 2 | + 2 |
| Wilmington, N. C | −1.3 | −10 | + 2 | − 4 | + 1 | + 1 | + 4 | + 4 | − 7 | + 2 | + 5 | 0 | − 2 |
| Charleston, S. C | 0 | − 8 | + 3 | − 3 | + 1 | + 3 | + 8 | + 7 | − 6 | + 4 | + 4 | 0 | − 2 |
| Augusta, Ga | −1.4 | −11 | + 1 | − 1 | + 1 | + 5 | + 7 | + 7 | − 5 | + 5 | + 6 | − 1 | 0 |
| Savannah, Ga | − .5 | − 9 | + 2 | − 4 | 0 | + 4 | + 8 | + 7 | − 4 | + 4 | + 4 | 0 | − 1 |
| Jacksonville, Fla | − .1 | − 6 | − 1 | − 3 | − 1 | + 4 | + 6 | + 6 | − 2 | + 2 | + 2 | 0 | − 2 |
| Gulf States: | | | | | | | | | | | | | |
| Atlanta, Ga | −2.3 | −11 | 0 | 0 | + 4 | + 7 | + 7 | + 9 | 0 | + 9 | + 6 | − 1 | + 4 |
| Mobile, Ala | −2.6 | −10 | − 2 | − 1 | + 3 | + 4 | + 6 | + 4 | − 1 | 0 | + 1 | − 1 | − 1 |
| Montgomery, Ala | −2.4 | −11 | 0 | 0 | + 6 | + 8 | + 7 | + 8 | − 2 | + 6 | + 5 | 0 | + 2 |
| Vicksburg, Miss | −3.4 | −13 | + 1 | − 1 | + 6 | + 5 | + 4 | + 6 | + 1 | + 5 | 0 | − 2 | − 1 |
| New Orleans, La | −2.1 | −10 | − 1 | − 2 | + 4 | + 5 | + 6 | + 6 | + 1 | + 2 | − 1 | 0 | − 2 |
| Shreveport, La | −3.1 | −12 | + 3 | − 3 | + 6 | + 6 | + 4 | + 5 | + 2 | + 6 | + 3 | − 3 | − 1 |
| Fort Smith, Ark | −2.1 | −14 | + 4 | − 1 | + 9 | + 3 | + 6 | +10 | + 3 | + 8 | + 3 | − 2 | + 1 |
| Little Rock, Ark | −4.8 | −14 | + 2 | − 1 | + 8 | + 2 | + 4 | + 7 | + 1 | + 7 | + 2 | − 3 | 0 |
| Palestine, Tex | −2.2 | −13 | + 3 | − 3 | + 7 | + 4 | + 4 | + 8 | + 5 | + 7 | + 4 | − 2 | − 1 |
| Galveston, Tex | −2.5 | − 8 | 0 | − 3 | 0 | + 1 | + 3 | + 3 | + 2 | + 2 | + 1 | − 1 | − 2 |
| San Antonio, Tex | −2.0 | − 9 | + 2 | − 3 | + 7 | + 1 | + 3 | + 5 | + 4 | + 5 | 0 | − 4 | − 3 |
| Ohio Valley and Tennessee: | | | | | | | | | | | | | |
| Memphis, Tenn | −4.1 | −14 | + 3 | + 4 | +11 | + 5 | + 3 | + 4 | 0 | + 7 | + 2 | − 2 | + 1 |
| Nashville, Tenn | −4.5 | −14 | + 2 | + 4 | + 8 | + 9 | + 3 | + 3 | 0 | + 7 | + 4 | − 2 | + 2 |
| Chattanooga, Tenn | −3.4 | −12 | 0 | 0 | + 5 | + 8 | + 5 | + 7 | + 1 | + 7 | + 5 | − 2 | + 2 |
| Louisville, Ky | −3.9 | −13 | + 5 | + 8 | +11 | + 8 | + 1 | + 1 | 0 | + 6 | + 5 | − 4 | + 3 |
| Indianapolis, Ind | −4.5 | −11 | + 5 | + 9 | +13 | + 6 | − 2 | − 2 | 0 | + 4 | + 4 | − 4 | + 2 |
| Cincinnati, Ohio | −4.6 | −11 | + 4 | + 9 | +12 | + 8 | 0 | 0 | 0 | + 4 | + 5 | − 4 | + 2 |
| Columbus, Ohio | −2.8 | − 8 | + 5 | +12 | +13 | + 8 | 0 | 0 | + 4 | + 6 | + 7 | − 4 | + 3 |
| Pittsburg, Pa | −2.1 | − 8 | + 3 | +12 | +15 | + 8 | + 3 | − 4 | + 1 | + 4 | + 5 | − 3 | + 2 |

*Average daily temperature departures (in degrees Fahrenheit) for the season of 1899 from the normal, etc.*—Continued.

| Stations. | From Jan. 1 to Apr. 3, inclusive. | For weeks ending— | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | April— | | | May— | | | | | June— | | | |
| | | 10. | 17. | 24. | 1. | 8. | 15. | 22. | 29. | 5. | 12. | 19. | 26. |
| Lake region: | | | | | | | | | | | | | |
| Oswego, N. Y | −1.7 | − 4 | − 1 | + 7 | +13 | + 5 | − 1 | − 9 | + 1 | + 4 | + 3 | 0 | − 1 |
| Buffalo, N. Y | − .4 | − 4 | + 3 | +13 | +17 | + 8 | + 3 | − 8 | + 3 | + 4 | + 4 | 0 | + 1 |
| Cleveland, Ohio | −2.5 | − 9 | + 6 | +10 | +18 | + 6 | + 3 | − 4 | + 1 | + 5 | + 5 | 0 | 0 |
| Detroit, Mich | −3.6 | − 7 | + 6 | + 9 | +18 | + 8 | + 3 | − 7 | + 2 | + 6 | + 5 | − 1 | 0 |
| Grand Haven, Mich | −3.9 | − 5 | + 5 | + 8 | +15 | + 9 | + 3 | − 5 | + 1 | + 5 | + 3 | − 2 | 0 |
| Milwaukee, Wis | −3.6 | − 4 | +10 | + 6 | +13 | + 7 | + 4 | − 4 | 0 | + 5 | + 6 | + 3 | + 2 |
| Chicago, Ill | −4.8 | − 7 | +10 | + 5 | +17 | + 5 | + 3 | − 3 | + 1 | + 8 | + 7 | + 2 | + 1 |
| Duluth, Minn | −6.0 | + 2 | + 7 | − 1 | + 3 | − 1 | + 2 | − 4 | − 6 | + 2 | + 5 | 0 | + 1 |
| Upper Mississippi Valley: | | | | | | | | | | | | | |
| St. Paul, Minn | −5.3 | − 4 | + 6 | + 2 | +13 | + 6 | + 2 | − 7 | + 1 | + 5 | 0 | − 2 | − 1 |
| La Crosse, Wis | −6.2 | − 6 | + 5 | + 3 | +11 | + 5 | + 1 | − 8 | + 1 | + 4 | 0 | − 3 | 0 |
| Davenport, Iowa | −3.9 | − 7 | + 6 | + 4 | +14 | + 7 | + 1 | − 3 | 0 | + 7 | + 2 | 0 | 0 |
| Des Moines, Iowa | −3.0 | − 9 | + 4 | − 1 | + 8 | + 3 | − 2 | − 4 | + 2 | + 8 | + 2 | − 1 | + 2 |
| Springfield, Ill | −5.2 | −11 | + 4 | + 6 | +13 | + 6 | − 1 | 0 | + 2 | + 7 | + 1 | − 3 | + 3 |
| Cairo, Ill | −4.9 | −13 | + 3 | + 3 | +10 | + 6 | + 2 | + 3 | 0 | + 7 | + 3 | − 4 | + 2 |
| St. Louis, Mo | −4.3 | −13 | + 6 | + 5 | +14 | + 6 | + 1 | + 1 | + 1 | + 8 | + 2 | − 2 | + 4 |
| Missouri Valley: | | | | | | | | | | | | | |
| Springfield, Mo | −5.2 | −17 | + 4 | − 1 | + 9 | + 2 | + 3 | + 9 | + 3 | + 7 | + 1 | − 4 | + 1 |
| Kansas City, Mo | −4.0 | −14 | + 8 | 0 | + 9 | + 5 | + 4 | + 1 | + 3 | + 5 | 0 | − 1 | + 2 |
| Concordia, Kans | −4.1 | −14 | + 6 | − 2 | + 8 | + 2 | + 5 | + 3 | + 4 | + 6 | − 2 | 0 | + 2 |
| Omaha, Nebr | −4.5 | −12 | + 5 | − 2 | + 8 | + 2 | − 1 | − 4 | 0 | + 5 | 0 | − 1 | 0 |
| Valentine, Nebr | −5.5 | − 6 | + 8 | 0 | + 5 | − 2 | + 2 | − 4 | + 2 | + 5 | − 2 | − 3 | 0 |
| Huron, S. Dak | −3.2 | −10 | + 5 | − 2 | + 9 | + 1 | + 3 | − 5 | + 4 | + 5 | − 2 | − 2 | − 1 |
| Extreme Northwest: | | | | | | | | | | | | | |
| Moorhead, Minn | −1.6 | − 2 | + 5 | − 1 | + 8 | 0 | + 3 | − 4 | + 2 | + 4 | − 3 | − 4 | − 1 |
| Bismarck, N. Dak | −6.7 | − 6 | + 4 | − 4 | + 5 | − 3 | − 2 | − 7 | + 1 | + 4 | − 3 | − 2 | − 2 |
| Williston, N. Dak | −8.4 | − 7 | + 3 | − 5 | + 1 | − 7 | − 5 | − 6 | − 2 | + 1 | − 6 | − 6 | 0 |
| Rocky Mountain Slope: | | | | | | | | | | | | | |
| Havre, Mont | −9.6 | −10 | + 2 | − 4 | − 2 | −15 | − 4 | − 7 | − 3 | − 2 | − 4 | − 2 | 0 |
| Helena, Mont | −5.5 | 0 | + 1 | − 5 | − 4 | − 5 | − 2 | − 9 | − 2 | − 5 | − 4 | + 1 | 0 |
| Spokane, Wash | −0.9 | + 1 | 0 | − 4 | − 6 | − 2 | − 6 | − 6 | − 5 | − 6 | − 4 | 0 | + 1 |
| Salt Lake City, Utah | +0.5 | + 3 | + 6 | + 3 | − 8 | − 8 | 0 | − 7 | − 3 | − 7 | − 4 | − 1 | − 1 |
| Cheyenne, Wyo | −6.9 | − 2 | + 7 | + 2 | 0 | − 5 | + 2 | − 2 | − 1 | − 2 | − 2 | − 3 | 0 |
| North Platte, Nebr | −4.7 | − 6 | + 9 | − 3 | + 3 | − 1 | + 1 | − 2 | + 2 | + 4 | − 2 | − 1 | 0 |
| Denver, Col | −5.9 | − 2 | +10 | + 3 | + 1 | − 5 | + 4 | 0 | 0 | 0 | − 1 | 0 | + 1 |
| Dodge, Kans | −3.0 | −10 | + 9 | − 3 | + 7 | + 1 | + 6 | + 3 | + 5 | + 5 | − 2 | 0 | + 2 |
| Abilene, Tex | −1.9 | −13 | + 4 | − 4 | + 5 | 0 | + 1 | + 5 | + 2 | + 4 | 0 | − 4 | − 2 |
| Santa Fe, N. Mex | −1.2 | − 1 | + 9 | + 2 | 0 | − 5 | + 5 | 0 | 0 | − 5 | + 2 | 0 | − 1 |
| El Paso, Tex | −0.3 | − 5 | + 2 | 0 | − 2 | − 6 | + 1 | + 1 | − 1 | − 6 | 0 | − 1 | − 2 |
| Phenix, Ariz | −0.2 | + 4 | + 8 | + 3 | − 8 | − 9 | + 3 | − 5 | − 3 | − 9 | − 3 | + 5 | + 4 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pacific Coast: | | | | | | | | | | | | | |
| Seattle, Wash | -0.2 | + 2 | - 2 | - 2 | - 4 | - 1 | - 6 | - 4 | - 4 | - 4 | - 2 | 0 | - 2 |
| Portland, Oreg | -1.0 | + 2 | - 2 | - 4 | - 8 | - 3 | - 7 | - 7 | - 7 | - 6 | - 3 | + 1 | - 3 |
| Roseburg, Oreg | +0.2 | + 4 | - 2 | - 3 | - 9 | - 1 | - 4 | - 7 | - 6 | - 4 | 0 | + 2 | - 4 |
| Red Bluff, Cal | +1.3 | + 8 | + 7 | 0 | -11 | - 1 | + 6 | - 5 | -12 | - 3 | + 7 | + 7 | - 2 |
| Sacramento, Cal | +1.1 | + 7 | + 5 | 0 | - 7 | - 3 | + 3 | - 5 | -10 | - 7 | + 5 | + 8 | - 2 |
| San Francisco, Cal | +0.5 | + 4 | + 1 | - 1 | - 4 | - 5 | 0 | - 5 | - 5 | - 5 | - 2 | 0 | - 1 |
| Los Angeles, Cal | +0.8 | + 5 | + 1 | + 3 | - 5 | - 2 | 0 | - 4 | - 3 | - 5 | - 3 | + 1 | - 1 |
| San Diego, Cal | +0.3 | 0 | 0 | + 3 | - 4 | - 2 | - 1 | - 4 | - 3 | - 4 | - 4 | - 2 | - 3 |

| Stations. | For weeks ending— | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July— | | | | | August— | | | | September— | | | | October— | |
| | 3. | 10. | 17. | 24. | 31. | 7. | 14. | 21. | 28. | 4. | 11. | 18. | 25. | 2. | 9. |
| New England: | | | | | | | | | | | | | | | |
| Eastport, Me | - 1 | - 2 | 0 | - 3 | - 1 | 0 | - 3 | + 4 | 0 | 0 | - 2 | - 3 | 0 | 0 | - 5 |
| Portland, Me | - 1 | + 1 | 0 | - 3 | - 1 | + 1 | - 7 | + 2 | - 2 | + 1 | - 2 | - 5 | - 1 | - 4 | - 6 |
| Boston, Mass | - 1 | + 6 | + 2 | - 2 | 0 | + 2 | - 5 | + 3 | - 3 | + 1 | - 2 | - 4 | + 3 | - 2 | - 5 |
| Middle Atlantic States: | | | | | | | | | | | | | | | |
| Albany, N. Y | - 3 | + 4 | + 1 | - 1 | + 1 | + 1 | - 3 | + 3 | + 6 | + 4 | - 3 | - 5 | + 2 | - 3 | - 5 |
| New York City | - 1 | + 2 | 0 | 0 | 0 | + 2 | - 1 | + 1 | + 4 | + 2 | + 1 | - 3 | + 1 | - 4 | - 4 |
| Philadelphia, Pa | - 1 | + 1 | + 2 | + 2 | 0 | + 3 | - 1 | - 1 | + 3 | + 3 | + 2 | - 3 | + 2 | - 6 | - 5 |
| Washington, D. C | - 3 | - 1 | - 1 | + 3 | - 1 | + 2 | 0 | - 1 | + 3 | + 2 | + 4 | - 6 | 0 | - 9 | - 5 |
| Lynchburg, Va | - 6 | - 3 | 0 | + 1 | + 2 | + 4 | + 2 | - 1 | + 3 | + 2 | + 4 | - 4 | - 3 | -11 | - 6 |
| Norfolk, Va | - 4 | + 1 | 0 | + 2 | + 1 | + 3 | + 2 | 0 | + 3 | + 2 | + 4 | - 2 | + 1 | - 5 | - 2 |
| South Atlantic States: | | | | | | | | | | | | | | | |
| Charlotte, N. C | - 1 | - 1 | + 2 | + 3 | 0 | + 4 | + 4 | + 2 | + 5 | + 2 | + 6 | - 3 | - 3 | - 9 | - 8 |
| Wilmington, N. C | - 4 | - 3 | - 1 | - 2 | + 2 | + 4 | + 3 | - 1 | + 2 | - 1 | + 5 | - 2 | - 1 | - 7 | - 4 |
| Charleston, S. C | - 4 | - 2 | - 2 | 0 | + 2 | + 6 | + 4 | + 1 | + 3 | 0 | + 5 | + 1 | 0 | - 5 | - 4 |
| Augusta, Ga | - 3 | - 1 | + 1 | + 1 | + 2 | + 4 | + 3 | + 2 | + 3 | + 1 | + 5 | 0 | - 3 | - 8 | - 6 |
| Savannah, Ga | - 3 | - 2 | - 1 | 0 | + 2 | + 6 | + 3 | + 2 | + 3 | 0 | + 4 | + 1 | 0 | - 5 | - 4 |
| Jacksonville, Fla | - 3 | - 2 | - 1 | 0 | + 1 | + 3 | + 3 | + 1 | + 2 | 0 | + 2 | + 1 | - 1 | - 4 | - 2 |
| Gulf States: | | | | | | | | | | | | | | | |
| Atlanta, Ga | 0 | - 1 | + 4 | 0 | + 2 | + 4 | + 5 | + 3 | + 5 | + 3 | + 9 | 0 | - 4 | - 9 | - 6 |
| Mobile, Ala | - 2 | - 1 | - 1 | + 1 | 0 | + 4 | + 3 | 0 | + 3 | + 1 | + 3 | + 3 | - 6 | - 8 | - 5 |
| Montgomery, Ala | - 2 | - 1 | 0 | 0 | + 2 | + 2 | + 5 | + 1 | + 4 | 0 | + 6 | + 2 | - 5 | - 9 | - 7 |
| Vicksburg, Miss | 0 | - 1 | 0 | + 1 | 0 | + 2 | + 5 | 0 | + 4 | + 1 | + 4 | + 2 | - 6 | - 8 | - 3 |
| New Orleans, La | - 1 | 0 | 0 | + 3 | 0 | + 4 | + 4 | 0 | + 3 | + 1 | + 3 | + 2 | - 4 | - 6 | - 4 |
| Shreveport, La | - 3 | - 1 | - 1 | + 2 | + 3 | + 6 | + 7 | + 3 | + 7 | + 2 | + 7 | + 3 | - 4 | - 6 | - 2 |
| Fort Smith, Ark | 0 | 0 | - 1 | - 1 | + 2 | + 7 | + 7 | + 4 | +10 | + 7 | + 8 | 0 | - 3 | - 6 | - 1 |
| Little Rock, Ark | - 1 | - 2 | - 1 | - 1 | + 2 | + 5 | + 7 | + 2 | + 6 | + 4 | + 7 | 0 | - 5 | - 9 | - 2 |
| Palestine, Tex | - 4 | 0 | - 2 | + 1 | 0 | + 2 | + 3 | + 1 | + 7 | + 2 | + 5 | + 2 | - 3 | - 5 | - 2 |
| Galveston, Tex | - 4 | - 1 | - 1 | + 2 | - 2 | + 1 | 0 | 0 | + 2 | - 3 | + 2 | + 4 | - 2 | - 2 | - 2 |
| San Antonio, Tex | - 4 | 0 | - 2 | + 2 | 0 | + 1 | + 3 | + 5 | + 4 | + 3 | + 4 | + 2 | - 3 | - 2 | - 2 |
| Ohio Valley and Tennessee: | | | | | | | | | | | | | | | |
| Memphis, Tenn | - 1 | - 3 | + 1 | - 2 | + 1 | + 4 | + 6 | + 2 | + 5 | + 5 | + 8 | + 2 | - 3 | - 9 | - 1 |
| Nashville, Tenn | - 2 | - 2 | + 2 | - 1 | + 1 | + 3 | + 3 | + 2 | + 3 | + 4 | + 8 | + 1 | - 4 | -12 | - 3 |
| Chattanooga, Tenn | 0 | 0 | + 2 | - 1 | + 2 | + 5 | + 5 | + 4 | + 8 | + 4 | + 9 | + 1 | - 5 | -12 | - 4 |

*Average daily temperature departures (in degrees Fahrenheit) for the season of 1899 from the normal, etc.*—Continued.

| Stations. | For weeks ending— | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July— | | | | | August— | | | | September— | | | | October— | |
| | 3. | 10. | 17. | 24. | 31. | 7. | 14. | 21. | 28. | 4. | 11. | 18. | 25. | 2. | 9. |
| Ohio Valley and Tennessee—Continued. | | | | | | | | | | | | | | | |
| Louisville, Ky | −2 | −1 | +2 | −1 | +1 | +5 | −1 | +1 | +5 | +7 | +8 | +1 | −2 | −13 | −1 |
| Indianapolis, Ind | −1 | −3 | 0 | +2 | −1 | +3 | −1 | +1 | +7 | +7 | +7 | +1 | −2 | −13 | 0 |
| Cincinnati, Ohio | −3 | −3 | −1 | +1 | +1 | +4 | 0 | +1 | +5 | +6 | +6 | +1 | −1 | −12 | −1 |
| Columbus, Ohio | −1 | 0 | +1 | +3 | +1 | +3 | +1 | +3 | +6 | +8 | +6 | 0 | −2 | −13 | −2 |
| Pittsburg, Pa | −3 | 0 | 0 | +2 | +1 | +4 | +1 | +1 | +3 | +5 | +2 | −3 | +1 | −12 | −1 |
| Lake region: | | | | | | | | | | | | | | | |
| Oswego, N. Y | −3 | +2 | −1 | −2 | +1 | 0 | −2 | +1 | +4 | +5 | −2 | −2 | 0 | −8 | −5 |
| Buffalo, N. Y | −2 | +1 | −1 | −1 | +2 | +1 | −1 | +5 | +4 | +7 | 0 | −1 | −1 | −9 | −2 |
| Cleveland, Ohio | −3 | 0 | 0 | +2 | +1 | +1 | +1 | +1 | +2 | +6 | +1 | −1 | −2 | −12 | −2 |
| Detroit, Mich | −1 | −1 | −2 | 0 | +1 | 0 | +1 | +4 | +3 | +5 | +1 | 0 | −6 | −14 | −2 |
| Grand Haven, Mich | 0 | −4 | −2 | +4 | +1 | +1 | 0 | +4 | +4 | +7 | +2 | −2 | −7 | −12 | −2 |
| Milwaukee, Wis | 0 | −4 | −1 | +1 | +1 | +1 | +1 | +4 | +5 | +8 | +6 | +2 | −4 | −10 | +3 |
| Chicago, Ill | −1 | −3 | 0 | +2 | 0 | 0 | +1 | +3 | +4 | +6 | +6 | +1 | −5 | −12 | +2 |
| Duluth, Minn | −2 | −4 | 0 | −4 | +2 | −2 | −4 | +1 | +4 | +2 | +4 | −1 | −2 | −5 | +4 |
| Upper Mississippi Valley: | | | | | | | | | | | | | | | |
| St. Paul, Minn | −2 | −1 | 0 | +7 | 0 | 0 | +1 | +3 | +6 | +6 | +5 | −1 | −3 | −7 | +5 |
| La Crosse, Wis | −2 | −2 | −2 | +6 | −2 | 0 | +1 | +2 | +4 | +7 | +3 | 0 | −5 | −7 | +2 |
| Davenport, Iowa | −1 | −2 | 0 | +4 | −1 | +1 | 0 | +2 | +5 | +9 | +7 | +1 | −3 | −11 | +3 |
| Des Moines, Iowa | −1 | −4 | +1 | +2 | −3 | +1 | +2 | +2 | +4 | +10 | +7 | 0 | −3 | −8 | +2 |
| Springfield, Ill | 0 | −2 | +1 | 0 | 0 | +4 | +1 | +1 | +5 | +8 | +7 | 0 | −5 | −12 | 0 |
| Cairo, Ill | −2 | −3 | +1 | −2 | 0 | +4 | +5 | +2 | +5 | +6 | +8 | +2 | −4 | −11 | 0 |
| St. Louis, Mo | 0 | −3 | +1 | 0 | +1 | +5 | +1 | +2 | +7 | +8 | +8 | +2 | −3 | −9 | +2 |
| Missouri Valley: | | | | | | | | | | | | | | | |
| Springfield, Mo | −1 | 0 | +1 | −1 | +2 | +6 | +7 | +3 | +11 | +8 | +9 | +1 | −3 | −4 | +4 |
| Kansas City, Mo | +1 | −4 | −1 | −1 | −1 | +5 | +3 | +2 | +4 | +8 | +5 | 0 | −2 | −4 | +1 |
| Concordia, Kans | +2 | 0 | 0 | −2 | −5 | +4 | +5 | +2 | +9 | +10 | +5 | 0 | −3 | +1 | +3 |
| Omaha, Nebr | −1 | −4 | −1 | +2 | −3 | 0 | +2 | +2 | +3 | +9 | +6 | 0 | −1 | −5 | +3 |
| Valentine, Nebr | +4 | +3 | −1 | +4 | −1 | 0 | +1 | +3 | +6 | +7 | +3 | +2 | −1 | −2 | +1 |
| Huron, S. Dak | 0 | −1 | +2 | +7 | −1 | +3 | +2 | +5 | +6 | +7 | +2 | −1 | −3 | −4 | +4 |
| Extreme Northwest: | | | | | | | | | | | | | | | |
| Moorhead, Minn | +1 | 0 | +1 | +6 | −2 | 0 | −2 | +7 | +5 | +4 | +4 | +1 | −2 | −5 | +4 |
| Bismarck, N. Dak | +2 | −1 | 0 | +6 | −5 | −1 | −3 | +3 | +1 | 0 | +4 | +3 | −2 | −1 | +4 |
| Williston, N. Dak | −3 | −1 | +1 | +2 | −4 | −4 | −3 | −1 | −1 | 0 | +1 | +2 | +2 | +2 | +4 |
| Rocky Mountain Slope: | | | | | | | | | | | | | | | |
| Havre, Mont | −4 | +2 | +6 | +2 | −5 | −3 | −1 | −3 | −7 | −1 | +2 | +2 | +7 | +7 | −2 |
| Helena, Mont | −3 | +1 | +4 | +2 | −4 | −2 | −8 | −6 | −9 | 0 | +1 | +1 | +10 | +5 | +2 |
| Spokane, Wash | −4 | 0 | +5 | −2 | +1 | −1 | −7 | −9 | −11 | −4 | −1 | +7 | +9 | +4 | +1 |
| Salt Lake City, Utah | +1 | +3 | 0 | −1 | +2 | −8 | −3 | −7 | −5 | +6 | −1 | 0 | +5 | +6 | −3 |
| Cheyenne, Wyo | +2 | −2 | −3 | +1 | −1 | −3 | −1 | 0 | +3 | +6 | +4 | +1 | +2 | +5 | −4 |
| North Platte, Nebr | 0 | −1 | 0 | 0 | −3 | −1 | 0 | +1 | +4 | +7 | +4 | +1 | +2 | +1 | −1 |
| Denver, Colo | +2 | −1 | −3 | −1 | 0 | −1 | +1 | +3 | +4 | +6 | +4 | +1 | +2 | +5 | −2 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dodge, Kans | −1 | −1 | −3 | −3 | −1 | +4 | +5 | +4 | +8 | +8 | +3 | 0 | +1 | +3 | −2 |
| Abilene, Tex | −5 | 0 | −3 | +1 | −2 | +4 | +5 | +8 | +10 | +7 | +5 | 0 | 0 | +3 | −2 |
| Santa Fe, N. Mex | −2 | −1 | −3 | −1 | +2 | −1 | +1 | +2 | +6 | +9 | +3 | −1 | +4 | +6 | −2 |
| El Paso, Tex | −3 | 0 | −1 | −2 | 0 | −1 | 0 | +4 | +6 | +7 | +3 | +1 | 0 | +4 | −4 |
| Phœnix, Ariz | +5 | +3 | +1 | −3 | +3 | −4 | 0 | −3 | +2 | +8 | +2 | +4 | +7 | +11 | +3 |
| Pacific Coast: | | | | | | | | | | | | | | | |
| Seattle, Wash | −2 | −3 | +4 | 0 | +7 | +1 | −3. | −4 | −6 | +1 | +2 | +3 | +6 | +5 | +5 |
| Portland, Oreg | −3 | −4 | +3 | −3 | +5 | +1 | −6 | −7 | −7 | −2 | +1 | +3 | +7 | +5 | +4 |
| Roseburg, Oreg | −2 | −4 | +2 | −3 | +3 | 0 | −6 | −7 | −7 | −2 | −1 | +4 | +7 | +5 | +3 |
| Red Bluff, Cal | +2 | 0 | −1 | +2 | −2 | −7 | −9 | −10 | −5 | −5 | +1 | +7 | +10 | +6 | +8 |
| Sacramento, Cal | +3 | −1 | −3 | +4 | −3 | −6 | −6 | −6 | −2 | −4 | 0 | +7 | +9 | +4 | +7 |
| San Francisco, Cal | −1 | −2 | −4 | −1 | −2 | −1 | 0 | 0 | +1 | −3 | −2 | −2 | −2 | −2 | +9 |
| Los Angeles, Cal | +3 | +2 | 0 | +1 | −1 | −1 | −2 | −4 | −2 | +3 | −1 | +3 | +4 | +3 | +5 |
| San Diego, Cal | −2 | 0 | −3 | −1 | −2 | −2 | −4 | −5 | −3 | −1 | −3 | −1 | 0 | −2 | +2 |

*Precipitation departures (inches and hundredths) for season of 1899 from normal, based upon observations for many years, by sections.*

| Sections. | From Jan. 1 to Apr. 3, inclusive. | For weeks ending— | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | April— | | | May— | | | | | June— | | | |
| | | 10. | 17. | 24. | 1. | 8. | 15. | 22. | 29. | 5. | 12. | 19. | 26. |
| Middle and South Atlantic States | +2.40 | +0.25 | −0.59 | −0.20 | −0.42 | −0.20 | −0.08 | −0.55 | −0.31 | −0.14 | −0.42 | −0.32 | −0.57 |
| Gulf States | −2.66 | − .09 | − .79 | + .03 | −1.01 | − .11 | + .05 | − .82 | − .49 | − .83 | + .84 | − .31 | − .63 |
| Ohio Valley and Tennessee | + .68 | + .09 | − .84 | + .15 | − .58 | + .05 | .00 | − .27 | − .69 | + .03 | − .12 | − .65 | − .23 |
| Lake region | −1.12 | − .30 | − .40 | − .48 | − .10 | − .23 | − .24 | − .11 | + .30 | + .24 | − .35 | − .45 | − .67 |
| Upper Mississippi and Missouri valleys | − .96 | − .38 | − .56 | + .04 | + .03 | + .24 | + .24 | + .72 | + .36 | + .32 | + .33 | + .31 | − .43 |
| Rocky Mountain region | + .06 | − .04 | − .17 | − .15 | − .15 | − .13 | − .17 | + .02 | + .04 | + .16 | + .39 | − .27 | − .01 |
| North Pacific coast | −1.62 | − .56 | + .78 | − .30 | + .25 | − .30 | + .11 | + .12 | + .42 | + .17 | − .26 | − .31 | − .03 |
| California | − .85 | − .46 | − .41 | − .26 | − .02 | − .22 | − .19 | − .15 | + .02 | + .61 | − .07 | − .05 | + .01 |

| Sections. | For weeks ending— | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July— | | | | | August— | | | | September— | | | | October— | |
| | 3. | 10. | 17. | 24. | 31. | 7. | 14. | 21. | 28. | 4. | 11. | 18. | 25. | 2. | 9. |
| Middle and South Atlantic States | −0.54 | +0.60 | −0.59 | −0.31 | +0.56 | −0.43 | −0.10 | −0.45 | +0.10 | +0.30 | −0.78 | −0.26 | −0.07 | −0.01 | +0.57 |
| Gulf States | + .62 | − .35 | − .60 | +1.81 | + .82 | − .48 | − .78 | − .28 | − .40 | + .03 | − .48 | − .66 | − .74 | − .77 | − .20 |
| Ohio Valley and Tennessee | − .72 | − .53 | − .21 | + .48 | + .46 | + .49 | .00 | − .68 | − .53 | − .10 | − .05 | − .66 | − .20 | − .42 | − .19 |
| Lake region | .00 | + .71 | + .18 | − .29 | − .39 | − .20 | − .06 | − .43 | − .42 | − .48 | − .18 | − .46 | + .43 | − .04 | − .57 |
| Upper Mississippi and Missouri valleys | − .17 | + .06 | − .10 | − .47 | − .27 | + .43 | + .33 | − .31 | − .17 | − .54 | − .19 | − .24 | − .44 | − .58 | − .54 |
| Rocky Mountain region | + .10 | − .16 | + .19 | + .33 | + .02 | + .31 | − .20 | − .28 | − .18 | − .12 | − .02 | − .03 | − .25 | − .27 | − .21 |
| North Pacific coast | − .03 | − .14 | − .15 | + .07 | − .06 | − .07 | + .97 | + .57 | + .54 | + .11 | − .09 | − .16 | − .48 | − .02 | − .62 |
| California | − .02 | .00 | .00 | .00 | .00 | .00 | .00 | + .01 | .00 | − .03 | − .04 | − .06 | − .10 | − .14 | − .16 |

*Precipitation departures (inches and hundredths) for season of 1899, from normal, based upon observation for many years, by stations.*

| Stations. | From Jan. 1 to Apr. 3, inclusive. | For weeks ending— | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | April— | | | May— | | | | | June— | | | |
| | | 10. | 17. | 24. | 1. | 8. | 15. | 22. | 29. | 5. | 12. | 19. | 26. |
| New England: | | | | | | | | | | | | | |
| Eastport, Me | +0.29 | −0.15 | −0.59 | −0.63 | −0.51 | −0.05 | −0.63 | +1.02 | +0.10 | −0.66 | −0.25 | +0.32 | −0.60 |
| Portland, Me | +2.54 | + .39 | − .48 | − .62 | − .58 | − .61 | − .72 | − .42 | − .83 | − .78 | − .54 | − .56 | − .39 |
| Boston, Mass | +1.10 | − .04 | − .26 | − .77 | − .83 | − .47 | − .62 | − .60 | − .77 | − .73 | − .08 | − .21 | − .11 |
| Middle Atlantic States: | | | | | | | | | | | | | |
| Albany, N. Y | + .94 | − .11 | − .37 | − .59 | − .22 | + .05 | − .37 | − .18 | − .21 | − .77 | − .81 | − .82 | + .07 |
| New York City | +4.13 | + .12 | − .48 | − .77 | − .77 | − .43 | − .14 | − .55 | − .68 | − .63 | − .67 | − .26 | − .11 |
| Philadelphia, Pa | +6.54 | − .05 | − .31 | − .70 | − .70 | − .70 | + .52 | − .09 | − .37 | − .60 | − .38 | − .59 | − .30 |
| Washington, D. C | +3.84 | + .11 | − .20 | − .74 | − .72 | − .50 | + .14 | + .20 | − .90 | − .01 | − .30 | − .69 | − .16 |
| Lynchburg, Va | +8.34 | + .47 | − .73 | − .77 | − .60 | + .23 | − .31 | − .59 | − .63 | + .91 | + .61 | + .39 | − .35 |
| Norfolk, Va | +2.03 | + .36 | − .90 | − .91 | − .38 | − .54 | − .26 | − .85 | − .54 | +1.25 | +1.94 | − .74 | − .98 |
| South Atlantic States: | | | | | | | | | | | | | |
| Charlotte, N. C | +2.97 | + .93 | − .71 | − .78 | − .21 | + .41 | − .22 | − .92 | −1.03 | − .51 | − .27 | − .56 | −1.08 |
| Wilmington, N. C | −4.10 | + .72 | − .61 | +1.33 | + .31 | +1.38 | − .34 | − .94 | + .27 | + .34 | −1.13 | − .66 | − .03 |
| Charleston, S. C | −2.36 | + .78 | − .82 | + .51 | − .17 | − .69 | + .89 | − .78 | + .26 | −1.01 | −1.24 | − .17 | − .01 |
| Augusta, Ga | +4.96 | + .34 | − .52 | − .69 | − .48 | − .63 | − .77 | − .71 | + .84 | − .73 | − .08 | +1.39 | −1.12 |
| Savannah, Ga | +2.55 | − .19 | − .84 | − .33 | − .38 | − .23 | − .02 | − .57 | − .72 | − .82 | −1.52 | −1.14 | −1.61 |
| Jacksonville, Fla | − .99 | − .53 | − .63 | +1.97 | − .71 | − .75 | − .08 | − .94 | + .04 | +1.09 | −1.21 | + .33 | −1.15 |
| Gulf States: | | | | | | | | | | | | | |
| Atlanta, Ga | − .91 | + .17 | − .80 | − .32 | − .62 | − .53 | − .43 | − .33 | − .82 | − .36 | − .41 | − .81 | − .68 |
| Mobile, Ala | −1.97 | −1.00 | − .94 | − .64 | − .88 | − .91 | − .88 | − .98 | − .54 | − .60 | +2.88 | −1.36 | − .19 |
| Montgomery, Ala | −3.71 | − .69 | −1.08 | + .82 | −1.04 | − .94 | − .66 | − .88 | + .58 | −1.03 | − .74 | − .91 | − .35 |
| Vicksburg, Miss | +1.87 | + .15 | −1.40 | −1.06 | −1.27 | −1.19 | −1.11 | −1.10 | − .81 | − .27 | +1.98 | + .75 | − .82 |
| New Orleans, La | −7.34 | − .82 | −1.13 | − .10 | −1.18 | −1.09 | −1.05 | −1.06 | −1.17 | −1.19 | +2.95 | −1.00 | + .27 |
| Shreveport, La | −5.24 | + .11 | −1.16 | − .53 | −1.13 | −1.00 | +1.50 | − .91 | − .76 | − .91 | − .88 | − .08 | − .79 |
| Fort Smith, Ark | −4.30 | − .76 | − .74 | +1.11 | −1.14 | +4.64 | − .08 | − .54 | − .34 | − .54 | +3.77 | − .64 | − .98 |
| Little Rock, Ark | −4.35 | − .17 | − .60 | + .69 | −1.20 | − .37 | − .26 | − .27 | +1.35 | −1.18 | − .55 | − .94 | − .89 |
| Palestine, Tex | −1.85 | + .80 | − .96 | − .21 | −1.20 | − .77 | +2.94 | −1.35 | −1.28 | −1.21 | − .30 | − .57 | − .87 |
| Galveston, Tex | +3.88 | + .93 | + .09 | − .23 | − .70 | − .73 | − .81 | − .89 | −1.00 | −1.11 | − .52 | − .83 | −1.04 |
| San Antonio, Tex | −5.29 | − .23 | + .02 | + .76 | − .77 | − .48 | +1.14 | − .66 | − .70 | − .70 | +1.09 | +1.92 | − .56 |
| Ohio Valley and Tennessee: | | | | | | | | | | | | | |
| Memphis, Tenn | −4.00 | − .49 | −1.15 | − .85 | −1.25 | + .23 | + .80 | − .76 | − .18 | − .01 | − .26 | − .81 | + .30 |
| Nashville, Tenn | +2.99 | + .53 | −1.12 | + .32 | − .94 | + .80 | + .24 | − .12 | − .77 | − .89 | − .98 | − .96 | − .98 |
| Chattanooga, Tenn | +7.75 | + .58 | −1.04 | +3.16 | − .80 | − .72 | − .41 | − .36 | − .90 | − .33 | + .86 | − .91 | − .75 |
| Louisville, Ky | + .36 | + .04 | −1.07 | + .67 | − .32 | − .06 | + .07 | + .21 | − .85 | − .31 | + .99 | − .29 | − .14 |
| Indianapolis, Ind | − .74 | − .55 | − .77 | − .23 | − .59 | + .29 | − .43 | − .56 | − .77 | + .65 | − .84 | − .92 | − .42 |
| Cincinnati, Ohio | + .55 | + .01 | − .76 | − .70 | − .35 | + .23 | + .72 | − .77 | − .77 | +1.15 | .00 | − .82 | + .66 |
| Columbus, Ohio | −1.84 | − .11 | − .55 | − .54 | − .63 | + .08 | − .45 | − .94 | − .69 | + .03 | − .76 | − .69 | − .25 |
| Pittsburg, Pa | + .51 | + .69 | − .30 | − .66 | + .20 | − .45 | − .50 | + .94 | − .57 | + .32 | + .05 | + .18 | − .27 |
| Lake region: | | | | | | | | | | | | | |
| Oswego, N. Y | +1.74 | + .69 | − .05 | − .42 | − .48 | − .44 | + .21 | + .29 | + .45 | + .21 | − .72 | + .29 | − .70 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Buffalo, N. Y | −1.05 | − .25 | − .38 | − .56 | − .64 | − .42 | + .03 | − .33 | − .59 | + .89 | − .82 | − .60 | − .79 |
| Cleveland, Ohio | − .70 | − .14 | − .20 | − .49 | − .35 | − .36 | − .53 | + .09 | + .06 | − .25 | − .54 | − .53 | − .85 |
| Detroit, Mich | +1.47 | − .36 | − .44 | − .36 | − .45 | − .10 | − .40 | + .66 | − .26 | − .57 | + .10 | − .63 | − .72 |
| Grand Haven, Mich | −2.07 | − .56 | − .45 | − .55 | +1.19 | − .58 | − .16 | − .45 | +1.10 | + .32 | − .83 | − .94 | − .87 |
| Milwaukee, Wis | −3.56 | − .61 | − .48 | − .70 | − .24 | − .29 | + .06 | − .69 | + .67 | − .05 | + .23 | − .91 | − .49 |
| Chicago, Ill | −2.86 | − .68 | − .66 | − .65 | − .76 | + .61 | − .41 | − .58 | + .77 | + .26 | − .03 | − .23 | − .89 |
| Duluth, Minn | −1.90 | − .48 | − .56 | − .12 | + .96 | − .29 | − .68 | + .16 | + .22 | +1.07 | − .16 | − .08 | − .02 |
| Upper Mississippi Valley: | | | | | | | | | | | | | |
| St. Paul, Minn | +1.19 | − .49 | − .53 | − .53 | + .82 | − .54 | − .70 | − .17 | +1.21 | +1.51 | + .74 | +1.54 | − .81 |
| La Crosse, Wis | − .55 | − .47 | − .39 | − .31 | +2.03 | + .07 | − .66 | + .44 | +1.31 | +1.71 | +5.01 | +1.44 | −1.04 |
| Davenport, Iowa | −1.45 | − .59 | − .21 | + .10 | + .95 | − .24 | +1.35 | − .38 | +2.53 | + .10 | − .88 | + .24 | + .43 |
| Des Moines, Iowa | −2.10 | − .42 | − .63 | − .54 | + .84 | + .39 | + .67 | +1.17 | − .17 | − .78 | −1.33 | − .01 | − .47 |
| Springfield, Ill | −1.14 | − .79 | − .77 | − .22 | − .99 | +1.16 | − .20 | +1.99 | +2.49 | + .88 | + .07 | − .45 | − .95 |
| Cairo, Ill | − .13 | + .06 | − .81 | + .26 | − .79 | +1.13 | + .96 | + .16 | − .77 | − .31 | + .41 | +2.65 | −1.04 |
| St. Louis, Mo | + .51 | − .32 | − .86 | + .54 | − .95 | + .63 | + .60 | +1.54 | −1.06 | − .62 | − .18 | − .50 | − .78 |
| Missouri Valley: | | | | | | | | | | | | | |
| Springfield, Mo | −4.33 | − .25 | + .16 | +2.20 | −1.14 | +1.12 | +2.09 | −1.25 | −1.15 | − .18 | + .86 | + .89 | − .19 |
| Kansas City, Mo | − .04 | + .16 | − .68 | +1.37 | − .36 | − .67 | + .06 | +1.31 | −1.12 | + .79 | + .50 | − .48 | − .96 |
| Concordia, Kans | −1.01 | − .05 | − .43 | − .50 | − .54 | − .54 | − .01 | + .88 | +1.17 | + .61 | + .97 | − .92 | + .10 |
| Omaha, Nebr | −1.68 | − .49 | − .73 | − .69 | + .50 | + .68 | − .38 | + .49 | − .26 | − .20 | −1.02 | + .80 | + .12 |
| Valentine, Nebr | − .51 | − .58 | − .68 | − .70 | + .11 | − .45 | − .45 | + .29 | + .82 | + .03 | − .48 | − .63 | + .40 |
| Huron, S. Dak | − .30 | − .65 | − .70 | − .50 | − .03 | + .34 | − .22 | + .43 | − .35 | + .76 | − .41 | − .50 | − .45 |
| Extreme Northwest: | | | | | | | | | | | | | |
| Moorhead, Minn | − .05 | − .23 | − .44 | − .14 | + .86 | − .20 | − .36 | − .48 | +1.68 | + .18 | − .32 | − .66 | − .82 |
| Bismarck, N. Dak | −1.23 | − .42 | − .42 | + .50 | − .54 | +1.46 | − .31 | − .50 | +1.36 | +2.26 | − .69 | − .05 | + .29 |
| Williston, N. Dak | − .09 | − .25 | − .22 | + .04 | − .34 | + .12 | − .40 | − .42 | + .05 | +2.18 | − .07 | − .76 | − 25 |
| Rocky Mountain Slope: | | | | | | | | | | | | | |
| Havre, Mont | + .50 | − .20 | − .17 | + .12 | − .10 | +3.02 | − .29 | + .22 | + .79 | + .06 | − .45 | − .56 | + .07 |
| Helena, Mont | + .63 | − .23 | − .22 | + .35 | − .24 | − .14 | − .23 | +1.21 | − .42 | − .33 | − .55 | − .38 | − .50 |
| Spokane, Wash | + .67 | + .18 | .00 | − .16 | + .05 | − .23 | .00 | − .20 | − .06 | + .02 | − .38 | − .42 | − .12 |
| Salt Lake City, Utah | +2.27 | − .54 | − .54 | − .35 | − .25 | + .27 | − .23 | + .10 | + .38 | +1.06 | − .21 | − .16 | − .08 |
| Cheyenne, Wyo | +3.21 | − .11 | − .29 | − .35 | + .33 | − .24 | − .52 | + .70 | − .28 | − .07 | − .31 | − .30 | − .15 |
| North Platte, Nebr | − .49 | − .45 | − .53 | − .56 | + .26 | + .14 | − .50 | + .45 | +1.07 | − .75 | − .73 | − .20 | + .25 |
| Denver, Colo | + .30 | − .03 | − .45 | − .53 | − .38 | − .55 | − .70 | − .63 | − .57 | − .42 | + .13 | − .28 | − .30 |
| Dodge, Kans | −1.38 | − .06 | − .35 | − .41 | − .17 | − .54 | + .14 | − .36 | − .68 | +2.17 | +6.70 | − .77 | − .15 |
| Abilene, Tex | −3.11 | + .33 | + .39 | + .37 | − .77 | + .23 | + .74 | − .81 | + .64 | + .35 | + .45 | + .02 | − .72 |
| Santa Fe, N. Mex | − .06 | − .03 | − .03 | − .17 | − .21 | − .21 | − .25 | − .28 | − .22 | − .17 | − .14 | − .18 | + .83 |
| El Paso, Tex | −1.06 | + .67 | + .19 | − .04 | − .07 | − .07 | − .09 | − .14 | − .14 | − .09 | + .20 | − .05 | + .18 |
| Phenix, Ariz | − .79 | − .07 | − .07 | − .07 | − .07 | − .07 | − .07 | − .01 | .00 | + .14 | .00 | .00 | + .58 |
| Pacific Coast: | | | | | | | | | | | | | |
| Seattle, Wash | −2.40 | − .44 | +1.49 | − .45 | − .25 | − .37 | + .21 | + .28 | − .13 | + .06 | + .04 | − .19 | − .04 |
| Portland, Oreg | −5.81 | − .58 | + .85 | − .28 | + .38 | − .36 | + .37 | − .02 | + .44 | + .25 | − .48 | − .44 | − .09 |
| Roseburg, Oreg | +3.34 | − .56 | − .01 | − .16 | + .61 | − .18 | − .26 | + .10 | + .94 | + .20 | − .35 | − .31 | + .03 |
| Red Bluff, Cal | +3.63 | − .56 | − .51 | − .46 | + .28 | − .36 | − .33 | − .28 | + .31 | + .74 | − .14 | − .11 | + .08 |
| Sacramento, Cal | − .18 | − .56 | − .56 | − .51 | − .33 | − .32 | − .18 | − .19 | − .10 | + .82 | − .07 | − .05 | + .04 |
| San Francisco, Cal | − .38 | − .55 | − .49 | − .01 | − .10 | − .27 | − .21 | − .14 | + .03 | + .70 | − .07 | − .07 | − .05 |
| Los Angeles, Cal | −4.90 | − .41 | − .31 | − .17 | − .10 | − .10 | − .11 | − .07 | − .07 | + .50 | − .04 | .00 | .00 |
| San Diego, Cal | −2.42 | − .21 | − .20 | − .14 | + .15 | − .05 | − .09 | − .07 | − .05 | + .28 | − .03 | − .03 | .00 |

*Precipitation departures (inches and hundredths) for season of 1899 from normal, etc.*—Continued.

| Stations. | For weeks ending— | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July— | | | | | August— | | | | September— | | | | October— | |
| | 3. | 10. | 17. | 24. | 31. | 7. | 14. | 21. | 28. | 4. | 11. | 18. | 25. | 2. | 9. |
| New England: | | | | | | | | | | | | | | | |
| Eastport, Me | −0.26 | +0.51 | −0.56 | +1.00 | +0.29 | −0.84 | −0.63 | −0.77 | −0.38 | −0.44 | −0.65 | −0.76 | +0.72 | −0.59 | +0.37 |
| Portland, Me | − .56 | − .04 | − .62 | − .25 | +1.68 | − .53 | + .01 | − .84 | − .41 | − .05 | − .48 | − .48 | +1.66 | + .20 | − .73 |
| Boston, Mass | + .36 | + .28 | − .69 | − .76 | + .58 | − .92 | − .14 | −1.03 | + .52 | − .38 | − .65 | − .34 | +2.36 | + .58 | − .10 |
| Middle Atlantic States: | | | | | | | | | | | | | | | |
| Albany, N. Y | − .24 | + .02 | − .45 | − .87 | + .40 | − .02 | − .54 | − .91 | − .45 | − .31 | − .43 | − .78 | + .40 | +3.45 | − .77 |
| New York City | − .12 | +1.64 | +1.19 | − .16 | − .37 | + .28 | +1.12 | −1.04 | − .78 | +2.24 | − .81 | + .10 | + .56 | − .54 | − .10 |
| Philadelphia, Pa | − .71 | + .17 | − .83 | − .98 | +2.52 | + .51 | +1.85 | − .98 | − .16 | − .86 | − .34 | − .32 | + .86 | + .45 | + .03 |
| Washington, D. C | − .94 | + .63 | + .38 | − .61 | +1.50 | + .68 | − .21 | + .01 | − .41 | − .78 | − .84 | − .23 | +1.74 | +2.06 | + .64 |
| Lynchburg, Va | − .04 | + .81 | − .77 | − .43 | + .62 | + .86 | + .13 | +1.47 | +1.22 | − .43 | + .15 | − .75 | +1.42 | − .07 | +1.16 |
| Norfolk, Va | − .79 | + .42 | − .75 | − .71 | +1.48 | −1.13 | −1.24 | + .81 | −1.31 | −1.19 | − .99 | − .98 | − .89 | − .91 | + .40 |
| South Atlantic States: | | | | | | | | | | | | | | | |
| Charlotte, N. C | −1.17 | + .10 | −1.17 | −1.00 | +3.00 | −1.26 | − .45 | −1.22 | +2.54 | − .43 | + .46 | − .72 | − .37 | − .49 | +2.08 |
| Wilmington, N. C | − .17 | +1.13 | −1.63 | +1.61 | + .33 | + .54 | −1.08 | − .34 | − .55 | − .97 | −1.56 | −1.51 | −1.39 | −1.28 | − .15 |
| Charleston, S. C | − .86 | − .20 | −1.49 | + .62 | −1.15 | −1.81 | −1.45 | − .44 | + .39 | +3.47 | −1.61 | −1.12 | − .59 | − .98 | + .04 |
| Augusta, Ga | − .10 | + .60 | −1.19 | − .37 | − .08 | − .98 | +3.00 | −1.19 | − .36 | +1.31 | + .08 | − .95 | − .57 | − .61 | +2.41 |
| Savannah, Ga | −1.23 | +1.54 | − .01 | − .80 | − .98 | −1.68 | − .66 | − .57 | +1.82 | +1.47 | −1.54 | +2.64 | −1.21 | −1.19 | + .56 |
| Jacksonville, Fla | − .05 | + .33 | − .33 | − .02 | − .58 | −1.14 | − .62 | −1.09 | − .60 | − .07 | −2.01 | +1.54 | − .80 | −1.43 | + .68 |
| Gulf States: | | | | | | | | | | | | | | | |
| Atlanta, Ga | − .40 | + .27 | −1.12 | +3.15 | − .33 | −1.12 | −1.02 | − .96 | − .32 | +1.34 | + .96 | − .88 | − .75 | − .49 | +2.16 |
| Mobile, Ala | −1.34 | − .71 | −1.03 | +1.21 | +4.38 | −1.00 | − .39 | − .03 | − .95 | − .91 | − .98 | −1.20 | − .38 | − .99 | − .47 |
| Montgomery, Ala | − .52 | − .75 | − .33 | +9.12 | +1.30 | + .76 | − .98 | + .64 | +1.49 | +1.40 | − .49 | − .70 | − .21 | − .61 | +1.49 |
| Vicksburg, Miss | − .38 | − .88 | −1.05 | + .47 | − .09 | +2.01 | − .79 | + .14 | − .69 | + .27 | + .50 | − .87 | − .55 | − .63 | − .48 |
| New Orleans, La | − .43 | − .47 | −1.27 | − .88 | +1.96 | −1.33 | −1.25 | − .24 | − .52 | −1.04 | −1.09 | − .85 | −1.02 | − .91 | − .74 |
| Shreveport, La | − .42 | − .19 | − .83 | − .74 | − .63 | − .52 | − .39 | − .31 | − .43 | − .29 | − .85 | − .64 | − .80 | − .80 | − .70 |
| Fort Smith, Ark | − .76 | − .14 | − .90 | +3.11 | − .92 | − .87 | − .26 | − .27 | − .84 | − .84 | − .81 | − .53 | − .83 | − .75 | − .67 |
| Little Rock, Ark | − .53 | + .40 | − .47 | +4.45 | − .68 | − .92 | − .89 | − .96 | + .79 | − .81 | + .61 | + .72 | − .69 | − .59 | − .52 |
| Palestine, Tex | +8.17 | − .03 | − .13 | +1.17 | − .25 | − .56 | − .59 | + .66 | − .63 | − .13 | − .76 | − .49 | − .77 | − .75 | − .70 |
| Galveston, Tex | +2.76 | − .67 | + .16 | − .68 | +4.28 | −1.05 | −1.20 | − .76 | −1.38 | +2.33 | −1.52 | −1.51 | −1.38 | −1.25 | −1.05 |
| San Antonio, Tex | + .65 | − .18 | + .37 | − .50 | .00 | − .73 | − .84 | − .93 | − .95 | − .87 | − .87 | − .29 | − .74 | − .62 | − .47 |
| Ohio Valley and Tennessee: | | | | | | | | | | | | | | | |
| Memphis, Tenn | − .89 | − .06 | − .77 | +2.21 | +1.36 | − .65 | − .59 | − .09 | + .03 | − .67 | − .53 | − .64 | − .55 | − .62 | − .58 |
| Nashville, Tenn | − .42 | − .97 | − .94 | +3.65 | + .84 | + .53 | − .67 | − .66 | − .76 | + .15 | − .23 | −1.02 | − .63 | − .35 | − .28 |
| Chattanooga, Tenn | −1.06 | − .52 | − .93 | + .79 | − .82 | − .59 | − .85 | − .83 | − .63 | +1.09 | − .26 | − .91 | − .45 | − .47 | +1.68 |
| Louisville, Ky | − .95 | − .73 | − .20 | + .08 | − .43 | + .53 | + .50 | − .80 | − .76 | − .70 | − .32 | − .67 | − .15 | − .55 | − .52 |
| Indianapolis, Ind | − .92 | − .93 | + .12 | − .97 | +1.58 | +2.79 | +1.45 | − .70 | − .70 | − .20 | + .36 | − .27 | − .14 | − .58 | − .59 |
| Cincinnati, Ohio | − .83 | + .03 | − .15 | − .74 | − .61 | +1.14 | + .65 | − .86 | − .67 | − .73 | + .93 | − .55 | + .03 | − .39 | − .46 |
| Columbus, Ohio | − .77 | − .27 | +1.34 | − .41 | +1.30 | + .46 | − .55 | − .76 | − .61 | − .16 | − .48 | − .63 | + .54 | − .33 | − .52 |
| Pittsburg, Pa | + .08 | − .75 | − .16 | − .79 | + .50 | + .43 | + .03 | − .70 | − .10 | + .39 | + .13 | − .61 | − .23 | − .01 | − .28 |
| Lake region: | | | | | | | | | | | | | | | |
| Oswego, N. Y | − .53 | + .24 | − .53 | − .28 | − .55 | − .32 | − .37 | − .56 | − .30 | − .23 | − .52 | − .63 | − .31 | +1.95 | − .47 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Buffalo, N. Y | — .63 | + .15 | — .48 | .00 | — .28 | — .64 | — .48 | — .70 | — .50 | — .31 | — .42 | — .66 | + .44 | + .61 | — .67 |
| Cleveland, Ohio | — .18 | + .75 | +1.15 | — .74 | — .35 | — .50 | — .70 | — .70 | + .62 | — .71 | — .82 | — .84 | + .32 | — .38 | — .19 |
| Detroit, Mich | — .31 | + .16 | — .08 | + .42 | — .53 | — .28 | — .63 | — .63 | — .31 | — .11 | — .47 | — .58 | + .83 | — .29 | — .56 |
| Grand Haven, Mich | — .45 | +1.41 | + .03 | — .32 | + .04 | — .28 | — .46 | — .60 | — .65 | — .74 | + .47 | — .44 | +1.22 | — .72 | — .77 |
| Milwaukee, Wis | — .19 | + .53 | — .49 | — .15 | — .59 | + .59 | + .57 | — .59 | — .63 | — .60 | — .39 | — .03 | +1.57 | — .58 | — .54 |
| Chicago, Ill | + .05 | +2.37 | +2.16 | — .77 | — .50 | — .09 | — .40 | — .65 | — .63 | — .67 | — .32 | + .02 | + .26 | — .19 | — .70 |
| Duluth, Minn | +2.20 | — .33 | — .36 | — .51 | — .31 | — .36 | +2.03 | + .96 | + .32 | — .45 | + .66 | — .71 | — .87 | — .75 | — .67 |
| Upper Mississippi Valley: | | | | | | | | | | | | | | | |
| St. Paul, Minn | — .37 | — .54 | — .08 | — .28 | — .57 | — .46 | — .33 | — .13 | — .19 | + .46 | — .05 | — .55 | — .59 | — .61 | — .51 |
| La Crosse, Wis | + .11 | — .95 | +2.03 | — .38 | — .74 | — .17 | + .39 | + .07 | + .34 | — .71 | — .85 | — .73 | — .42 | — .86 | — .63 |
| Davenport, Iowa | — .55 | + .45 | + .44 | — .84 | — .74 | +2.13 | + .03 | — .53 | — .36 | — .77 | — .55 | — .27 | — .60 | — .68 | — .63 |
| Des Moines, Iowa | +1.28 | + .67 | — .59 | — .77 | — .23 | +1.41 | + .17 | — .69 | — .17 | — .70 | — .35 | — .77 | — .01 | — .70 | — .70 |
| Springfield, Ill | — .34 | + .39 | — .51 | — .56 | — .38 | +1.16 | +1.31 | — .03 | — .57 | — .67 | + .49 | + .53 | — .15 | — .52 | — .64 |
| Cairo, Ill | — .78 | — .07 | — .76 | +2.03 | — .36 | — .21 | — .63 | — .04 | — .63 | — .63 | + .06 | + .09 | — .26 | — .60 | — .56 |
| St. Louis, Mo | — .90 | + .73 | + .39 | — .71 | + .42 | + .78 | + .48 | — .55 | — .77 | — .77 | — .50 | + .13 | — .54 | — .70 | — .67 |
| Missouri Valley: | | | | | | | | | | | | | | | |
| Springfield, Mo | — .85 | — .39 | —1.06 | — .78 | — .43 | — .88 | — .61 | — .81 | — .57 | — .91 | — .91 | — .04 | — .95 | — .83 | — .71 |
| Kansas City, Mo | —1.09 | +3.00 | + .30 | — .91 | — .57 | + .85 | + .13 | — .88 | +1.56 | — .84 | + .34 | — .33 | — .77 | — .77 | — .77 |
| Concordia, Kans | —2.18 | — .64 | — .12 | — .70 | +1.18 | — .48 | +1.06 | — .63 | + .21 | — .59 | + .50 | — .13 | — .56 | — .47 | — .18 |
| Omaha, Nebr | — .26 | —1.06 | — .47 | — .98 | — .17 | +1.69 | +2.67 | — .74 | — .55 | — .63 | — .38 | — .70 | — .45 | — .63 | — .54 |
| Valentine, Nebr | — .04 | — .65 | — .14 | — .50 | — .19 | + .13 | + .30 | + .31 | — .19 | — .13 | — .25 | — .21 | — .21 | — .21 | — .13 |
| Huron, S. Dak | — .54 | — .05 | — .45 | — .70 | — .70 | — .39 | — .60 | + .67 | — .33 | — .07 | — .36 | — .09 | — .28 | — .29 | — .26 |
| Extreme Northwest: | | | | | | | | | | | | | | | |
| Moorhead, Minn | + .48 | + .65 | — .21 | — .86 | — .67 | — .67 | — .13 | +1.86 | — .56 | — .50 | — .45 | + .15 | — .43 | + .30 | — .49 |
| Bismarck, N. Dak | + .04 | — .58 | — .52 | — .46 | — .33 | — .18 | — .39 | + .16 | — .42 | — .36 | — .20 | — .24 | — .24 | — .21 | — .28 |
| Williston, N. Dak | — .14 | + .83 | — .40 | — .27 | — .07 | + .09 | — .18 | — .25 | — .16 | — .21 | — .21 | — .21 | — .16 | — .09 | — .21 |
| Rocky Mountain Slope: | | | | | | | | | | | | | | | |
| Havre, Mont | — .29 | — .40 | — .20 | + .04 | — .04 | +1.88 | — .18 | — .14 | + .35 | — .13 | — .28 | — .16 | — .28 | — .22 | — .10 |
| Helena, Mont | — .38 | — .20 | — .24 | + .14 | — .02 | + .26 | + .33 | — .12 | + .24 | + .33 | — .28 | — .17 | — .28 | — .24 | — .18 |
| Spokane, Wash | — .14 | — .12 | — .18 | — .10 | + .08 | — .01 | + .21 | + .20 | + .63 | + .14 | + .12 | + .19 | — .28 | — .26 | — .35 |
| Salt Lake City, Utah | — .13 | — .14 | + .19 | — .02 | — .09 | + .92 | — .14 | — .14 | — .21 | — .21 | — .21 | — .21 | — .21 | — .27 | — .35 |
| Cheyenne, Wyo | — .09 | + .42 | + .69 | — .42 | + .76 | + .22 | — .26 | — .25 | — .33 | + .10 | — .15 | — .21 | — .21 | — .19 | — .16 |
| North Platte, Nebr | + .08 | — .64 | — .39 | — .39 | + .40 | + .24 | + .10 | — .55 | — .54 | — .06 | — .06 | — .24 | — .28 | — .28 | — .22 |
| Denver, Colo | + .02 | + .28 | + .23 | — .40 | — .12 | +1.33 | — .35 | — .35 | — .32 | — .14 | — .21 | + .04 | — .14 | — .21 | — .21 |
| Dodge, Kans | + .35 | — .68 | + .65 | +2.37 | + .47 | — .47 | — .67 | — .66 | — .40 | — .31 | + .72 | + .27 | — .28 | — .28 | + .12 |
| Abilene, Tex | +2.25 | — .40 | — .31 | + .34 | — .34 | — .52 | — .61 | — .53 | — .63 | — .63 | — .56 | — .12 | — .56 | — .56 | — .56 |
| Santa Fe, N. Mex | — .23 | — .21 | +2.25 | + .70 | — .70 | — .54 | — .66 | — .53 | — .34 | — .37 | + .05 | + .63 | — .35 | — .31 | — .20 |
| El Paso, Tex | — .18 | + .16 | — .28 | +1.23 | + .01 | — .07 | + .13 | — .42 | — .38 | — .31 | + .36 | — .28 | — .24 | — .21 | — .20 |
| Phenix, Ariz | — .07 | — .03 | — .11 | + .43 | — .24 | + .43 | — .27 | — .03 | — .18 | — .06 | + .23 | — .14 | — .14 | — .18 | — .10 |
| Pacific Coast: | | | | | | | | | | | | | | | |
| Seattle, Wash | + .08 | — .09 | — .21 | — .10 | — .05 | — .14 | +1.05 | + .61 | + .42 | + .11 | — .47 | + .08 | — .63 | — .15 | — .63 |
| Portland, Oreg | — .16 | — .18 | — .14 | + .39 | — .07 | — .07 | + .26 | + .83 | +1.02 | + .14 | + .09 | — .34 | — .50 | + .20 | — .70 |
| Roseburg, Oreg | — .21 | — .14 | — .09 | — .07 | — .07 | .00 | +1.59 | + .28 | + .17 | + .08 | + .12 | — .22 | — .31 | — .12 | — .54 |
| Red Bluff, Cal | — .07 | .00 | .00 | .00 | .00 | + .02 | .00 | .00 | .00 | — .06 | — .11 | — .16 | — .21 | — .21 | — .26 |
| Sacramento, Cal | .00 | .00 | .00 | .00 | .00 | + .02 | .00 | .00 | .00 | — .04 | — .07 | — .07 | — .08 | — .14 | — .14 |
| San Francisco, Cal | — .02 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | — .01 | .00 | — .07 | — .10 | — .16 | — .21 |
| Los Angeles, Cal | — .02 | .00 | .00 | .00 | .00 | + .01 | .00 | .00 | .00 | — .03 | .00 | .00 | — .03 | — .07 | — .14 |
| San Diego, Cal | .00 | .00 | .00 | .00 | — .01 | — .07 | — .05 | + .07 | .00 | .00 | .00 | .00 | — .06 | .00 | — .04 |

## PROGRESS IN AGRICULTURAL CHEMISTRY IN 1899.

As often happens, a large part of the work of this field has been of such a nature that no immediate results could be expected. In all parts of the world contributions have been made to agricultural chemistry during the past year which do not seem of sufficient general value to merit mention in a paper of this nature, but which will serve to make up data essential to generalizations that may follow in the near future. As an illustration, a vast array of digestion experiments may be cited, as well as the chemical examination of soils, irrigation waters, foods, and feeding stuffs.

The subject of the application of nitrifying organisms to the soil has received an increased amount of attention, and while the results of many experiments would seem to be conclusive, it can not be said that a marked advance has been made. It is well known that such an application is of value to soils on which a stand of a leguminous plant could not be otherwise secured, but much remains to be done in determining the classes of soils to which ferments may be added with advantage, and the particular ferment which is essential to each plant.

It has long been held that the ordinary complex nitrogenous compounds of the soil are changed successively into ammonia, nitrous acid, and nitric acid. Within the last year it has also been shown that even the simplest amins, when subjected to the action of soil ferments, are never oxidized to nitrous or nitric acid without the formation of ammonia as a preliminary product.[1]

Experiments made on the conservation of manures,[2] indicate that greater loss takes place in storing acid manures than those whose reaction is alkaline. In the former case the loss is due to the liberation of free nitrogen owing to the reaction of nitrites with amido or ammonium compounds, while some ammonia is given off by alkaline manures.

Pot experiments with soils show that a reduction in yield follows the application of coarse straw and manure. It has been held that this was due to that change in the physical nature of the soil caused by the coarse texture of the material employed. Recent experiments,[3] however, indicate that the reduction in yield is due to the supplying of a favorable medium for the denitrifying organisms already present in the soil. The grinding of the straw and manure did not tend to reduce the action of the denitrifying organisms. Pentosans were found to promote the development of these organisms more than cellulose. Ordinary variations of the water content of the soil did not appreciably affect denitrification, but a high water content seemed to favor it. It is not believed that much importance is to be attached to denitrification resulting from this cause in the field.

Contrary to the commonly accepted theory, humus, obtained from soil and peat, has been found to be comparatively free from amids.[4] Evidence has also been offered in support of the view that humus is capable of decomposing minerals and insoluble salts.[5]

Experiments[6] published during the year seem to indicate that the availability of the phosphoric acid of certain phosphates is due to the action of silicic acid. These acids always exist together in soluble form, and the amounts of the two are somewhat, though not regularly, proportional. It is suggested that phosphoric acid goes into solution on account of the more or less complete precipitation, either as carbonate or humate, of the calcium with which it is originally combined, and the consequent combination of phosphoric acid with ammonia or other alkalies. This takes place most readily in phosphates whose lime is most loosely combined, such as superphosphates and Thomas slag.

The investigation of peaty soils has been continued. One sample,[7] whose phosphoric acid content was 0.38 per cent, contained 0.05 per cent of free phosphoric acid, and 0.13 per cent combined with humus. Only insignificant amounts of lecithin were present.

The percentage of chlorin in the ash of the tobacco plant[8] has been found, generally speaking, to be roughly proportional to that of the chlorin in the soil, and inversely proportional to the percentage of nitrates in the soil. The chlorin occurs in greatest abundance in the leaves and is combined almost entirely with potassium and sodium, potassium chlorid largely predominating.

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[1] E. Demoussy, Ann. agron., 1899, **25**, 232–244.
[2] G. Marpmann, C. B. Bakt. Par., 1899, **2**, 67–70.
[3] Kruger and Schneidewind, Landw. Jahr., 1899, **28**, 217–252.
[4] F. Sistini, Landw. Versst., 1899, **51**, 153–158.
[5] P. Lyashchenko, Selsk, Kohz. i Lyesov, 1899, **193**, 718, through Exp. Sta. Record, 1899, **11**, 623.
[6] W. Hoffmeister, ibid., 1899, **52**, 329–346.
[7] G. Nannes, J. Landw., 1899, **47**, 45–48.
[8] P. Pichard, Cr., 1899, **128**, 615–617.

The cause of the reduction in the yield of starch when potatoes are fertilized with crude Stassfurt salts[1] has been studied further, and the theory that injurious effects were due to the chlorin contained in the crude salts is fully confirmed. In comparative experiments with potassium fertilizers containing chlorin and those free from it, the latter were found to increase both the percentage of starch and the yield of tubers and to be entirely free from the injurious effects of the former. It is suggested that potatoes take up more potash in the form of chlorid than in any other combination, and that the potassium chlorid content of the tubers interferes with the formation of starch.

Some attention has been given to the injurious effects suffered by soils that have been overflowed by sea water.[2] In addition to the salt that is left behind, the layer of mud that is deposited is said to prevent the washing out of the sodium chlorid and interfere with the germination of the seed.

In a large number of laboratories an extensive study of the composition of soils has been made. Of much of this work it can only be said at present that the literature of the subject has been increased. Many of the analyses were connected with extensive plans of fertilization, crop rotation, or irrigation. In some cases they form a part of the survey of a large section of the country. Many agricultural laboratories, both in this country and abroad, have conducted work of this nature.

Analytical methods have been criticised, and some new methods and important modifications of old ones have been devised. As illustrations, two methods[3] may be cited which have been suggested for estimation of the carbon dioxid combined with lime, without including that of the carbonate of iron. In this connection may also be mentioned valuable contributions that have been made to the literature of methods for the determination of the productiveness of soils.[4]

The study of the effect of special fertilization and culture on the composition of seeds has received considerable attention. It has been found that the fertilization of rape[5] for a large yield (with phosphoric acid) produces a seed with a relatively high percentage of fat and low percentage of proteids. Maize[6] has also been found to be susceptible of improvement in its composition, by means of seed selection. Thus, it is possible to grow a product rich in starch or in proteids as may be desired. It is claimed that this cereal may be roughly graded with respect to its proteid and fat content by the naked eye, since the percentage of proteids varies with the thickness of the glutinous layer, and that of the fat with the size of the germ.

The water supply and water content of the soil has received the usual amount of attention at home and abroad. A study has been made[7] of the relation between the fertilizer and water content of the soil, and the amount of water removed therefrom by oats under varying water and fertilizer content of the soil. In this work it was found that the water supplied could be more completely utilized the larger the application of fertilizers, and that a liberal application of fertilizers requires a large amount of water. With an insufficient water supply, however, a heavy application of fertilizers was found to make the soil solution too concentrated and cause a reduction of the yield. The application of salts, which caused deleterious changes in the composition of the fertilizing ingredients of the soil, was found to affect the water supply unfavorably. At the same time, experiments are described[8] which seem to disprove the theory that the applications of fertilizers to soils retards the loss of moisture by evaporation and drainage.

The study of the Australian salt bush and its value as a stock food, as well as its power of resisting alkali and drought, has been continued in California.[9] This work confirms the experience of preceding years in approving of the plant as a forage plant to be raised in alkaline soils. A number of other drought and alkali-resisting plants have also been described,[10] and their value as forage plants discussed.

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[1] Johann. Wilms., J. Landw., 1899, **47**, 251–292. B. Sjollema, ibid., 305–309.

[2] A. J. Swaving, Landw. Versst., 1899, **51**, 463–471.

[3] Adolf Mayer, ibid., 1899, **51**, 339–340. Stutzer and Hartleb, Mitt. Landw. Inst., Breslau, 1899, 101–105, abs. Exp. Sta. Record, 1899, **11**, 110.

[4] W. W. Winner, Izv. Moscow, Selsk. Inst., 1899, 5, 117–144, through Exp. Sta. Record, **11**, 623.

[5] Wilh. Grashoff, J. Landw., 1899, **47**, 85–90.

[6] C. G. Hopkins, Ill. Exp. Sta. Bull., No. 55.

[7] C. v. Seelhorst, J. Landw., 1899, **47**, 369–378.

[8] Willard and Clothier, Kan. Exp. Sta. Bull., No. 89.

[9] M. E. Jaffa, Cal. Exp. Sta. Bull., No. 125.

[10] Alven Nelson, Wyoming Exp. Sta. Bull., No. 42.

The chemistry of the changes of nitrogenous compounds during the germination of the seed and the growth of the plant has received careful attention.[1] The following is given as a summary of our information on this subject at the present time: (1) The process of proteid decomposition occupies a long period, and may be characterized by a peculiar curve. (2) The accumulation of asparagin is characterized by a similar curve, whose maximum is identical with that of the first-mentioned curve. (3) Both curves attain their maxima a few days before the evolution of carbon dioxid takes place. (4) At the end of the period of germination the rate of the formation of asparagin exceeds that of the decomposition of proteid, some asparagin being formed from amido compounds. (5) Proteids may be formed in the dark from carbohydrates and amido compounds, but not from asparagin. (6) Proteids are decomposed as rapidly in seeds germinating in the light as in those germinating in the dark. (7) The formation of proteid begins with the unfolding of the leaves—in some plants in ten days after germination, in others later. (8) Proteids are formed simultaneously from asparagin and other amido compounds, or from the latter first and then the former, but never the reverse. (9) The most energetic regeneration of proteids occurs in seeds.

Recent work in the study of the vegetable proteids[2] has led to the conclusion that the protein bodies hitherto prepared are in fact definite chemical compounds of protein substances with common mineral acids, or contain such compounds in admixture. It is also found that egg albumen prepared by the usual process contains two distinct substances.

Some very extensive work has been done on the chemistry of butter fat,[3] a series of samples of butter made from a herd of high-grade Guernseys being taken as the basis of the work. Attention has been given to the physical and chemical constituents of the substance, its chemical composition, and the chemistry of its rancidity. This work is of such a nature as not to permit an abstract, but adds materially to our information on the subject. In point of scientific value, it will doubtless take a high rank in the chemical work of the year.

## BEET SUGAR.

The attention of the laboratories of a large number of the agricultural experiment stations, especially of the Northern States, has been occupied a part of the year with sugar beets. While it can not be said that any new information has been gained by this work, a large number of analyses have been made, and the data accumulated are undoubtedly of value.

The importance that is attached to this work by the capitalists of the country is indicated by the number of beet-sugar factories that have been completed in the United States during the year 1899, in time to be operated during the beet season of 1899 and 1900, as well as the number building for the season of 1900-1901.

*Beet-sugar factories built in 1899.*

| Company. | Location. | Capacity. a |
|---|---|---|
| Spreckels Sugar Co | Spreckels, Cal | 3,000 |
| American Beet Sugar Co | Oxnard, Cal | 2,000 |
| Union Sugar Co | Santa Maria, Cal | 600 |
| Colorado Sugar Manufacturing Co | Grand Junction, Colo | 350 |
| Illinois Sugar Co | Pekin, Ill | 700 |
| Bay City Sugar Co | Essexville, Mich | 600 |
| West Bay City Sugar Co | West Bay City, Mich | 500 |
| Alma Sugar Co | Alma, Mich | 500 |
| Kalamazoo Sugar Co | Kalamazoo, Mich | 500 |
| Wolverine Sugar Co | Benton Harbor, Mich | 500 |
| Holland Sugar Co | Holland, Mich | 350 |
| Detroit Sugar Co | Rochester, Mich | 500 |
| Peninsula Sugar Refining Co | Caro, Mich | 600 |
| Standard Beet Sugar Co | Ames, Nebr | 600 |
| Utah Sugar Co | Springville, Utah (auxiliary to Lehi) | 350 |
| Washington State Sugar Co | Waverly, Wash | 350 |

a Quantity of beets ground daily when running full time expressed in tons of 2,240 pounds.

[1] D. N. Prianischnikow, Landw. Versst., 1899, **52**, 137-165 and 347-382.
[2] T. B. Osborne, J. Am. Chem. Soc., 1899, **4**, 477-495.
[3] C. A. Browne, jr., J. Am. Chem. Soc., 1899, **21**, 612-633, 807-827, and 975-994.

*Factories building for campaign of 1900–1901.*

| Company. | Location. | Capacity. *a* |
|---|---|---|
| American Beet Sugar Co | Rocky Ford, Colo | 1,000 |
| National Beet Sugar Co | Sugar City, Colo | 500 |
| Continental Sugar Co | Fremont, Ohio | 400 |
| Empire State Sugar Co | Lyons, N. Y | 500 |
| Utah Sugar Co | Bingham Junction, Utah (auxiliary to Lehi). | 350 |

*a* Quantity of beets ground daily when running full time expressed in tons of 2,240 pounds

## THE PRINCIPAL INJURIOUS INSECTS OF THE YEAR 1899.

THE AMERICAN LOCUST (*Schistocerca americana* Dr.).—The American grasshopper or locust appeared in great numbers in portions of Georgia and Mississippi, and did considerable damage to corn and small grains, and in cotton fields.

THE APPLE APHIS (*Aphis mali* Fab.).—Many cases of injury by this common apple pest were reported in various portions of the country, and in particular in Pennsylvania, District of Columbia, North Carolina, Georgia, Iowa, Washington, and Arizona.

THE APPLE-TREE TENT CATERPILLAR (*Clisiocampa americana* Harr.).—The apple-tree tent caterpillars were more abundant than in several years in New York and New Hampshire.

ASPARAGUS BEETLES (*Crioceris asparagi* Linn.; *C. 12-punctata* Linn.).—These two species continued their spread northward and westward, although no serious injury has yet been reported in the new localities which they have invaded.

THE BEAN LEAF-BEETLE (*Cerotoma trifurcata* Forst.).—This leaf-beetle did considerable damage to beans in Virginia, Maryland, Alabama, and Missouri; an attack was noticed also in Illinois.

THE BLACK APHIS OF VIOLETS (*Rhopalosiphum violæ* Perg.).—This, one of the most destructive insects in violet greenhouses, was reported as in previous years to be injurious in several localities in New York, Maryland, and Canada, in the last-mentioned locality being reported by Dr. James Fletcher.

THE BLACK GOOSEBERRY BORER (*Xylocrius agassizii* Lec.).—This new pest of the gooseberry was reported to have done injury to the stems of this fruit in British Columbia, where it was found in stock recently introduced from Oregon.

THE BOLL WORM; CORN-EAR WORM (*Heliothis armiger* Hbn.).—In Georgia the boll worm was more than usually destructive to tomatoes, beans, and sweet corn. It also did extensive damage to beans in Mississippi. Farther north it was less injurious than in many years.

THE BRONZE APPLE-TREE WEEVIL (*Magdalis ænescens* Lec.).—Injury by this new enemy to the fruit industry of the Pacific States was reported in portions of Washington and Oregon to apple trees of all ages.

THE CABBAGE CURCULIO (*Ceutorhynchus rapæ* Gyll.).—This enemy to young cabbage plants was troublesome in the vicinity of Racine, Wis., and was found in the greatest abundance in the District of Columbia.

THE CHERRY FRUIT FLY (*Trypeta cingulata* Loew.).—This fruit fly was found to be very injurious to cherries in various parts of New York the past spring.

THE CHINCH BUG (*Blissus leucopterus* Say).—An outbreak of the chinch bug in northern Ohio has been described by Professor Webster.

THE CLOVER-LEAF WEEVIL (*Phytonomus punctatus* Fab.).—Extremely abundant in the District of Columbia.

THE COLORADO POTATO BEETLE (*Doryphora 10-lineata* Say).—The "Colorado potato bug" attracted more attention than for several years past. Professors Slingerland and Quaintance report it as being more than usually common in New York and Georgia. Professor Johnson did not find it as abundant as usual in Maryland.

THE COMMON STRAWBERRY LEAF-ROLLER (*Phoxopteris comptana* Froel.).—This common leaf-roller occurred in abundance in the District of Columbia and Maryland during the last season, and was reported to have been troublesome also in Iowa and Illinois.

THE COMMON SQUASH BUG (*Anasa tristis* DeG.).—The squash bug continued its depredations on cucurbits, and has been especially destructive in Georgia. Dr. Felt has recorded it as abundant in parts of New York. Correspondents have reported injury also in Mississippi, Wisconsin, and Virginia.

THE DESTRUCTIVE GREEN PEA LOUSE (*Nectarophora destructor* Johns.).—This plant-louse, new to economic science, attracted much attention along the northern Atlantic section of our country. Recorded from Virginia to New Brunswick, it was especially injurious in Maryland, where Professor Johnson reports its damage to acres of peas.

THE EUROPEAN ORCHARD SCALE (*Aspidiotus ostreæformis* Curtis).—The discovery of this well-known European scale in various parts of our country has been recorded by Mr. Marlatt of the Division of Entomology. As yet, it has been found only in the northern portions—New York, Michigan, and Idaho; and in Canada.

THE FALL ARMY WORM OR GRASS WORM (*Laphygma frugiperda* S. and A.).—The fall army worm appeared in unusual numbers during the year throughout a considerable extent of the eastern United States, from central New York and northern Illinois to Florida and Georgia, and westward to Kansas. The species was particularly destructive to the rice and corn fields of the South, to small grains, grasses, and lawns northward, and to a great variety of garden crops in all sections. The same insect was reported as damaging tobacco in Cuba.

THE FOREST TENT CATERPILLAR (*Clisiocampa disstria* Hbn.).—The northeastern portion of the country again suffered severely from the ravages of the forest tent caterpillar.

THE FRUIT-TREE BARK-BEETLE (*Scolytus rugulosus* Ratz.).—The fruit-tree bark-beetle was observed injuring the peach and other fruit trees in Michigan, Georgia, Pennsylvania, Ohio, Indiana, Virginia, West Virginia, and Maryland.

THE GRAPE ROOT-WORM (*Fidia viticida* Walsh.).—This insect continued its depredations, according to Messrs. Webster and Mally, in northern Ohio.

THE GREENHOUSE LEAF-TYER (*Phlyctænia rubigalis* Guen.).—This destructive greenhouse pest, though not so troublesome as in previous years, was still of some importance as a depredator upon violets in Maryland and Virginia, and to other greenhouse plants in New York and Canada.

THE HARLEQUIN CABBAGE BUG (*Murgantia histrionica* Hahn).—This, one of the worst enemies of cruciferous crops, was less troublesome northward than for a number of years. It was, however, locally abundant in certain localities in Maryland and Georgia.

THE HESSIAN FLY (*Cecidomyia destructor* Say).—The ravages of the Hessian fly attracted attention in Ohio, New York, Michigan, and Minnesota, yet without instances of great severity. In Maryland it was reported as very abundant on early sown wheat.

THE IMBRICATED SNOUT-BEETLE (*Epicærus imbricatus* Say).—Injury by this beetle to fruit-trees in Texas and Oklahoma was reported. Attack was noticed in Maryland, but the species was rarer in its northern range than in former years.

THE IMPORTED CABBAGE WEBWORM (*Hellula undalis* Fab.).—This cabbage webworm, an important insect new to economic entomology, and of recent importation into the United States, was reported during the year as having done considerable damage to cabbage, turnip, and other cruciferous crops in portions of Georgia, South Carolina, and Alabama.

THE IMPORTED CABBAGE WORM (*Pieris rapæ* Linn.).—This species was quite troublesome to young cabbage in Maryland and Virginia early in the season, but was controlled by parasites later. It was troublesome during the year in Georgia, Alabama, California, Illinois, North Carolina, and the District of Columbia.

THE IMPORTED CURRANT WORM (*Pteronus ribesii* Scop.).—This introduced pest was abundant and injurious in Maryland, Virginia, and Kentucky.

THE IMPORTED ELM LEAF-BEETLE (*Galerucella luteola* Müll.).—The elm leaf-beetle has been recorded as very abundant in Massachusetts by Professor Kirkland, in New York by Dr. Felt, and in Maryland by Professor Johnson.

THE LARGER CORN STALK-BORER (*Diatræa saccharalis* Fab.).—This corn-stalk-borer has been recorded as abundant in parts of South Carolina, Georgia, and Alabama, but was rare farther southward.

THE MEDITERRANEAN FLOUR MOTH (*Ephestia kuehniella* Zell.).—This moth was a conspicuous mill pest in California, Pennsylvania, New York, Ohio, and Canada. Late in the previous year it was reported in a new State, Minnesota.

THE MELON PLANT-LOUSE (*Aphis gossypii* Glov.).—Professor Johnson reports that the melon plant-louse ruined hundreds of acres of melons in Maryland. Professor Quaintance recorded its abundance in Georgia.

THE NEW YORK WEEVIL (*Ithycerus noveboracensis* Forst.).—During the year this species effected injury to apple and peach trees, as reported by Professor Quaintance in Georgia, and by a correspondent of the Division of Entomology in Virginia.

THE OBLIQUE-BANDED LEAF-ROLLER (*Cacœcia rosaceana* Harr.).—This common enemy of rosaceous plants was observed by Messrs. Chittenden and Pratt in great numbers in different localities in Maryland, and an attack was reported by Dr. James Fletcher in greenhouses in Canada.

THE ONION THRIPS (*Thrips tabaci* Lind.).—The onion thrips continues to be a subject for investigation in several States, Michigan and Georgia being notably affected, while it was also recorded from Ohio, Florida, and New York.

THE PALE-STRIPED FLEA-BEETLE (*Systena blanda* Mels.).—Injury by this species was noticed by a correspondent in Michigan, and it was reported by Professor Johnson as troublesome in Maryland. Damage was severe to sugar beets, to Kieffer pear grafts and to tomatoes. Attack was also noticed on beans.

THE PEAR-TREE PSYLLA (*Psylla pyricola* Forst.).—The pear-tree Psylla has, according to Professor Johnson, been unusually abundant in Maryland pear orchards.

THE PICKLE WORM (*Margaronia nitidalis* Cram.).—The pickle worm was very destructive to cucurbits in Georgia.

PINE BARK-BEETLES (*Dendroctonus* spp.).—Extensive damage was done to coniferous forests in the Northwest by species of this genus of destructive bark-boring beetles.

THE PLUM CURCULIO (*Conotrachelus nenuphar* Hbst.).—The plum curculio was reported by Professor Quaintance as ovipositing in apples, currants, and salmon berries in Georgia. In Maryland Professor Johnson states that it did much injury to the peach crop.

THE PLUM MOTH (*Grapholitha prunivora* Walsh.).—This insect which is somewhat of a pest farther north, was abundant in Maryland near the District line, attacking and destroying both plums and apples.

THE PURPLE SCALE (*Mytilaspis citricola* Pack.).—The purple scale of the orange seems to have gained a firm foothold in southern California, and during the past season there was considerable alarm among the orange growers of that State. A State employee, Mr. George Compere, was sent to Hawaii to collect specimens of a Coccinellid beetle, which Californians hope may reduce the scale insect to insignificant numbers.

THE ROCKY MOUNTAIN LOCUST (*Melanoplus spretus* Thos.).—There was some hatching of the destructive Western grasshopper or migratory grasshopper in North Dakota during the present season, and a large swarm was observed flying over that portion of the country.

THE ROSE-CHAFER (*Macrodactylus subspinosus* Fab.).—Professor Webster, of Ohio, claims to have found a valuable remedy for the rose-chafer. One-half pound of fish-oil soap dissolved in a gallon of water and sprayed upon them will kill 95 per cent.

THE SALT-MARSH CATERPILLAR (*Leucarctia acræa* Dru.).—This was one of the commonest caterpillars in the District of Columbia, Maryland, and Georgia during the year, attacking cabbage, beans, peas, and various other garden crops.

THE SAN JOSE SCALE (*Aspidiotus perniciosus* Comst.).—The San Jose scale continues to occupy a prominent place in the list of insect pests. Notable remedial work was performed both in Maryland, where Professor Johnson exterminated it with hydrocyanic-acid gas, and in New Jersey, where Professor Smith used crude petroleum against the scale.

THE SEVENTEEN-YEAR CICADA (*Cicada septendecim* Linn.).—Brood XIX of the Seventeen-year Cicadi made its appearance in western New York.

THE SMALLER CORN STALK-BORER (*Elasmopalpus lignosellus* Zell.).—This stalk-borer was reported for the first time since 1881 as injurious in the Southern States. It was destructive to beans and peanuts in Alabama, Georgia, and South Carolina.

THE SOOTY CORN-ROOT WEBWORM (*Crambus caliginosellus* Clem.).—Professor Johnson has recorded a new and remarkable habit of the corn Crambus in infesting the stalks of tobacco. It was also abundant on lawns in the District of Columbia.

THE SQUASH-VINE BORER (*Melittia satyriniformis* Hbst.).—The squash-vine borer was reported in injurious numbers from Georgia and Ohio. It was abundant in some localities in Maryland, but occurred so late as to do little injury as compared with former years.

THE STRIPED BLISTER BEETLE (*Epicauta vittata* Fab.).—This blister beetle was very abundant in New York on potatoes, according to Dr. Felt. Professor Webster says that more complaints than usual were received of its ravages in Ohio, while Professor Johnson recorded it as especially numerous on potatoes, tomatoes, cabbage, and beets in Maryland.

THE STRIPED CUCUMBER BEETLE (*Diabrotica vittata* Fab.).—The striped cucumber beetle was reported as doing much damage in Georgia, Maryland, and Indiana.

THE TARNISHED PLANT-BUG (*Lygus pratensis* Linn.).—Professor Stedman has reported on the damage by the tarnished plant-bug in Missouri. Professor Johnson recorded it as sucking the buds of pear and plum trees in Maryland; he used a spray of 15 per cent solution of kerosene and water successfully. Professor Webster recorded it as injurious to peach buds in Ohio.

THE VIOLET SAWFLY (*Emphytus canadensis* Kby.).—This sawfly was reported by Dr. James Fletcher to have been destructive in violet greenhouses at Toronto, Canada.

THE WALNUT HAND-MAID MOTH (*Datana integerrima* G. & R.).—The caterpillar of this destructive forest insect was reported to have done extensive injury to different species of forest, shade, and fruit trees by defoliation in Ohio, North Carolina, Maryland, and the District of Columbia.

THE WESTERN CORN ROOT-WORM (*Diabrotica longicornis* Say).—During the season this species was injurious in Nebraska and Ohio, and was reported to be increasing in the severity of its attack in both States.

THE WESTERN GREEN JUNE BEETLE (*Allorhina mutabilis* Gory).—This southwestern species of June beetle was stated by a correspondent to have been injurious to a considerable number of fruits in southern Arizona.

THE WHITE-MARKED TUSSOCK-MOTH (*Orgyia leucostigma* S. & A.).—In Baltimore, Md., this tussock-moth was unusually troublesome on shade trees.

WINGLESS MAY BEETLES (*Lachnosterna farcta* Lec., and *L. lanceolata* Say).—The two species of wingless May beetles above mentioned were injurious to collards in Texas.

THE WOOLLY BEAR (*Spilosoma virginica* Fab.).—The woolly caterpillars of this moth were very injurious to onions in both Georgia and Massachusetts as reported by Professor Quaintance and Professor Kirkland.

## PROGRESS IN FRUIT GROWING IN 1899.

In the absence of statistics on the subject, it is safe to say in a general way the year 1899 was a fairly prosperous one in fruit growing. Where crops were short many valuable lessons resulted in experiences gained of certain peculiarities of the season.

A prominent fruit grower in southern Michigan, whose motto has been "Thorough Culture," reaped a rich harvest from his peach crop, though the widespread and unusual cold wave of February, 1899, had destroyed the peach buds, not only of his vicinity, but of nearly the whole peach belt from the Rocky Mountains to the Atlantic seaboard. The exception in his case was doubtless due to the fact that his trees were in complete health, full of vigor, and constant care and continuous culture prepared them for the trying ordeal through which they passed. This fact is suggestive.

Another peculiarity of the past season was the long-continued and universally prevalent droughts. Here, also, is found a valuable lesson on culture. An intelligent fruit grower of Connecticut, who has more than once pronounced blessings on the San Jose scale, curculio, and codling moth, inasmuch as they have no terrors for him, but assist him in securing a monopoly of the best markets, claims the drought is a blessing in disguise, as he meets it in an intelligent way that is sure to bring satisfactory rewards for his perseverance. It is sufficient to say he does not "wait for rain" before ordering his cultivators into the field.

Pomology not being an exact science, it is impossible to make a definite statement of the progress made during a given time; but it is safe to say that no single year in the history of fruit growing in the United States has shown greater progress in the production of new varieties as well as in methods of culture, care of trees, plants, and vines and the management and marketing of fruit products.

The production of new and desirable varieties is an art rapidly approaching the conditions of a true science. While it is a fact that many valuable discoveries in this line have been the result of accident, we are not content to longer trust to chance for valuable results. Fruit growers are learning to combine the good qualities of both parents in the improvement of pomological offspring, as is done in the breeding and improvement of domestic animals. Very great skill and scientific knowledge is required in the line of plant breeding in order to obtain anything like satisfactory results. From this cause the successful and continuous production of desirable new varieties will forever belong, as it now does, to the intelligent, painstaking few. No mere bungler or novice can expect to attain satisfactory results in this line of work. The creation and introduction of new and promising varieties of fruits is not the work of a given period of time, as, for instance, a calendar year, but more properly a series of years, in which to test their qualities under the varying conditions and vicissitudes of climate, etc. A variety must be pretty thoroughly tested by the above standard before it can be safely given out as beyond doubt an acquisition.

In this connection it is admissible to refer to a series of interesting experiments being made by Prof. H. J. Webber, of the Division of Physiology and Pathology, in the production of hybrids of the hardy orange, *Citrus trifoliata*, crossed with the common sweet orange. These experiments are now well under way, many promising plants having already been produced, from which it is hoped to obtain fruit in the near future. It is hoped that varieties may thus be obtained that are of fine quality and sufficiently hardy to greatly extend the limit of practical orange growing.

The successful introduction into California of the blastophaga during the past year by the Department of Agriculture, greatly encourages the hope of success in producing the true Smyrna fig. Great anticipation is now centered in the successful wintering of the colony of insects established during the past year at Fresno. If they should come out all right in the spring and follow their natural instincts, as in their native home of Smyrna, the successful pollination of the Smyrna fig in California is almost assured.

The export trade in apples, while not as large as that of 1896–97 (the largest ever known by more than 1,500,000 barrels), shows an increase over the year 1897–98 of almost a half a million barrels. Great Britain is the best export market for the apple, and there is an increasing demand for the apple in the German Empire.

The shipments of deciduous fruits from California shows an increase of 37 per cent over the year 1898. The total for the year was 7,500 carloads. California produced 14,000,000 pounds of almonds, equaling one-third of the home consumption.

The best paying fruit crop on the Delaware peninsula in 1899 seems to have been the Kieffer pear.

Florida produced about $300,000 worth of cocoanuts.

## RECENT PROGRESS IN ROAD BUILDING.

The Maryland highway division of the State geological survey, since its creation by the legislature in 1898, has made a careful inquiry into the road question of the State. Its report sets forth the need of better roads, and gives suggestions as to the manner in which this result may be most quickly and acceptably brought about. The document takes up the question of road legislation and shows how much money could be saved by putting the roads in good condition; which amount is estimated at $3,000,000 per annum. The total mileage of public roads in Maryland is placed at 14,483, or about 1.47 miles to each square mile of territory. This amount includes toll roads which are owned by 51 companies, the combined length of such roads being 497 miles. Over 13,000 miles of Maryland roads are composed of earth, 890 miles are built of stone, 225 miles of gravel, and 250 miles of shells. There are 2,021 miles of highways in the State that are classed as main roads.

Governor Stone, of Pennsylvania, has recently appointed a special commission to investigate the road subject of the State and to present a bill to the next legislature which, in the opinion of the commission, will best meet the demands for a change in the present system of road building. The commission consists of A. J. Cassatt, president of the Pennsylvania Railroad; ex-Governor Beaver, John P. Elkin, attorney-general of the State; H. B. Breckenridge, of Leetonia, and H. C. Snavely, of Lebanon.

A report comes from Allegheny County, Pa., that 25 miles of road were opened, improved, and dedicated to the public during the calendar year 1898, and during the past year the amount has been increased to 50 miles. These roads have been macadamized and given subdrainage and surface drainage. The width of the main roads is about 33 feet, and they traverse populous rural districts. The average cost per mile for road improvement in Allegheny County is about $6,000. About 85 miles of roads are either contracted for or are now undergoing improvements.

The legislature of New York is being strongly urged to appropriate $1,000,000 this year for the improvement of State roads. Massachusetts appropriates one-half million dollars annually for the same purpose, while New Jersey spends $150,000, and will this year probably increase that amount to $200,000.

The toll roads of Kentucky are being bought up and made free as fast as possible. These turnpikes are turned over to the counties in consideration of a payment of from $75 to $250 per mile. Some of them, however, are given to the counties without any consideration whatever. Shelby County has recently bought up 117 miles of turnpike, at a total cost of about $15,000, and these roads were made free on January 1, 1900. It has been estimated that nine-tenths of the roads of Kentucky are still worked in the old-fashioned way by forced labor. Each man living on the farm, between the ages of 18 and 50, is compelled to work the road or pay someone else to do so. This system very rarely results in good roads, as a large portion of the work injures rather than benefits them. The feeling is growing in Kentucky that the existing method compels too small a portion of the citizens to bear the burden of improving all the roads of the State, and a movement is now on foot to secure a more uniform system of taxation by passing a State-aid law. The same condition exists in Virginia, where the State-aid sentiment is also becoming very strong. A State-aid measure is also to be presented to the legislature of Ohio, and will stand a fair chance of becoming a law.

In Georgia road improvement is making a steady march. In the vicinity of Athens over six miles of roads have been, in the last six months, thoroughly graded and several very steep hills have been thrown out. The work has been done at a very small expense to the county, the excavation and removal of earth costing not more then 10 cents per cubic yard.

A long step toward better roads was taken in Tennessee by the adoption of a new road law. This law, in effect January 1, 1900, differs from the old law in that it requires the election of only one road commissioner for each county, who is to have charge and oversight of all roads and bridges in the county. Under the old law a commissioner was elected for each civil district. All highways in the State are now to be worked by contract, sealed proposals for which are submitted on or before the first Monday in January of each year. The main highways are to be constructed according to correct and high standard specifications, avoiding heavy grades and reducing some by cutting down steep portions or changing the direction of the road where advisable. Bradley County, Tenn., is to have a hundred miles of new stone roads, having recently borrowed money for the purpose. The construction of the main road from Cleveland to Mahan Gap has already been begun; hills are being leveled or skirted, hollows filled, and stone culverts and framework for bridges built. It is thought that 100 miles of stone and gravel roads will be completed in Bradley County by the end of the calendar year 1900.

The commissioner of highways of Connecticut estimates that 500 miles of roads have been completed since the State-aid system was adopted. The improvement of several hundred more miles is in progress or has been projected.

State Commissioner of Highways Viall, of Vermont, states that more miles of roads have been built during the last year than during the whole period from 1892 to 1898. One hundred and seventeen miles of road were built during the calendar year 1899, and at this rate, if it continues, the commissioner says that the main thoroughfares of the State will be made permanent within a few years.

The people of Columbia, S. C., have come to realize the necessity of good roads as well as the importance of building them in the best and most economical way through the medium of good-roads machinery. A road-building plant has recently been purchased at an expense of about $6,000, which includes a fine rock-crushing plant, a large and a small steam roller, big plows, road machines, etc. The rock-crushing plant turns out about 60 tons of stone daily.

A few years ago the legislature of California passed a wide-tire law, which went into effect January 1, 1900. Several defects have been pointed out in the law, and it is quite probable that it will become a dead letter on the statute books.

At East Hampton, N. Y., the women have taken a hand in the building and maintenance of the public highways, and for this use $1,551.50 has been turned into the treasury of the Ladies Village Improvement Society during the past season.

Considerable interest has been recently taken in the use of crude petroleum in improving the surfaces of common earth roads. The press has given the idea a wide circulation, and experiments are being made throughout the country. The advocates of this system claim that when a road is properly treated with oil the result is a dustless and nonabsorbent surface, which will turn rain water and furnish a dark-colored roadbed, which is more pleasing to the eye than the ordinary light, dusty soil; also that an oiled road will be free from grass or weeds. The present methods of oiling the roads are yet in the experimental stage.

## PLANT DISEASES IN THE UNITED STATES IN 1899.

### DISEASES OF FRUIT, SHADE, AND OTHER TREES.

With a few exceptions, the prevalence of fruit diseases in the United States in 1899 did not vary greatly from what has been noted for previous years. Fruit trees throughout the country were in many cases severely injured by the extreme cold of the winter, and, while in many instances they recovered remarkably well, yet a number were killed outright and some were so badly injured that they succumbed later. Some were so slightly affected that the injury was not very apparent, but in many cases such trees will inevitably sooner or later become affected with some of the more common diseases. Peaches and, to a lesser extent, other fruit trees were so injured that they bore no fruit. Pear blight was very prevalent during the year, causing much damage in the Le Conte pear region of the South, and was reported for the first time as doing considerable injury on the Pacific coast.

Apples were remarkably free from diseases of all kinds throughout the South, but in the Northern Pacific States a disease known as black canker caused great injury. Where the lines of treatment recommended by the Department were carried out, however, the latter disease seemed to be controlled.

Peach yellows still continues to do injury, notably in the region near the Atlantic coast. In Michigan the disease has been brought largely under control by rigid inspection of orchards and the destruction of diseased trees as soon as discovered. A new disease, known as little peach, has recently appeared in the peach orchards of Michigan, and is also known to occur in New York and Delaware. Peach-leaf curl has been more or less prevalent throughout the Pacific coast region, as well as in the East. The application during the year of sprays recommended by the Department has resulted in controlling the disease wherever the treatment was properly made.

Black rot, anthracnose, and other diseases of the grape prevailed more or less, but in most cases they were held in check where proper treatment was carried on. The California vine disease caused considerable alarm in parts of central and northern California, and experiments having for their object the discovery of resistant varieties are now being carried on and show encouraging results.

In the subtropical fruit-growing region, notably in Florida, freezes injured the young orange trees despite the strenuous efforts made by the growers to protect them by means of sheds, tents, etc. Pineapples have been injured by a number of diseases, especially by blight, but where careful attention is given to selecting healthy slips this disease may be in a measure controlled.

Various trees planted for shade or ornament have been affected with the usual diseases which prevail to a greater or less extent every year, depending much on climatic conditions. In cities especially shade trees are apt to suffer during even moderate droughts, and there were many complaints, resulting from local causes of this kind, during the year.

### DISEASES OF SMALL FRUITS.

Anthracnose of the raspberry and blackberry and strawberry leaf blight were abundant, although not more so than in previous years.

### DISEASES OF COTTON, VEGETABLES, AND CEREALS.

Cotton was considerably injured by a disease known as wilt, which has spread over large areas of the sea island region and has also done considerable damage in the upland districts. Anthracnose and rust of cotton also caused severe damage in several localities. Watermelons were injured by the wilt, but where the recommendations of the Department with reference to rotation of crops and the use of fresh land were followed the disease was held in check.

The leaf spot of muskmelons was exceedingly abundant, especially in the Central States and the Rocky Ford, Ga., melon district. Tomatoes were injured by the leaf blight (Septoria), which must now be regarded as a serious factor in connection with the growing of this crop in the Central States and to some extent elsewhere. The bacterial diseases of cabbage, and of the tomato, eggplant, and Irish potato were about as abundant as usual, but did not do great damage except in limited localities. The various grain rusts and smuts were not more destructive than usual, although prevalent to a considerable extent.

## STATE STANDARDS FOR DAIRY PRODUCTS, 1900.

The following table shows the requirements for articles sold under the names specified. States not named have no laws prescribing standards for dairy products:

[Prepared by Dairy Division, B. A. I.]

| States. | Milk. | | | Skim milk. | Cream. | Butter. | Cheese. |
|---|---|---|---|---|---|---|---|
| | Total solids. | Solids not fat. | Fat. | Total solids. | Fat. | Fat. | Fat. |
| | *Per cent.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per ct.* | *Per cent.* | |
| California | ...... | ...... | ...... | ...... | ...... | ...... | Full cream, 30 p. c. fat. Half skim, 15 p. c. fat. Skim, from skim milk. |
| Colorado | ...... | ...... | ...... | ...... | ...... | ...... | 35 p.c. total solids, fat. |
| Dist. of Columbia | ...... | 9 | 3.5 | 9.3 | 20 | 83 Not over 12 p. c. water or 5 p.c. salt | |
| Georgia | ...... | 8.5 | 3.5 | | | | |
| Illinois[1] | 12 | ...... | 3 | ...... | 15[2] | 80 | 48 p.c. total solids, fat. |
| Indiana | ...... | 9 | 3 | ...... | ...... | 80 | 10 p. c. milk-fats. |
| Iowa | 12.5 | ...... | 3 | ...... | 15 | | |
| Maine | 12 | ...... | 3 | | | | |
| Massachusetts | 13 | 9.3 | 3.7 | 9.3 | | | |
| April-September | 12 | 9 | 3 | | | | |
| Michigan | 12.5 | ...... | 3 | | | | |
| | Sp.grav. 1.029–33 | ...... | ...... | sp.grav 1.032–37 | | | |
| Minnesota | 13 | ...... | 3.5 | ...... | 20 | ...... | 45 p.c. total solids to be fat |
| Missouri | ...... | ...... | ...... | ...... | ...... | ...... | From milk testing at least 3 p. c. fat. |
| New Hampshire | 13 | | | | | | |
| New Jersey | 12 | | | | | | |
| New York[3] | 12 | ...... | 3 | | | | |
| North Dakota | 12 | ...... | 3 | ...... | 15 | | |
| Ohio[3] | 12 | ...... | 3 | 1 | 1 | 80 | 20 p. c. fat. |
| May and June | 11.5 | | | | | | |
| Oregon | 12 | ...... | 3 12 p. c. cream by vol. | sp.grav 1.035 | ...... | Not over 14 p. c. water. | |
| Pennsylvania (Milk and skim-milk standards refer to cities of second and third class.) | 12.5 Sp.grav. 1.029–33 | ...... | 3 | 2.5 p. c. fat. 6 per c. cream by vol. sp.grav 1.032–37 | ...... | ...... | Full cream, 32 p. c. fat. Three-fourths cream, 24 p. c. fat. One-half cream, 16 p. c. fat. One-fourth cream, 8 p. c. fat. Skim'd, below 8 p. c. fat. |
| Rhode Island | 12 | ...... | 2.5 | | | | |
| South Carolina | ...... | 8.5 | | | | | |
| Utah | ...... | ...... | ...... | 9 p. c. solids not fat | | | |
| Vermont | 12.5 | 9.25 | | | | | |
| May and June | 12 | | | | | | |
| Washington | ...... | 8 | 3 | ...... | ...... | ...... | Full cream, 30 p. c. fat. Skimmed, 15 p. c. fat. |
| Wisconsin | ...... | ...... | 3 | | | | |

[1] Condensed milk shall be made from milk containing at least the legal standard of 3 p. c. butter fat, and evaporated to one-third or less of its original volume.

[2] Coffee cream shall contain at least 15 p. c. of fat, and whipping cream 22 p. c. fat.

[3] Milk solids of condensed milk shall be in quantity the equivalent of 12 p. c. of milk solids in crude milk, of which solids 25 p. c. shall be fat.

## PROGRESS IN FORESTRY DURING 1899.

Advancement in forestry during the past year is observable both in the direction of growth of public sentiment and in that of specific legislative and executive action.

In May, 1898, an important increase in the appropriation of Congress for the administration of the Federal forest reserves enabled the Secretary of the Interior to place in the field a more nearly adequate forest service. The forest ranger system as it now exists may hopefully be regarded, subject, of course, to important elaboration and extension, as the first step toward a scheme of forest protection that promises to be substantially effective. In the suppression and avertance of forest fires the present system has already shown encouraging results.

Since September, 1898, seven new reserves have been added. These are the Trabuco Canyon and the Fish Lake reserves, the Gallatin reserves, the Gila River, Lake Tahoe, Santa Inez, and Prescott reserves, with a total acreage of 5,250,136 acres. The Mount Rainier Reserve, originally created by President Cleveland, has been reduced by 207,360 acres, which have been set aside to form the Mount Rainier National Park.

The United States Geological Survey is steadily pursuing its all-important work of surveying, describing, and mapping the lands included in the reserves. The work of mapping has progressed in the Flathead and Lewis and Clarke reserves of Montana, the Priest River and Bitter Root reserves of Idaho, the Cascade Reserve of Washington, and the Uintah Reserve of Utah.

The examination of the forests of the reserves and adjacent regions has, during the past season, been completed in the Mount Rainer Reserve of Washington; has been continued in the Olympic Reserve, nearly completing that valuable forest region; has been commenced in the Cascade Reserve of Oregon, and the reserves of the Sierra Nevada of California. The work of estimating the supply of standing timber, which was completed for the State of Washington last year, has been continued into Oregon, and most of the stand of that State has been secured. It has been continued in California, with the prospect of completing that State during the coming year. Similar estimates are being made for the States of the Great Lakes—Michigan, Wisconsin, and Minnesota—the work being carried on jointly by the Department of Agriculture and the Geological Survey.

General public interest in forestry has increased in a remarkable degree, shown by the attitude of the press and the favorable legislative action which has followed agitation among the States: New York, with its College of Forestry and management of the the college forest, both now well under way, under the direction of Dr. B. E. Fernow, takes, perhaps, the first rank. This year a further appropriation of $300,000 was made for additional purchases of forest land in the Adirondacks, bringing the whole amount expended for this purpose since the organization of the Forest Preserve Board in 1897 to a total of $1,800,000. Though the purchases are not yet completed, the figures contained in the last report of the board show a total area of lands in the Adirondacks reserved to the State amounting to something over 1,100,000 acres. More significant still, as marking the beginning of a distinct movement on the part of private owners of forest lands, is the work in private forestry, also in the Adirondacks, which has been regarded as satisfactory in the main, both by the persons interested and by the Division of Forestry, under whose guidance it has been carried on.

California, as usual, has been most active in all departments of forest agitation, and although comprehensive legislation failed of the governor's approval at the very close of the last session of the legislature, the intent of the plan was carried into operation by the forest organizations themselves. A noteworthy happening has been the offer of certain redwood manufacturers to furnish $1,000 in money, as well as to provide subsistence in their camps and transportation over their lines for the agents of the Division of Forestry, in order to hasten the time by a year when investigations on the growth and reproduction of the redwood could be begun. At the University of California a school of foresty may be established in the not distant future.

Pennsylvania also has made marked progress. Her forest-fire law has received a useful amendment. The commissioner of forestry has received added authority, conferring power to purchase lands for creating forest reservations whenever there are available funds in the treasury for that purpose. Under the safeguards provided there is no necessity for delay in awaiting special legislation for each new case of purchase. Finally, the commission authorized sometime since to select three tracts of land of at least 40,000 acres each, is about to take final action, and a recent communication from Dr. Rothrock states that within the next few months probably 200,000 acres of forest land will be reserved to the State of Pennsylvania.

Minnesota has been especially energetic, and has been fortunate in having the efforts of her own citizens, ably assisted by enthusiastic friends from other States, in the endeavor to induce Congress to set apart vast timber lands for a national park and forest reserve. A State board of forestry has been appointed, whose members have been chosen on a well-considered plan. The special points of this admirable act are its provisions for the acceptance by the board of lands granted, deeded, or devised to them for the purposes of forest reservations, and for the reinvestment of the moneys to be derived as revenue from the proposed management. Assurances have been given that gifts, under these provisions, amounting to thousands of acres, will very soon be made to the board. An executive committee has been chosen, composed of Captain Cross, president of the board; General Andrews, its secretary; and Professor Green. It took action at once to arrange for a visit of inspection of the Minnesota forests by Dr. C. A. Schenck.

Michigan has likewise created a permanent forest commission, with the commissioner of the State land office as ex officio member. The personnel of the commission, headed by Mr. Arthur Hill, a prominent lumberman, promises most favorably. The main provision of the act is that the governor appoints a State fire marshal, for a term of two years. The marshal appoints two deputies, one of whom shall reside in the upper peninsula; and in addition, city and town fire marshals throughout the State are made deputies. A bill to create the office of fire warden, with provisions based on the Massachusetts law of 1894, was introduced but failed of passage. Its supporters, however, have good hope of securing its enactment at the next session of the legislature.

What Minnesota has been attempting for the North and West, North Carolina is urging for the South, and for the seaboard States in general. A great national park is proposed for the crest of the Alleghenies, primarily for timber preservation.

Georgia has passed a significant amendment to her forest-fire law by which the setting of fire to woods willfully, carelessly, or negligently is now made a misdemeanor, whereas formerly malicious intent was specified, a provision which made the law inoperative from the difficulty of establishing proof. A number of other States stand in need of similar amendments before their statutes, long dead on the books, can be rendered effective.

Wisconsin has provided that forest wardens, formerly appointed in every organized town, are henceforth to be appointed in certain counties, while in the remaining counties they are to be appointed only on request of the supervisors.

In the matter of tree planting and conservation on a small scale, Indiana has passed a law offering partial remission of taxes on definite proportions of holdings covered with a specified number of forest trees per acre, either as virgin forest or as planted or partially planted to that number. Such areas are to be assessed at a valuation of $1 per acre.

Nebraska and Nevada have repealed their laws providing bounties for forest trees planted and cultivated. Like the bounty law of Pennsylvania, they have had small results because of the trivial inducement offered.

The legislature of North Dakota recently established a school of forestry, located at the village of Bottineau; and a bill has just been introduced in the United States Senate (Senate bill 158, December 6, 1899,) providing for the grant of 30,000 acres of public land, to be selected by the proper authorities of the State, to aid in the maintenance of the school. The bill has been twice read, and referred to the committee on public lands.

*Forest reserves[1] of the United States, names, locations, areas, etc.*

| Numbers of— | | States. | Names of reserves. | Present areas of reserves. | Dates of proclamations. | Areas of reserves. | Remarks. |
|---|---|---|---|---|---|---|---|
| Reserves. | Proclamations. | | | | | | |
| | | | ADMINISTRATION OF PRESIDENT HARRISON. | | | | |
| | | | | *Acres.* | | *Acres.* | |
| 1, 2 | 1 | Wyoming | Timber land reserve, Yellowstone Park | 1, 239, 040 | Mar. 30, 1891 | 1, 239, 040 | Proclamation revised. |
| 1, 2 | 2 | do | do | | Sept. 10, 1891 | | |
| 3 | 3 | Colorado | Timber land reserve, White River Plateau | 1, 198, 080 | Oct. 16, 1891 | 1, 198, 080 | |
| 4, 35 | 4 | New Mexico | The Pecos River Forest Reserve | | Jan. 11, 1892 | 311, 040 | See proclamation No. 35. |
| 5, 6 | 5 | Colorado | Timber land reserve, Pike's Peak | 184, 320 | Feb. 11, 1892 | 184, 320 | Proclamation revised. |
| 5, 6 | 6 | do | do | | Mar. 18, 1892 | | |
| 7 | 7 | Oregon | Timber land reserve, Bull Run | 142, 080 | June 17, 1892 | 142, 080 | |
| 8 | 8 | Colorado | Timber land reserve, Plum Creek | 179, 200 | June 23, 1892 | 179, 200 | |
| 9 | 9 | do | The South Platte Forest Reserve | 683, 520 | Dec. 9, 1892 | 683, 520 | |
| 10 | 10 | California | Timber land reserve, San Gabriel | 555, 520 | Dec. 20, 1892 | 555, 520 | |
| 11 | 11 | Colorado | Battlement Mesa Forest Reserve | 858, 240 | Dec. 24, 1892 | 858, 240 | |
| 12 | 12 | Alaska | Afognak Forest and Fish Culture Reserve | 403, 640 | do | 403, 640 | Area, not official—estimated by planimeter on Coast and Geodetic map. Scale 1:1200000. |
| 13 | 13 | California | Sierra Forest Reserve | 4, 096, 000 | Feb. 14, 1893 | 4, 096, 000 | |
| 28, 14, 44 | 14 | Washington | The Pacific Forest Reserve | 967, 680 | Feb. 20, 1893 | 967, 680 | The title, "The Pacific Forest Reserve," was abolished February 22, 1897. The Reserve is now included in "The Mount Rainier Forest Reserve." See proclamation No. 28. |
| 15 | 15 | Arizona | Grand Canyon Forest Reserve | 1, 851, 520 | do | 1, 851, 520 | |
| 16 | 16 | California | San Bernardino Forest Reserve | 737, 280 | Feb. 25, 1893 | 737, 280 | |
| 17, 40 | 17 | do | Trabuco Canyon Forest Reserve | | do | 49, 920 | See proclamation No. 40. |
| | | | | | | 13, 457, 080 | |
| | | | ADMINISTRATION OF PRESIDENT CLEVELAND. | | | | |
| 18 | 18 | Oregon | The Cascade Range Forest Reserve | 4, 492, 800 | Sept. 28, 1893 | 4, 492, 800 | |
| 19 | 19 | do | Ashland Forest Reserve | 18, 560 | do | 18, 560 | |
| 20 | 20 | California | The Stanislaus Forest Reserve | 691, 200 | Feb. 22, 1897 | 691, 200 | |
| 21 | 21 | do | The San Jacinto Forest Reserve | 737, 280 | do | 737, 280 | |
| 22 | 22 | Idaho and Montana | The Bitter Root Forest Reserve | 4, 147, 200 | do | 4, 147, 200 | |
| 23 | 23 | Idaho and Washington. | The Priest River Forest Reserve | 645, 120 | do | 645, 120 | |
| 24, 39 | 24 | South Dakota | The Black Hills Forest Reserve | | do | 967, 680 | See proclamation No. 39. |
| 25 | 25 | Utah | The Uintah Forest Reserve | 875, 520 | do | 875, 520 | |
| 26 | 26 | Washington | The Washington Forest Reserve | 3, 594, 240 | do | 3, 594, 240 | |
| 27 | 27 | do | The Olympic Forest Reserve | 2, 188, 800 | do | 2, 188, 800 | |

[1] See figure 4, page 296, for map showing locations of these reserves. The first number in each line of the first column of this table is the number of the reserve and refers to the principal proclamation; the succeeding numbers refer to subsidiary proclamation.

*Forest reserves of the United States, names, locations, areas, etc.*—Continued.

| Numbers of— Reserves. | Numbers of— Proclamations. | States. | Names of reserves. | Present areas of reserves. | Dates of proclamations. | Areas of reserves. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | ADMINISTRATION OF PRESIDENT HARRISON—Continued. | *Acres.* | | *Acres.* | |
| 28, 14, 44 | 28 | Washington | The Mount Rainier Forest Reserve | | Feb. 22, 1897 | 1,267,200 | The original reserve comprised 2,234,880 acres, including "The Pacific Forest Reserve." This area was reduced March 2, 1899, to 2,027,520 acres. See proclamation No. 44. |
| 29 | 29 | Wyoming | The Big Horn Forest Reserve | 1,127,680 | do | 1,127,680 | |
| 30 | 30 | do | The Teton Forest Reserve | 829,440 | do | 829,440 | |
| 31 | 31 | Montana | The Flathead Forest Reserve | 1,382,400 | do | 1,382,400 | |
| 32 | 32 | do | The Lewis and Clarke Forest Reserve | 2,926,080 | do | 2,926,080 | |
| 33, 36 | 33 | California | The Pine Mountain and Zaca Lake Forest Reserve. | | Mar. 2, 1898 | 1,144,594 | See proclamation No. 36. |
| | | | | | | 27,035,794 | |
| | | | ADMINISTRATION OF PRESIDENT M'KINLEY. | | | | |
| 34, 47 | 34 | Arizona | The Prescott Forest Reserve | | May 10, 1898 | 10,240 | See proclamation No. 47. |
| 4, 35 | 35 | New Mexico | The Pecos River Forest Reserve | 431,040 | May 27, 1898 | 120,000 | See proclamation No. 4. |
| 33, 36 | 36 | California | The Pine Mountain and Zaca Lake Forest Reserve. | 1,644,594 | June 29, 1898 | 500,000 | See proclamation No. 33. |
| 37 | 37 | do | The San Francisco Mountains Forest Reserves. | 975,360 | Aug. 17, 1898 | 975,360 | Even-numbered sections only reserved. |
| 38 | 38 | Arizona | The Black Mesa Forest Reserve | 1,658,880 | do | 1,658,880 | |
| 24, 39 | 39 | South Dakota and Wyoming. | The Black Hills Forest Reserve | 1,211,680 | Sept. 19, 1898 | 244,000 | See proclamation No. 24. |
| 17, 40 | 40 | California | The Trabuco Canyon Forest Reserve | 109,920 | Jan. 30, 1899 | 60,000 | See proclamation No. 17. |
| 41 | 41 | Utah | The Fish Lake Forest Reserve | 67,840 | Feb. 10, 1899 | 67,840 | |
| 42 | 42 | Montana | The Gallatin Forest Reserves | 40,320 | do | 40,320 | Even-numbered sections only reserved. |
| 43 | 43 | New Mexico | The Gila River Forest Reserve | 2,327,040 | Mar. 2, 1899 | 2,327,040 | |
| 28, 14, 44 | 44 | Washington | The Mount Rainier Forest Reserve | 2,027,520 | do | 207,360 | The area of "The Mount Rainier National Park" of 207,360 acres which was set aside has been deducted. See proclamation No. 28. |
| 45 | 45 | California | The Lake Tahoe Forest Reserve | 136,335 | April 13, 1899 | 136,335 | |
| 46 | 46 | do | The Santa Ynez Forest Reserve | 145,000 | Oct. 2, 1899 | 145,000 | |
| 34, 47 | 47 | Arizona | The Prescott Forest Reserve | 423,680 | Oct. 21, 1899 | 413,440 | See proclamation No. 34. |
| | | | | | | 6,491,095 | |
| | | | Grand total | | | 46,983,969 | |

## AGRICULTURAL LIBRARIES OF THE UNITED STATES.[1]

| State. | Post office. | Institution. | Volumes agricultural. | Total volumes. |
|---|---|---|---|---|
| Alabama | Auburn | State Ag'l and Mechanical College | 2,494 | 12,982 |
| | Uniontown | Canebrake Experiment Station | 1,000 | ---------- |
| Arizona | Tucson | University of Arizona | 248 | 4,000 |
| Arkansas | Fayetteville | University of Arkansas | 750 | 2,000 |
| California | Berkeley | University of California | 3,000 | 79,000 |
| Colorado | Fort Collins | State Agricultural College | 500 | 9,968 |
| Connecticut | Storrs | Connecticut Agricultural College | 1,000 | 7,000 |
| | New Haven | Conn. Ag'l Experiment Station | 2,000 | ---------- |
| Delaware | Newark | Delaware College | 4,500 | 10,000 |
| Florida | Lake City | Florida Agricultural College | 3,300 | 5,500 |
| Georgia | Athens | State College of Agriculture and Mechanic Arts. | 600 | 20,000 |
| | College | Georgia State Industrial College | (*a*) | 500 |
| | Dahlonega | North Georgia Agricultural College. | (*a*) | 5,000 |
| | Experiment | Experiment Station | 800 | 800 |
| | Milledgeville | Middle Georgia College | (*a*) | 1,500 |
| Idaho | Moscow | University of Idaho | ---------- | 13,000 |
| Illinois | Urbana | University of Illinois | 7,500 | 45,000 |
| | Glenwood | Illinois School of Agriculture and Manual Training for Boys. | (*a*) | 3,000 |
| Indiana | Lafayette | Purdue University | 2,800 | 9,200 |
| Iowa | Ames | State College of Agriculture and Mechanic Arts. | 2,400 | 13,000 |
| | Des Moines | Iowa Horticultural Society | 1,500 | 1,500 |
| Kansas | Manhattan | Kansas Agricultural College | 7,260 | 19,704 |
| | Topeka | State Board of Agriculture | (*a*) | 1,000 |
| | Topeka | Kansas Horticultural Society | (*a*) | 500 |
| Kentucky | Lexington | Agricultural and Mechanical College of Kentucky. | 500 | 7,015 |
| | Frankfort | State Normal School | 957 | 1,372 |
| Louisiana | New Orleans | Louisiana University | 550 | 1,665 |
| Maine | Orono | University of Maine | 2,500 | 16,000 |
| | Augusta | Maine Board of Agriculture | 1,300 | 1,500 |
| Maryland | College Park | Maryland Agricultural College | (*a*) | 4,000 |
| | College Park | Maryland Horticultural Society | (*a*) | 3,000 |
| Massachusetts | Amherst | Massachusetts Agricultural College. | 9,192 | 19,980 |
| | Jamaica Plain (Boston). | Bussey Institution | (*a*) | 14,569 |
| | Boston, 101 Tremont street. | Massachusetts Horticultural Society. | 10,000 | 10,000 |
| | Boston, State House | Massachusetts Board of Agriculture. | 3,200 | 3,200 |
| | Worcester | Worcester County Horticultural Society. | 3,000 | 3,000 |
| | Winchester | Massachusetts Forestry Association. | 500 | 500 |
| Michigan | Agricultural College | State Agricultural College | 9,000 | 19,380 |
| Minnesota | Minneapolis | University of Minnesota | 7,000 | 50,000 |
| | Minneapolis | Minnesota Horticultural Society | 1,800 | 1,800 |
| | Taylors Falls | Minnesota Forestry Association | 100 | 100 |
| Mississippi | Agricultural College | Mississippi Agricultural and Mechanical College. | 3,810 | 10,084 |
| | Westside | Alcorn Agricultural and Mechanical College. | 75 | 4,000 |
| Missouri | Columbia | University of Missouri | 3,000 | 30,000 |
| Montana | Bozeman | Montana College of Agriculture and Mechanic Arts. | 100 | 4,000 |
| | Bozeman | State Board of Horticulture | 300 | 300 |
| Nebraska | Lincoln | University of Nebraska | 4,856 | 44,000 |
| Nevada | Reno | Nevada State University | (*a*) | 4,000 |
| New Hampshire | Durham | New Hampshire College of Agriculture and Mechanic Arts. | 2,100 | 7,000 |
| New Jersey | New Brunswick | Rutgers College | 12,855 | 40,000 |
| | New Brunswick | Experiment Station | 2,885 | 2,885 |
| | Trenton | State Board of Agriculture | 350 | 400 |
| New Mexico | Mesilla Park | New Mexico College of Agriculture and Mechanic Arts. | 500 | 3,552 |
| New York | Geneva | Experiment Station | 4,400 | 4,400 |
| | Ithaca | Cornell University | 15,000 | 225,000 |
| North Carolina | Raleigh | North Carolina College of Agriculture and Mechanic Arts. | (*a*) | 4,000 |
| North Dakota | Fargo | N. Dakota Agricultural College | 3,800 | 8,000 |
| Ohio | Columbus | Ohio State University | 5,000 | 32,000 |
| | Columbus | State Board of Agriculture | 4,000 | 4,000 |
| | Wooster | Agricultural Experiment Station | 1,600 | ---------- |
| Oklahoma | Stillwater | Oklahoma Agricultural and Mechanical College. | (*a*) | 3,497 |
| Oregon | Corvallis | Oregon Agricultural College | 170 | 5,000 |
| Pennsylvania | Harrisburg | Pennsylvania State Agricultural Society. | 3,125 | 3,125 |

[1] The numbers in some cases include pamphlets as well as bound volumes. *a* Not stated.

## AGRICULTURAL LIBRARIES OF THE UNITED STATES—Continued.

| State. | Post office. | Institution. | Volumes, agricultural. | Total volumes. |
|---|---|---|---|---|
| Pennsylvania | Philadelphia, Broad above Spruce. | Pennsylvania Horticultural Society. | 3,500 | 3,500 |
| | State College | The Pennsylvania State College | 1,311 | 15,754 |
| | State College | Experiment Station | 500 | 500 |
| Rhode Island | Kingston | Rhode Island College of Agriculture and Mechanic Arts. | 2,100 | 7,800 |
| South Carolina | Clemson College | Clemson College | (a) | 5,000 |
| | Georgetown | Winyah Indigo Society | (a) | 2,000 |
| South Dakota | Brookings | South Dakota Agricultural College. | 585 | 4,974 |
| Tennessee | Knoxville | University of Tennessee | 8,000 | 20,000 |
| Texas | College Station | State Agricultural and Mechanical College. | 450 | 6,000 |
| Utah | Logan | Agricultural College of Utah | 364 | 7,201 |
| Vermont | Burlington | University of Vermont | (a) | 57,384 |
| Virginia | Blacksburg | Virginia Polytechnic Institute | (b) | ---------- |
| | Hampton | Hampton Agricultural Institute | 600 | 9,600 |
| Washington | Pullman | Washington Agricultural College and School of Science. | (a) | 5,132 |
| West Virginia | Morgantown | West Virginia University | 3,176 | 17,500 |
| Wisconsin | Madison | University of Wisconsin | 5,000 | 50,000 |
| Wyoming | Laramie | University of Wyoming | 1,366 | 7,000 |

a Not stated. b Library recently burned.

## BOARDS OF TRADE THAT PUBLISH COMMERCIAL NEWS.

| City and State. | Name of organization. | Secretary. |
|---|---|---|
| Baltimore, Md | Chamber of Commerce | W. F. Wheatley. |
| Boston, Mass | do | Elwyn G. Preston. |
| Buffalo, N. Y | Merchants' Exchange | C. H. Keep. |
| Chicago, Ill | Board of Trade | George F. Stone. |
| Cincinnati, Ohio | Chamber of Commerce | Charles B. Murray (Sup't). |
| Denver, Colo | Chamber of Commerce and Board of Trade. | Arthur Williams. |
| Detroit, Mich | Board of Trade | F. W. Waring. |
| Duluth, Minn | do | S. A. Kemp. |
| Indianapolis, Ind | do | Jacob W. Smith. |
| Louisville, Ky | do | J. F. Buckner. |
| Memphis, Tenn | Merchants' Exchange | N. S. Graves. |
| Milwaukee, Wis | Chamber of Commerce | W. J. Langson. |
| New York, N. Y | Produce Exchange | J. C. Brown (statistician). |
| Omaha, Nebr | Board of Trade | L. C. Harding. |
| Peoria, Ill | do | R. C. Grier. |
| Philadelphia, Pa | Commercial Exchange | Armon D. Acheson. |
| Do | Produce Exchange | Howard Austin. |
| Portland, Oreg | Board of Trade | P. L. Willis. |
| Richmond, Va | Chamber of Commerce | R. A. Dunlop. |
| St. Louis, Mo | Merchants' Exchange | George H. Morgan. |
| San Francisco, Cal | Chamber of Commerce | E. Scott. |
| Do | Produce Exchange | T. C. Friedlander. |
| Seattle, Wash | Chamber of Commerce | Thomas W. Prosch. |
| Toledo, Ohio | Produce Exchange | Denison B. Smith. |
| Washington, D. C | Board of Trade | George H. Harries. |

## COTTON EXCHANGES.

| City and State. | Name of organization. | Secretary. |
|---|---|---|
| Atlanta, Ga | Chamber of Commerce | V. V. Bullock. |
| Augusta, Ga | Exchange and Board of Trade | W. F. Alexander. |
| Birmingham, Ala | Commercial Club | J. B. Gibson. |
| Charleston, S. C | Cotton Exchange | R. A. Tavel. |
| Columbia, S. C | Board of Trade | W. E. McNulty. |
| Columbus, Ga | do | Rhodes Brown. |
| Dallas, Tex | Commercial Club | Paul Giraud. |
| Eufaula, Ala | Cotton Exchange | H. Lampley. |
| Fort Worth, Tex | Chamber of Commerce | S. M. Smith. |
| Galveston, Tex | Cotton Exchange and Board of Trade | S. O. Young. |
| Greenville, Miss | Cotton Exchange | Edward Holland. |
| Greenwood, Miss | do | C. K. Marshall. |
| Houston, Tex | Cotton Exchange and Board of Trade | B. R. Warner. |
| Little Rock, Ark | Board of Trade | George R. Brown. |

## COTTON EXCHANGES—Continued.

| City and State. | Name of organization. | Secretary. |
|---|---|---|
| Memphis, Tenn | Cotton Exchange | Henry Hotter. |
| Meridian, Miss | Board of Trade and Cotton Exchange | P. E. Walker. |
| Mobile, Ala | Cotton Exchange | R. H. Bolling. |
| Monroe, La | Board of Trade | E. D. Windes. |
| Montgomery, Ala | Commercial and Industrial Association | L. L. Gilbert. |
| Nashville, Tenn | Chamber of Commerce | L. R. Eastman. |
| Natchez, Miss | Cotton and Merchants' Exchange | W. E. Fitzpatrick. |
| Newbern, N. C | Cotton and Grain Exchange | James Redmond. |
| New Orleans, La | Cotton Exchange | Henry G. Hester. |
| New York, N. Y | do | Robert P. McDougall. |
| Norfolk and Portsmouth, Va. | do | S. B. Harrell (Treas.). |
| Raleigh, N. C | Cotton and Grocers' Exchange | P. T. Wyatt. |
| Richmond, Va | Grain and Cotton Exchange | B. A. Jacob. |
| Rome, Ga | Board of Trade | A. W. Walton. |
| St. Louis, Mo | Merchants' Exchange | George A. Morgan. |
| Savannah, Ga | Cotton Exchange | J. P. Merrihew. |
| Selma, Ala | do | C. A. McKinnon. |
| Sherman, Tex | Commercial Club | M. L. Kelly. |
| Shreveport, La | Board of Trade | Henry Hawkins. |
| Texarkana, Ark | do | G. A. Hays. |
| Vicksburg, Miss | Cotton Exchange | J. H. Cook. |
| Waco, Tex | Commercial Club | S. L. Jones. |
| Wilmington, N. C | Produce Exchange | John L. Cantwell. |
| Yazoo City, Miss | Cotton Exchange | L. Bowman. |

## STATISTICS OF THE PRINCIPAL CROPS AND FARM ANIMALS.

[From Division of Statistics.]

*Acreage, production, value, prices, and exports of corn in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1. | Farm value, Dec. 1. | Chicago cash price per bushel, No. 2. December. Low. | December. High. | May of following year. Low. | May of following year. High. | Domestic exports, including corn meal, fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cents.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* |
| 1866 | 34,306,538 | 25.3 | 867,946,295 | 47.4 | 411,450,830 | 53 | 62 | 64 | 79 | 16,026,947 |
| 1867 | 32,520,249 | 23.6 | 768,320,000 | 57.0 | 437,769,763 | 61 | 65 | 61 | 71 | 12,493,522 |
| 1868 | 34,887,246 | 26.0 | 906,527,000 | 46.8 | 424,056,649 | 38 | 58 | 44 | 51 | 8,286,665 |
| 1869 | 37,103,245 | 23.6 | 874,320,000 | 59.8 | 522,550,509 | 56 | 67 | 73 | 85 | 2,140,487 |
| 1870 | 38,646,977 | 28.3 | 1,094,255,000 | 49.4 | 540,520,456 | 41 | 59 | 46 | 52 | 10,676,873 |
| 1871 | 34,091,137 | 29.1 | 991,898,000 | 43.4 | 430,355,910 | 36 | 39 | 38 | 43 | 35,727,010 |
| 1872 | 35,526,836 | 30.8 | 1,092,719,000 | 35.3 | 385,736,210 | 27 | 28 | 34 | 39 | 40,154,374 |
| 1873 | 39,197,148 | 23.8 | 932,274,000 | 44.2 | 411,961,151 | 40 | 49 | 49 | 59 | 35,985,834 |
| 1874 | 41,036,918 | 20.7 | 850,148,500 | 58.4 | 496,271,255 | 64 | 76 | 53 | 67 | 30,025,036 |
| 1875 | 44,841,371 | 29.4 | 1,321,069,000 | 36.7 | 484,674,804 | 40 | 47 | 41 | 45 | 50,910,532 |
| 1876 | 49,033,364 | 26.2 | 1,283,827,500 | 34.0 | 436,108,521 | 40 | 43 | 43 | 56 | 72,652,611 |
| 1877 | 50,369,113 | 26.7 | 1,342,558,000 | 34.8 | 467,635,230 | 41 | 49 | 35 | 41 | 87,192,110 |
| 1878 | 51,585,000 | 26.9 | 1,388,218,750 | 31.7 | 440,280,517 | 30 | 32 | 33 | 36 | 87,884,892 |
| 1879 | 53,085,450 | 29.2 | 1,547,901,790 | 37.5 | 580,486,217 | 39 | 43¼ | 32⅝ | 36½ | 99,572,329 |
| 1880 | 62,317,842 | 27.6 | 1,717,434,543 | 39.6 | 679,714,499 | 35⅝ | 42 | 41½ | 45 | 93,648,147 |
| 1881 | 64,262,025 | 18.6 | 1,194,916,000 | 63.6 | 759,482,170 | 58½ | 63½ | 69 | 76½ | 44,340,683 |
| 1882 | 65,659,545 | 24.6 | 1,617,025,100 | 48.5 | 783,867,175 | 49½ | 61 | 53½ | 56¾ | 41,655,653 |
| 1883 | 68,301,889 | 22.7 | 1,551,066,895 | 42.4 | 658,051,485 | 54¼ | 63½ | 52½ | 57 | 46,258,606 |
| 1884 | 69,683,780 | 25.8 | 1,795,528,000 | 35.7 | 640,735,560 | 34½ | 40¼ | 44¾ | 49 | 52,876,456 |
| 1885 | 73,130,150 | 26.5 | 1,936,176,000 | 32.8 | 635,674,630 | 36 | 42¾ | 34½ | 36¾ | 64,829,617 |
| 1886 | 75,694,208 | 22.0 | 1,665,441,000 | 36.6 | 610,311,000 | 35¾ | 38 | 36⅞ | 39⅝ | 41,368,584 |
| 1887 | 72,392,720 | 20.1 | 1,456,161,000 | 44.4 | 646,106,770 | 47 | 51½ | 54 | 60 | 25,360,869 |
| 1888 | 75,672,763 | 26.3 | 1,987,790,000 | 34.1 | 677,561,580 | 33¼ | 35⅞ | 33½ | 35⅝ | 70,841,673 |
| 1889 | 78,319,651 | 27.0 | 2,112,892,000 | 28.3 | 597,918,829 | 29¼ | 35 | 32¾ | 35 | 103,418,709 |
| 1890 | 71,970,763 | 20.7 | 1,489,970,000 | 50.6 | 754,433,451 | 47¾ | 53 | 55 | 69½ | 32,041,529 |
| 1891 | 76,204,515 | 27.0 | 2,060,154,000 | 40.6 | 836,439,228 | 39⅝ | 59 | 40¾ | *a*100 | 76,602,285 |
| 1892 | 70,626,658 | 23.1 | 1,628,464,000 | 39.4 | 642,146,630 | 40 | 42⅞ | 39½ | 44½ | 47,121,894 |
| 1893 | 72,036,465 | 22.5 | 1,619,496,131 | 36.5 | 591,625,627 | 34¼ | 36½ | 36¾ | 38½ | 66,489,529 |
| 1894 | 62,582,269 | 19.4 | 1,212,770,052 | 45.7 | 554,719,162 | 44⅝ | 47½ | 47¾ | 55½ | 28,585,405 |
| 1895 | 82,075,830 | 26.2 | 2,151,138,580 | 25.3 | 544,985,534 | 25 | 26¾ | 27½ | 29½ | 101,100,375 |
| 1896 | 81,027,156 | 28.2 | 2,283,875,165 | 21.5 | 491,006,967 | 22½ | 23¾ | 23 | 25½ | 178,817,417 |
| 1897 | 80,095,051 | 23.8 | 1,902,967,933 | 26.3 | 501,072,952 | 25 | 27½ | 32⅝ | 37 | 212,055,543 |
| 1898 | 77,721,781 | 24.8 | 1,924,184,660 | 28.7 | 552,023,428 | 33⅜ | 38 | 32½ | 34⅝ | 177,255,046 |
| 1899 | 82,108,587 | 25.3 | 2,078,143,933 | 30.3 | 629,210,110 | 30 | 31½ | ---- | ---- | ---- |

*a* Result of corner.

*Acreage, production, value, prices, and exports of wheat in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1 | Farm value, Dec. 1. | Chicago cash price per bushel, No. 2. December. Low. | December. High. | May of following year. Low. | May of following year. High. | Domestic exports including flour, fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cents.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* |
| 1866 | 15,424,496 | 9.9 | 151,999,906 | 152.7 | 232,109,630 | 129 | 145 | 185 | 211 | 12,646,941 |
| 1867 | 18,321,561 | 11.6 | 212,441,400 | 145.2 | 308,387,146 | 126 | 140 | 134 | 161 | 25,284,803 |
| 1868 | 18,460,132 | 12.1 | 224,036,600 | 108.5 | 243,032,746 | 80 | 88 | 87 | 96 | 29,717,201 |
| 1869 | 19,181,004 | 13.6 | 260,146,900 | 76.5 | 199,024,996 | 63 | 76 | 79 | 92 | 53,900,780 |
| 1870 | 18,992,591 | 12.4 | 235,884,700 | 94.4 | 222,766,969 | 91 | 98 | 113 | 120 | 52,580,111 |
| 1871 | 19,943,893 | 11.6 | 230,722,400 | 114.5 | 264,075,851 | 107 | 111 | 120 | 143 | 38,995,755 |
| 1872 | 20,858,359 | 11.9 | 249,997,100 | 111.4 | 278,522,068 | 97 | 108 | 112 | 122 | 52,014,715 |
| 1873 | 22,171,676 | 12.7 | 281,264,700 | 106.9 | 300,669,533 | 96 | 106 | 105 | 114 | 91,510,398 |
| 1874 | 24,967,027 | 12.3 | 308,102,700 | 86.3 | 265,881,167 | 78 | 83 | 78 | 94 | 72,912,817 |
| 1875 | 26,381,512 | 11.1 | 292,136,000 | 89.5 | 261,396,926 | 82 | 91 | 89 | 100 | 74,750,682 |
| 1876 | 27,627,021 | 10.4 | 289,356,500 | 96.3 | 278,697,238 | 104 | 117 | 130 | 172 | 57,043,936 |
| 1877 | 26,277,546 | 13.9 | 364,194,146 | 105.7 | 385,089,444 | 103 | 108 | 98 | 113 | 92,071,726 |
| 1878 | 32,108,560 | 13.1 | 420,122,400 | 77.6 | 325,814,119 | 81 | 84 | 91 | 102 | 150,502,506 |
| 1879 | 32,545,950 | 13.8 | 448,756,630 | 110.8 | 497,030,142 | 122 | 133¼ | 112½ | 119 | 180,304,180 |
| 1880 | 37,986,717 | 13.1 | 498,549,868 | 95.1 | 474,201,850 | 93½ | 109¾ | 101 | 112⅝ | 186,321,514 |
| 1881 | 37,709,020 | 10.2 | 383,280,090 | 119.2 | 456,880,427 | 124¾ | 129 | 123 | 140 | 121,892,389 |
| 1882 | 37,067,194 | 13.6 | 504,185,470 | 88.2 | 445,602,125 | 91⅛ | 94¾ | 108 | 113⅝ | 147,811,316 |
| 1883 | 36,455,593 | 11.6 | 421,086,160 | 91.1 | 383,649,272 | 94⅝ | 99¼ | 85 | 94¾ | 111,534,182 |
| 1884 | 39,475,885 | 13.0 | 512,765,000 | 64.5 | 330,862,260 | 69⅛ | 76⅝ | 85⅝ | 90¾ | 132,570,366 |
| 1885 | 34,189,246 | 10.4 | 357,112,000 | 77.1 | 275,320,390 | 82⅞ | 89 | 72½ | 79 | 94,565,793 |
| 1886 | 36,806,184 | 12.4 | 457,218,000 | 68.7 | 314,226,020 | 75⅛ | 79½ | 80¾ | 88⅛ | 153,804,969 |
| 1887 | 37,641,783 | 12.1 | 456,329,000 | 68.1 | 310,612,960 | 75⅛ | 79¼ | 81¼ | 89⅞ | 119,624,344 |
| 1888 | 37,336,138 | 11.1 | 415,868,000 | 92.6 | 385,248,030 | 96⅝ | 105½ | 77¼ | 95½ | 88,600,742 |
| 1889 | 38,123,859 | 12.9 | 490,560,000 | 69.8 | 342,491,707 | 76¾ | 80½ | 89¾ | 100 | 109,430,467 |
| 1890 | 36,087,154 | 11.1 | 399,262,000 | 83.8 | 334,773,678 | 87½ | 92⅝ | 98⅞ | 108 | 106,181,316 |
| 1891 | 39,916,897 | 15.3 | 611,780,000 | 83.9 | 513,472,711 | 89⅝ | 93¼ | 80 | 85¾ | 225,665,812 |
| 1892 | 38,554,430 | 13.4 | 515,949,000 | 62.4 | 322,111,881 | 69½ | 73 | 68¼ | 76¼ | 191,912,635 |
| 1893 | 34,629,418 | 11.4 | 396,131,725 | 53.8 | 213,171,381 | 59⅛ | 64⅛ | 52½ | 60⅛ | 164,283,129 |
| 1894 | 34,882,436 | 13.2 | 460,267,416 | 49.1 | 225,902,025 | 52¾ | 63⅝ | 60⅞ | 85⅝ | 144,812,718 |
| 1895 | 34,047,332 | 13.7 | 467,102,947 | 50.9 | 237,938,998 | 53⅞ | 64⅝ | 57⅛ | 67⅝ | 126,443,968 |
| 1896 | 34,618,646 | 12.4 | 427,684,346 | 72.6 | 310,602,539 | 74⅝ | 93⅛ | 68¾ | 97⅞ | 145,124,972 |
| 1897 | 39,465,066 | 13.4 | 530,149,168 | 80.8 | 428,547,121 | 92 | 109 | 117 | 185 | 217,306,005 |
| 1898 | 44,055,278 | 15.3 | 675,148,705 | 58.2 | 392,770,320 | 62¾ | 70 | 68⅝ | 79½ | 222,694,920 |
| 1899 | 44,592,516 | 12.3 | 547,303,846 | 58.4 | 319,545,259 | 64 | 69½ | ------ | ------ | ------------ |

*Acreage, production, value, prices, exports, and imports of oats in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1 | Farm value, Dec. 1. | Chicago cash price per bushel, No. 2. December. Low. | December. High. | May of following year. Low. | May of following year. High. | Domestic exports, including oatmeal, fiscal years beginning July 1. | Imports during fiscal years beginning July 1.*a* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cts.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* | *Bushels.* |
| 1866 | 8,864,219 | 30.2 | 268,141,078 | 35.1 | 94,057,945 | 36 | 43 | 59 | 78 | 825,895 | 778,198 |
| 1867 | 10,746,416 | 25.9 | 278,698,000 | 44.5 | 123,902,556 | 52 | 57¼ | ------ | ------ | 122,554 | 780,798 |
| 1868 | 9,665,736 | 26.4 | 254,960,800 | 41.7 | 106,355,976 | 43 | 49½ | 56¾ | 62½ | 481,871 | 326,659 |
| 1869 | 9,461,441 | 30.5 | 288,334,000 | 38.0 | 109,521,734 | 40 | 44¾ | 46½ | 53½ | 121,517 | 2,266,785 |
| 1870 | 8,792,395 | 28.1 | 247,277,400 | 39.0 | 96,443,637 | 37¾ | 41 | 47½ | 51 | 147,572 | 599,514 |
| 1871 | 8,365,809 | 30.6 | 255,743,000 | 36.2 | 92,591,359 | 30¾ | 33 | 34¾ | 42½ | 262,975 | 535,250 |
| 1872 | 9,000,769 | 30.2 | 271,747,000 | 29.9 | 81,303,518 | 23½ | 25¾ | 30 | 34 | 714,072 | 225,555 |
| 1873 | 9,751,700 | 27.7 | 270,340,000 | 34.6 | 93,474,161 | 34 | 40⅝ | 44 | 48½ | 812,873 | 191,802 |
| 1874 | 10,897,412 | 22.1 | 240,369,000 | 47.1 | 113,133,934 | 51¾ | 54½ | 57¼ | 64½ | 504,770 | 1,500,040 |
| 1875 | 11,915,075 | 29.7 | 354,317,500 | 32.0 | 113,441,491 | 29½ | 30½ | 28⅝ | 31½ | 1,466,228 | 121,547 |
| 1876 | 13,358,908 | 24.0 | 320,884,000 | 32.4 | 103,844,896 | 31¾ | 34½ | 37¼ | 45¾ | 2,854,128 | 41,597 |
| 1877 | 12,826,148 | 31.7 | 406,394,000 | 28.5 | 115,546,194 | 24½ | 27 | 23 | 27 | 3,715,479 | 21,391 |
| 1878 | 13,176,500 | 31.4 | 413,578,560 | 24.6 | 101,752,468 | 19⅝ | 20⅝ | 24⅝ | 30¼ | 5,452,136 | 13,395 |
| 1879 | 12,683,500 | 28.7 | 363,761,320 | 33.1 | 120,533,294 | 32¾ | 36¾ | 29½ | 34⅞ | 766,366 | 489,576 |
| 1880 | 16,187,977 | 25.8 | 417,885,380 | 36.0 | 150,243,565 | 29⅛ | 33½ | 36½ | 39½ | 402,904 | 64,412 |
| 1881 | 16,831,600 | 24.7 | 416,481,000 | 46.4 | 193,198,970 | 43½ | 46¾ | 48¾ | 56⅝ | 625,690 | 1,850,983 |
| 1882 | 18,494,691 | 26.4 | 488,250,610 | 37.5 | 182,978,022 | 34¾ | 41½ | 38¾ | 42¾ | 461,496 | 815,017 |
| 1883 | 20,324,962 | 28.1 | 571,302,400 | 33.0 | 187,040,264 | 29⅝ | 36⅛ | 30¾ | 34¼ | 3,274,622 | 121,064 |
| 1884 | 21,300,917 | 27.4 | 583,628,000 | 28.0 | 161,528,470 | 22½ | 25¼ | 34½ | 37 | 6,193,104 | 94,310 |
| 1885 | 22,783,630 | 27.6 | 629,409,000 | 28.5 | 179,631,860 | 27 | 29 | 26¼ | 29⅝ | 7,311,306 | 149,480 |

*a* In years 1866, and 1884 to 1899, inclusive, oatmeal is included.

*Acreage, production, value, prices, exports, and imports of oats in the United States, 1866 to 1899, inclusive*—Continued.

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1 | Farm value, Dec. 1. | Chicago cash price per bushel, No. 2. December. Low. | Chicago cash price per bushel, No. 2. December. High. | Chicago cash price per bushel, No. 2. May of following year. Low. | Chicago cash price per bushel, No. 2. May of following year. High. | Domestic exports, including oatmeal, fiscal years beginning July 1. | Imports during fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cts.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* | *Bushels.* |
| 1886 | 23,658,474 | 26.4 | 624,134,000 | 29.8 | 186,137,930 | 25¾ | 27¼ | 25⅛ | 27½ | 1,374,635 | 139,575 |
| 1887 | 25,920,906 | 25.4 | 659,618,000 | 30.4 | 200,699,790 | 28⅝ | 30⅞ | 32¼ | 38 | 573,080 | 123,817 |
| 1888 | 26,998,282 | 30.0 | 701,735,000 | 27.8 | 195,424,240 | 25 | 26⅛ | 21⅝ | 23⅝ | 1,191,471 | 131,501 |
| 1889 | 27,462,316 | 27.4 | 751,515,000 | 23.0 | 171,781,008 | 20 | 21 | 24¾ | 30 | 15,107,238 | 153,232 |
| 1890 | 26,431,369 | 19.8 | 523,621,000 | 42.4 | 222,048,486 | 39⅞ | 43⅞ | 45¼ | 54 | 1,382,836 | 41,848 |
| 1891 | 25,581,861 | 28.9 | 738,394,000 | 31.5 | 232,312,267 | 31½ | 33⅝ | 28⅛ | 33½ | 10,586,644 | 47,782 |
| 1892 | 27,063,835 | 24.4 | 661,035,000 | 31.7 | 209,253,611 | 25⅜ | 31¼ | 28⅜ | 32¼ | 2,700,793 | 49,433 |
| 1893 | 27,273,033 | 23.4 | 638,854,850 | 29.4 | 187,576,092 | 27½ | 29⅛ | 32½ | 36 | 6,290,229 | 31,759 |
| 1894 | 27,023,553 | 24.5 | 662,036,928 | 32.4 | 214,816,920 | 28¾ | 29⅝ | 27½ | 30¾ | 1,708,824 | 330,317 |
| 1895 | 27,878,406 | 29.6 | 824,443,537 | 19.9 | 163,655,068 | 16⅛ | 17¼ | 18 | 19⅝ | 15,156,618 | 66,602 |
| 1896 | 27,565,985 | 25.7 | 707,346,404 | 18.7 | 132,485,033 | 16½ | 18¾ | 16⅞ | 18¾ | 37,725,083 | 893,908 |
| 1897 | 25,730,375 | 27.2 | 698,767,809 | 21.2 | 147,974,719 | 21 | 23⅝ | 26 | 32 | 73,880,307 | 25,093 |
| 1898 | 25,777,110 | 28.4 | 730,906,643 | 25.5 | 186,405,364 | 26 | 27¾ | 24 | 27¾ | 33,534,264 | 28,098 |
| 1899 | 26,341,380 | 30.2 | 796,177,713 | 24.9 | 198,167,975 | 22¼ | 23 | ------ | ------ | ---------- | -------- |

*Acreage, production, value, prices, exports, and imports of barley in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1. | Farm value, Dec. 1. | Chicago cash price per bushel, No. 2. December. Low. | Chicago cash price per bushel, No. 2. December. High. | Chicago cash price per bushel, No. 2. May of following year. Low. | Chicago cash price per bushel, No. 2. May of following year. High. | Domestic exports fiscal years beginning July 1. | Imports during fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cts.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* | *Bushels.* |
| 1866 | 492,532 | 22.9 | 11,283,807 | 70.2 | 7,916,342 | 59 | 70 | 85 | 100 | ---------- | 3,247,250 |
| 1867 | 1,131,217 | 22.7 | 25,727,000 | 70.1 | 18,027,746 | 150 | 180 | 227 | 250 | 9,810 | 3,783,966 |
| 1868 | 937,498 | 24.4 | 22,896,100 | 109.0 | 24,948,127 | 140 | 170 | 149 | 175 | 59,077 | 5,069,880 |
| 1869 | 1,025,795 | 27.9 | 28,652,200 | 70.8 | 20,298,164 | 74 | 85 | 50 | 62 | 255,490 | 6,727,597 |
| 1870 | 1,108,924 | 23.7 | 26,295,400 | 79.1 | 20,792,213 | 68 | 80 | 72 | 95 | 340,093 | 4,866,700 |
| 1871 | 1,177,735 | 22.7 | 26,718,500 | 75.8 | 20,264,015 | 55½ | 64 | 55 | 71 | 86,891 | 5,565,591 |
| 1872 | 1,397,082 | 19.2 | 26,846,400 | 68.6 | 18,415,839 | 60 | 70 | 71 | 85 | 482,410 | 4,244,751 |
| 1873 | 1,387,106 | 23.1 | 32,044,491 | 86.7 | 27,794,229 | 132 | 158 | 130 | 155 | 320,399 | 4,891,189 |
| 1874 | 1,580,626 | 20.6 | 32,552,500 | 86.0 | 27,997,824 | 120 | 129½ | 115 | 137 | 91,118 | 6,255,063 |
| 1875 | 1,789,902 | 20.6 | 36,908,600 | 74.1 | 27,367,522 | 81 | 88 | 62½ | 72½ | 317,781 | 10,285,957 |
| 1876 | 1,766,511 | 21.9 | 38,710,500 | 63.0 | 24,402,691 | 63¾ | 68½ | 80 | 85 | 1,186,129 | 6,702,965 |
| 1877 | 1,614,654 | 21.3 | 34,441,400 | 62.8 | 21,629,130 | 56¼ | 64 | 46½ | 52½ | 3,921,501 | 6,764,228 |
| 1878 | 1,790,400 | 23.6 | 42,245,630 | 57.9 | 24,454,301 | 91 | 100 | 64 | 73 | 715,536 | 5,720,979 |
| 1879 | 1,680,700 | 24.0 | 40,283,100 | 58.9 | 23,714,444 | 86 | 92 | 75 | 80 | 1,128,923 | 7,135,258 |
| 1880 | 1,843,329 | 24.5 | 45,165,346 | 66.6 | 30,090,742 | 100 | 120 | 95 | 105 | 885,246 | 9,528,616 |
| 1881 | 1,967,510 | 20.9 | 41,161,330 | 82.3 | 33,862,513 | 101 | 107 | 100 | 100 | 205,930 | 12,182,722 |
| 1882 | 2,272,103 | 21.5 | 48,953,926 | 62.8 | 30,768,015 | 79 | 82 | 80 | 80 | 433,005 | 10,050,687 |
| 1883 | 2,379,009 | 21.1 | 50,136,097 | 58.7 | 29,420,423 | 62 | 67 | 65 | 74 | 724,955 | 8,596,122 |
| 1884 | 2,608,818 | 23.5 | 61,203,000 | 48.7 | 29,779,170 | 53 | 58 | 65 | 65 | 629,130 | 9,986,507 |
| 1885 | 2,729,359 | 21.4 | 58,360,000 | 56.3 | 32,867,696 | 62 | 65 | 58 | 60 | 252,183 | 10,197,115 |
| 1886 | 2,652,957 | 22.4 | 59,428,000 | 53.6 | 31,840,510 | 51 | 54 | 57 | 57 | 1,305,300 | 10,355,594 |
| 1887 | 2,901,953 | 19.6 | 56,812,000 | 52.2 | 29,464,390 | 80 | 80 | 69 | 77 | 550,884 | 10,831,461 |
| 1888 | 2,996,382 | 21.3 | 63,884,000 | 59.6 | 37,672,032 | ------ | ------ | ------ | ------ | 1,440,321 | 11,368,414 |
| 1889 | 3,220,834 | 24.3 | 78,332,976 | 42.7 | 32,614,271 | 58 | 58 | ------ | ------ | 1,408,311 | 11,332,545 |
| 1890 | 3,135,302 | 21.0 | 67,168,344 | 64.8 | 42,140,502 | ------ | ------ | ------ | ------ | 973,062 | 5,078,733 |
| 1891 | 3,352,579 | 25.8 | 86,839,153 | 54.0 | 45,470,342 | ------ | ------ | ------ | ------ | 2,800,075 | 3,146,328 |
| 1892 | 3,400,361 | 23.7 | 80,096,762 | 47.2 | 38,026,062 | 65 | 67 | 65 | 65 | 3,035,267 | 1,970,129 |
| 1893 | 3,220,371 | 21.7 | 69,869,495 | 41.1 | 28,729,386 | 52 | 54 | 55 | 60 | 5,219,405 | 791,061 |
| 1894 | 3,170,602 | 19.4 | 61,400,465 | 44.2 | 27,134,127 | 53½ | 55½ | 51 | 52 | 1,563,754 | 2,116,816 |
| 1895 | 3,299,973 | 26.4 | 87,072,744 | 33.7 | 29,312,413 | 33 | 40 | ------ | ------ | 7,680,331 | 837,384 |
| 1896 | 2,950,539 | 23.6 | 69,695,223 | 32.3 | 22,491,241 | ------ | ------ | ------ | ------ | 20,030,301 | 1,271,787 |
| 1897 | 2,719,116 | 24.5 | 66,685,127 | 37.7 | 25,142,139 | ------ | ------ | ------ | ------ | 11,237,077 | 124,804 |
| 1898 | 2,583,125 | 21.6 | 55,792,257 | 41.3 | 23,064,359 | ------ | ------ | ------ | ------ | 2,267,400 | 110,475 |
| 1899 | 2,878,229 | 25.5 | 73,381,563 | 40.3 | 29,594,254 | ------ | ------ | ------ | ------ | ---------- | -------- |

*Acreage, production, value, prices, and exports of rye in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1. | Farm value, Dec. 1. | Chicago cash price per bushel, No. 2. December. Low. | Chicago cash price per bushel, No. 2. December. High. | Chicago cash price per bushel, No. 2. May of following year. Low. | Chicago cash price per bushel, No. 2. May of following year. High. | Domestic exports, including rye flour, fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cents.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* |
| 1866 | 1,548,033 | 12.8 | 20,864,944 | 82.2 | 17,149,716 | ------ | ------ | 142 | 150 | 234,971 |
| 1867 | 1,689,175 | 13.7 | 23,184,000 | 100.4 | 23,280,584 | 132 | 157 | 173 | 185 | 564,901 |
| 1868 | 1,651,321 | 13.6 | 22,504,800 | 94.9 | 21,349,190 | 106½ | 118 | 100 | 115½ | 92,869 |
| 1869 | 1,657,584 | 13.6 | 22,527,900 | 77.0 | 17,341,861 | 66 | 77¼ | 78 | 83½ | 199,450 |
| 1870 | 1,176,137 | 13.2 | 15,473,600 | 73.2 | 11,326,967 | 67 | 74 | 81 | 91 | 87,174 |
| 1871 | 1,069,531 | 14.4 | 15,365,500 | 71.1 | 10,927,623 | 62 | 63¾ | 75 | 93 | 832,689 |
| 1872 | 1,048,654 | 14.2 | 14,888,600 | 67.6 | 10,071,061 | 57½ | 70 | 68½ | 70 | 611,749 |
| 1873 | 1,150,355 | 13.2 | 15,142,000 | 70.3 | 10,638,258 | 70 | 81 | 91 | 102 | 1,923,404 |
| 1874 | 1,116,716 | 13.4 | 14,990,900 | 77.4 | 11,610,339 | 93 | 99½ | 103 | 107½ | 267,058 |
| 1875 | 1,359,788 | 13.0 | 17,722,100 | 67.1 | 11,894,223 | 67 | 68¾ | 61½ | 70½ | 589,159 |
| 1876 | 1,468,374 | 13.9 | 20,374,800 | 61.4 | 12,504,970 | 65½ | 73 | 70 | 92½ | 2,234,856 |
| 1877 | 1,412,902 | 15.0 | 21,170,100 | 57.6 | 12,201,759 | 55½ | 56½ | 54 | 60 | 4,249,684 |
| 1878 | 1,622,700 | 15.9 | 25,842,790 | 52.5 | 13,566,002 | 44 | 44½ | 47 | 52 | 4,877,821 |
| 1879 | 1,625,450 | 14.5 | 23,639,460 | 65.6 | 15,507,431 | 73½ | 81 | 73½ | 85 | 2,943,894 |
| 1880 | 1,767,619 | 13.9 | 24,540,829 | 75.6 | 18,564,560 | 82 | 91½ | 115 | 118 | 1,955,155 |
| 1881 | 1,789,100 | 11.6 | 20,704,950 | 93.3 | 19,327,415 | 96½ | 98 | 77 | 83 | 1,003,615 |
| 1882 | 2,227,894 | 13.4 | 29,960,037 | 61.5 | 18.439,194 | 57 | 58½ | 62 | 67 | 2,206,212 |
| 1883 | 2,314,754 | 12.1 | 28,058,582 | 58.0 | 16,300,503 | 56½ | 60 | 60½ | 62½ | 6,247,590 |
| 1884 | 2,343,963 | 12.2 | 28,640,000 | 52.0 | 14,857,040 | 51 | 52 | 68 | 73 | 2,974,390 |
| 1885 | 2,129,301 | 10.2 | 21,756,000 | 57.9 | 12,594,820 | 58½ | 61 | 58 | 61 | 216,699 |
| 1886 | 2,129,918 | 11.5 | 24,489,000 | 53.1 | 13,181,330 | 53 | 54½ | 54½ | 56½ | 377,302 |
| 1887 | 2,053,447 | 10.1 | 20,693,000 | 54.4 | 11,283,140 | 55½ | 61½ | 63 | 68 | 94,827 |
| 1888 | 2,364,805 | 12.0 | 28,415,000 | 58.8 | 16,721,869 | 50 | 52 | 39 | 41½ | 309,266 |
| 1889 | 2,171,493 | 13.1 | 28,420,299 | 45.7 | 12,009,752 | 44 | 45½ | 49½ | 54 | 2,280,975 |
| 1890 | 2,141,853 | 11.8 | 25,807,472 | 62.9 | 16,229,992 | 64½ | 68½ | 83 | 92 | 358,263 |
| 1891 | 2,176,466 | 14.4 | 31,751,868 | 77.4 | 24,589,217 | 86 | 92 | 70¼ | 79 | 12,068,628 |
| 1892 | 2,163,657 | 12.7 | 27,978,824 | 54.2 | 15,160,056 | 46 | 51 | 50½ | 62 | 1,493,924 |
| 1893 | 2,038,485 | 13.0 | 26,555,446 | 51.3 | 13,612,222 | 45 | 47½ | 44½ | 48 | 249,152 |
| 1894 | 1,944,780 | 13.7 | 26,727,615 | 50.1 | 13,395,476 | 47½ | 49 | 62½ | 67 | 32,045 |
| 1895 | 1,890,345 | 14.4 | 27,210,070 | 44.0 | 11,964,826 | 32 | 35¾ | 33 | 36½ | 1,011,128 |
| 1896 | 1,831,201 | 13.3 | 24,369,047 | 40.9 | 9,960,769 | 37 | 42½ | 32¾ | 35½ | 8,581,667 |
| 1897 | 1,703,561 | 16.1 | 27,363,324 | 44.7 | 12,239,647 | 45¾ | 47 | 48 | 75 | 15,562,035 |
| 1898 | 1,643,207 | 15.6 | 25,657,522 | 46.3 | 11,875,350 | 52½ | 55½ | 56½ | 62 | 10,169,832 |
| 1899 | 1,659,308 | 14.4 | 23,961,741 | 51.0 | 12,214,118 | 49 | 52 | ------ | ------ | ------ |

*Acreage, production, value, and prices of buckwheat in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1. | Farm value, Dec. 1. |
|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* |
| 1866 | 1,045,624 | 21.8 | 22,791,839 | 67.6 | 15,413,160 |
| 1867 | 1,227,826 | 17.4 | 21,359,000 | 78.7 | 16,812,070 |
| 1868 | 1,113,993 | 17.8 | 19,863,700 | 78.0 | 15,490,426 |
| 1869 | 1,028,693 | 16.9 | 17,431,100 | 71.9 | 12,534,851 |
| 1870 | 536,992 | 18.3 | 9,841,500 | 70.5 | 6,937,471 |
| 1871 | 413,915 | 20.1 | 8,328,700 | 74.5 | 6,208,165 |
| 1872 | 448,497 | 18.1 | 8,133,500 | 73.5 | 5,979,222 |
| 1873 | 454,152 | 17.2 | 7,837,700 | 75.0 | 5,878,629 |
| 1874 | 452,590 | 17.7 | 8,016,600 | 72.9 | 5,843,645 |
| 1875 | 575,530 | 17.5 | 10,082,100 | 62.0 | 6,254,564 |
| 1876 | 666,441 | 14.5 | 9,668,800 | 66.6 | 6,435,836 |
| 1877 | 649,923 | 15.6 | 10,177,000 | 66.9 | 6,808,180 |
| 1878 | 673,100 | 18.2 | 12,246,820 | 52.6 | 6,441,240 |
| 1879 | 639,900 | 20.5 | 13,140,000 | 59.8 | 7,856,191 |
| 1880 | 822,802 | 17.7 | 14,617,535 | 59.4 | 8,682,488 |
| 1881 | 828,815 | 11.4 | 9,486,200 | 86.5 | 8,205,705 |
| 1882 | 847,112 | 13.1 | 11,019,353 | 72.9 | 8,038,862 |
| 1883 | 857,349 | 8.9 | 7,668,954 | 82.2 | 6,303,980 |
| 1884 | 879,403 | 12.6 | 11,116,000 | 59.0 | 6.549,020 |
| 1885 | 914,394 | 13.8 | 12,626,000 | 55.9 | 7,057,363 |
| 1886 | 917,915 | 12.9 | 11,869,000 | 54.4 | 6,465,120 |
| 1887 | 910,506 | 11.9 | 10,844,000 | 56.1 | 6,122,320 |
| 1888 | 912,630 | 13.2 | 12,050,000 | 63.6 | 7,627,647 |
| 1889 | 837,162 | 14.5 | 12,110,329 | 51.8 | 6,113,119 |
| 1890 | 844,579 | 14.5 | 12,432,831 | 57.4 | 7,132,872 |

*Acreage, production, value, etc., of buckwheat in the United States, 1866 to 1899, inclusive*—Continued.

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per bushel, Dec. 1. | Farm value, Dec. 1. |
|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* |
| 1891 | 849,364 | 15.3 | 12,760,932 | 57.0 | 7,271,506 |
| 1892 | 861,451 | 14.1 | 12,143,185 | 51.8 | 6,295,643 |
| 1893 | 815,614 | 14.9 | 12,122,311 | 58.4 | 7,074,450 |
| 1894 | 789,232 | 16.1 | 12,668,200 | 55.6 | 7,040,238 |
| 1895 | 763,277 | 20.1 | 15,341,399 | 45.2 | 6,936,325 |
| 1896 | 754,898 | 18.7 | 14,089,783 | 39.2 | 5,522,339 |
| 1897 | 717,836 | 20.9 | 14,997,451 | 42.1 | 6,319,188 |
| 1898 | 678,332 | 17.3 | 11,721,927 | 45.0 | 5,271,462 |
| 1899 | 670,148 | 16.6 | 11,094,473 | 55.7 | 6,183,675 |

*Acreage, production, value, prices, exports, and imports of potatoes in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre | Production. | Average farm price per bushel, Dec. 1 | Farm value, Dec. 1. | Chicago price per bushel, Burbank. December. Low. | Chicago price per bushel, Burbank. December. High. | Chicago price per bushel, Burbank. May of following year. Low. | Chicago price per bushel, Burbank. May of following year. High. | Domestic exports, fiscal years beginning July 1. | Imports during fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bush.* | *Bushels.* | *Cts.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bushels.* | *Bushels.* |
| 1866 | 1,069,381 | 100.2 | 107,200,976 | 47.3 | 50,722,553 | | | | | 512,380 | 198,265 |
| 1867 | 1,192,195 | 82.0 | 97,783,000 | 65.9 | 64,462,486 | | | | | 378,605 | 209,555 |
| 1868 | 1,131,552 | 93.8 | 106,090,000 | 59.3 | 62,918,660 | | | | | | 138,470 |
| 1869 | 1,222,250 | 109.5 | 133,886,000 | 42.9 | 57,481,362 | | | | | 596,968 | 75,336 |
| 1870 | 1,325,119 | 86.6 | 114,775,000 | 65.0 | 74,621,019 | | | | | 553,070 | 458,758 |
| 1871 | 1,220,913 | 98.7 | 120,461,700 | 53.9 | 64,905,189 | | | | | 621,537 | 96,259 |
| 1872 | 1,331,331 | 85.3 | 113,516,000 | 53.5 | 60,692,129 | | | | | 515,306 | 346,840 |
| 1873 | 1,295,139 | 81.9 | 106,089,000 | 65.2 | 69,153,709 | | | | | 497,413 | 549,073 |
| 1874 | 1,310,041 | 80.9 | 105,981,000 | 61.5 | 65,223,314 | | | | | 609,642 | 188,757 |
| 1875 | 1,510,041 | 110.5 | 166,877,000 | 34.4 | 57,357,515 | | | | | 704,379 | 92,148 |
| 1876 | 1,741,983 | 71.7 | 124,827,000 | 61.9 | 77,319,541 | | | | | 529,650 | 3,205,555 |
| 1877 | 1,792,287 | 94.9 | 170,092,000 | 43.7 | 74,272,500 | | | | | 744,409 | 528,584 |
| 1878 | 1,776,800 | 69.9 | 124,126,650 | 58.7 | 72,923,575 | | | | | 625,342 | 2,624,149 |
| 1879 | 1,836,800 | 98.9 | 181,626,400 | 43.6 | 79,153,673 | | | | | 696,080 | 721,868 |
| 1880 | 1,842,510 | 91.0 | 167,659,570 | 48.3 | 81,062,214 | | | | | 638,840 | 2,170,372 |
| 1881 | 2,041,670 | 53.5 | 109,145,494 | 90.9 | 99,291,341 | | | | | 408,286 | 8,789,860 |
| 1882 | 2,171,635 | 78.7 | 170,972,508 | 55.7 | 95,304,844 | | | | | 439,443 | 2,362,362 |
| 1883 | 2,289,275 | 90.9 | 208,164,425 | 42.2 | 87,849,991 | | | | | 554,613 | 425,408 |
| 1884 | 2,220,980 | 85.8 | 190,642,000 | 39.6 | 75,524,290 | | | | | 380,868 | 658,633 |
| 1885 | 2,265,823 | 77.2 | 175,029,000 | 44.7 | 78,153,403 | | | 33 | 50 | 494,948 | 1,937,416 |
| 1886 | 2,287,136 | 73.5 | 168,051,000 | 46.7 | 78,441,940 | 44 | 47 | 65 | 90 | 434,864 | 1,432,490 |
| 1887 | 2,357,322 | 56.9 | 134,103,000 | 68.5 | 91,506,740 | 70 | 83 | 65 | 85 | 403,880 | 8,259,538 |
| 1888 | 2,533,280 | 79.9 | 202,365,000 | 40.4 | 81,413,589 | 30 | 37 | 24 | 45 | 471,955 | 883,380 |
| 1889 | 2,647,989 | 77.4 | 204,930,345 | 40.3 | 72,704,413 | 33 | 45 | 30 | 60 | 406,618 | 3,415,578 |
| 1890 | 2,651,579 | 57.5 | 148,078,945 | 75.8 | 112,205,235 | 82 | 93 | 95 | 110 | 341,189 | 5,401,912 |
| 1891 | 2,714,770 | 93.9 | 254,426,971 | 35.8 | 91,024,521 | 30 | 40 | 30 | 50 | 557,022 | 186,871 |
| 1892 | 2,547,962 | 62.0 | 156,654,819 | 66.1 | 103,567,520 | 60 | 72 | 70 | 98 | 845,720 | 4,317,021 |
| 1893 | 2,605,186 | 70.3 | 183,034,203 | 59.4 | 108,661,801 | 51 | 60 | 64 | 88 | 803,111 | 3,002,578 |
| 1894 | 2,737,973 | 62.4 | 170,787,338 | 53.6 | 91,526,787 | 43 | 58 | 40 | 70 | 572,957 | 1,341,533 |
| 1895 | 2,954,952 | 100.6 | 297,237,370 | 26.6 | 78,984,901 | 18 | 24 | 10 | 23 | 680,049 | 175,240 |
| 1896 | 2,767,465 | 91.1 | 252,234,540 | 28.6 | 72,182,350 | 18 | 26 | 19 | 26 | 926,646 | 246,178 |
| 1897 | 2,534,577 | 64.7 | 164,015,964 | 54.7 | 89,643,059 | 50 | 62 | 60 | 87 | 605,187 | 1,171,378 |
| 1898 | 2,557,729 | 75.2 | 192,306,338 | 41.4 | 79,574,772 | 30 | 36 | | | 581,833 | 530,420 |
| 1899 | 2,581,353 | 88.6 | 228,783,232 | 39.0 | 89,328,832 | | | | | | |

*Acreage, production, value, prices, and exports of hay in the United States, 1866 to 1899, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per ton, Dec. 1. | Farm value, Dec. 1. | Chicago prices of No. 1 timothy by carload lots. December. Low. | December. High. | May of following year. Low. | May of following year. High. | Domestic exports, fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Tons.* | *Tons.* | *Dolls.* | *Dollars.* | *Dolls.* | *Dolls.* | *Dolls.* | *Dolls.* | *Tons.* |
| 1866 | 17,668,904 | 1.23 | 21,778,627 | 10.14 | 220,835,771 | | | | | 5,028 |
| 1867 | 20,020,554 | 1.31 | 26,277,000 | 10.21 | 268,300,623 | ------ | ------ | ------ | ------ | 5,645 |
| 1868 | 21,541,573 | 1.21 | 26,141,900 | 10.08 | 263,589,235 | ------ | ------ | ------ | ------ | ------ |
| 1869 | 18,591,281 | 1.42 | 26,420,000 | 10.18 | 268,933,048 | ------ | ------ | ------ | ------ | 6,723 |
| 1870 | 19,861,805 | 1.23 | 24,525,000 | 12.47 | 305,743,224 | ------ | ------ | ------ | ------ | 4,581 |
| 1871 | 19,009,052 | 1.17 | 22,239,400 | 14.30 | 317,939,799 | ------ | ------ | ------ | ------ | 5,266 |
| 1872 | 20,318,936 | 1.17 | 23,812,800 | 12.94 | 308,024,517 | ------ | ------ | ------ | ------ | 4,557 |
| 1873 | 21,894,084 | 1.14 | 25,085,100 | 12.53 | 314,241,037 | ------ | ------ | ------ | ------ | 4,889 |
| 1874 | 21,769,772 | 1.11 | 25,133,900 | 11.94 | 300,222,454 | ------ | ------ | ------ | ------ | 7,183 |
| 1875 | 23,507,964 | 1.18 | 27,873,600 | 10.78 | 300,377,839 | ------ | ------ | ------ | ------ | 7,528 |
| 1876 | 25,282,797 | 1.22 | 30,867,100 | 8.97 | 276,991,422 | ------ | ------ | 9.00 | 10.00 | 7,287 |
| 1877 | 25,367,708 | 1.24 | 31,629,300 | 8.37 | 264,879,796 | 9.50 | 10.50 | 9.75 | 10.75 | 9,514 |
| 1878 | 26,931,300 | 1.47 | 39,608,296 | 7.20 | 285,015,625 | 8.00 | 8.50 | 9.00 | 11.50 | 8,127 |
| 1879 | 27,484,991 | 1.29 | 35,493,000 | 9.32 | 330,804,494 | 14.00 | 14.50 | 14.00 | 15.00 | 13,739 |
| 1880 | 25,863,955 | 1.23 | 31,925,233 | 11.65 | 371,811,084 | 15.00 | 15.50 | 17.00 | 19.00 | 12,662 |
| 1881 | 30,888,700 | 1.14 | 35,135,064 | 13.43 | 415,131,366 | 16.00 | 16.50 | 15.00 | 16.50 | 10,570 |
| 1882 | 32,339,585 | 1.18 | 38,138,049 | 9.70 | 371,170,326 | 11.50 | 12.25 | 12.00 | 13.00 | 13,309 |
| 1883 | 35,515,948 | 1.32 | 46,864,009 | 8.19 | 384,834,451 | 9.00 | 10.00 | 12.50 | 17.00 | 16,908 |
| 1884 | 38,571,593 | 1.26 | 48,470,460 | 8.17 | 396,139,309 | 10.00 | 11.50 | 15.50 | 17.50 | 11,142 |
| 1885 | 39,849,701 | 1.12 | 44,731,550 | 8.71 | 389,752,873 | 11.00 | 12.00 | 10.00 | 12.00 | 13,390 |
| 1886 | 36,501,688 | 1.15 | 41,796,499 | 8.46 | 353,437,699 | 9.50 | 10.50 | 11.00 | 12.50 | 13,873 |
| 1887 | 37,664,739 | 1.10 | 41,454,458 | 9.34 | 413,440,283 | 13.50 | 14.50 | 17.00 | 21.00 | 18,198 |
| 1888 | 38,591,903 | 1.21 | 46,643,094 | 8.76 | 408,499,565 | 11.00 | 11.50 | 10.50 | 11.00 | 21,928 |
| 1889 | 52,947,236 | 1.26 | 66,829,612 | 7.88 | 470,374,948 | 9.00 | 10.00 | 9.00 | 14.00 | 36,274 |
| 1890 | 50,712,513 | 1.20 | 60,197,589 | 7.74 | 473,569,972 | 9.00 | 10.50 | 12.50 | 15.50 | 28,066 |
| 1891 | 51,044,490 | 1.18 | 60,817,771 | 8.39 | 494,113,616 | 12.50 | 15.00 | 13.50 | 14.00 | 35,201 |
| 1892 | 50,853,061 | 1.18 | 59,823,735 | 8.49 | 490,427,798 | 11.00 | 11.50 | 12.00 | 13.50 | 33,084 |
| 1893 | 49,613,469 | 1.33 | 65,766,158 | 8.68 | 570,882,872 | 10.00 | 10.50 | 10.00 | 10.50 | 54,446 |
| 1894 | 48,321,272 | 1.14 | 54,874,408 | 8.54 | 468,578,321 | 10.00 | 11.00 | 10.00 | 10.25 | 47,117 |
| 1895 | 44,206,453 | 1.06 | 47,078,541 | 8.35 | 393,185,615 | 12.00 | 12.50 | 11.50 | 12.00 | 59,052 |
| 1896 | 43,259,756 | 1.37 | 59,282,158 | 6.55 | 388,145,614 | 8.00 | 8.50 | 8.50 | 9.00 | 61,658 |
| 1897 | 42,426,770 | 1.43 | 60,664,876 | 6.62 | 401,390,728 | 8.00 | 8.50 | 9.50 | 10.50 | 81,827 |
| 1898 | 42,780,827 | 1.55 | 66,376,920 | 6.00 | 398,060,647 | 8.00 | 8.25 | 9.50 | 10.50 | 64,918 |
| 1899 | 41,328,462 | 1.35 | 56,655,756 | 7.27 | 411,926,187 | 10.50 | 11.50 | ------ | ------ | --------- |

*Acreage, production, value, prices, and exports of cotton in the United States, 1866 to 1898, inclusive.*

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per pound, Dec. 1. | Value. | New York closing prices per pound on middling upland. December. Low. | December. High. | May of following year. Low. | May of following year. High. | Domestic exports, fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bales.* | *Bales.* | *Cents.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bales of 500 pounds.* |
| 1866 | a 6,300,000 | .33 | 2,097,254 | ------ | 204,561,896 | | | | | 1,322,947 |
| 1867 | 7,000,000 | .36 | 2,519,554 | ------ | 199,583,510 | ------ | ------ | ------ | ------ | 1,569,527 |
| 1868 | 7,000,000 | .34 | 2,366,467 | ------ | 226,794,168 | ------ | ------ | ------ | ------ | 1,288,655 |
| 1869 | 7,750,000 | .40 | 3,122,551 | 16.5 | 261,067,037 | ------ | ------ | ------ | ------ | 1,917,117 |
| 1870 | 8,680,000 | .50 | 4,352,317 | 12.1 | 292,703,086 | ------ | ------ | ------ | ------ | 2,925,856 |
| 1871 | 7,378,000 | .40 | 2,974,351 | 17.9 | 242,672,804 | ------ | ------ | 23½ | 24⅞ | 1,867,074 |
| 1872 | 8,500,000 | .46 | 3,930,508 | 16.5 | 280,552,629 | 19½ | 20¼ | 19¼ | 19⅜ | 2,400,127 |
| 1873 | 9,350,000 | .45 | 4,170,388 | 14.1 | 289,853,486 | 15⅝ | 16½ | 17¾ | 18⅞ | 2,717,204 |
| 1874 | 10,982,000 | .35 | 3,832,991 | 13.0 | 228,113,080 | 14⅛ | 14⅞ | 16¼ | 16⅝ | 2,520,837 |
| 1875 | 10,803,030 | .43 | 4,632,313 | 11.1 | 233,109,945 | 13 1/16 | 13 5/16 | 11 13/16 | 13½ | 2,982,810 |
| 1876 | 11,677,250 | .38 | 4,474,069 | 9.9 | 211,655,041 | 12 1/16 | 12½ | 10 13/16 | 11⅝ | 2,890,738 |
| 1877 | 12,600,000 | .38 | 4,773,865 | 10.5 | 235,721,194 | 11¼ | 11½ | 10⅝ | 11¼ | 3,215,067 |
| 1878 | 12,266,800 | .41 | 5,074,155 | 8.2 | 193,467,706 | 8 13/16 | 9½ | 11⅞ | 13¾ | 3,256,745 |
| 1879 | 12,595,500 | .46 | 5,761,252 | 10.2 | 242,140,987 | 12⅝ | 13 7/16 | 11 11/16 | 11⅞ | 3,644,122 |
| 1880 | 15,475,300 | .43 | 6,605,750 | 9.8 | 280,266,242 | 11⅞ | 12 | 10 7/16 | 10⅞ | 4,381,857 |
| 1881 | 16,710,730 | .33 | 5,456,048 | 10.0 | 294,135,547 | 11⅞ | 12⅛ | 12 1/16 | 12⅜ | 3,479,951 |
| 1882 | 16,791,557 | .41 | 6,949,756 | 9.9 | 309,696,500 | 10¼ | 10 7/16 | 10¼ | 11⅛ | 4,576,150 |
| 1883 | 16,777,993 | .34 | 5,713,200 | 9.0 | 250,594,750 | 10⅝ | 10 9/16 | 11½ | 11¾ | 3,725,145 |

a Estimated.

*Acreage, production, value, prices, and exports of cotton in the United States, 1866 to 1898, inclusive*—Continued.

| Year. | Acreage. | Average yield per acre. | Production. | Average farm price per pound, Dec. 1. | Value. | New York closing prices per pound on middling upland. December. Low. | December. High. | May of following year. Low. | May of following year. High. | Domestic exports, fiscal years beginning July 1. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bales.* | *Bales.* | *Cents.* | *Dollars.* | *Cts.* | *Cts.* | *Cts.* | *Cts.* | *Bales of 500 pounds.* |
| 1884 | 17,439,612 | .33 | 5,706,165 | 9.2 | 253,993,385 | $10\frac{7}{16}$ | $11\frac{7}{16}$ | $10\frac{11}{16}$ | 11 | 3,783,318 |
| 1885 | 18,300,865 | .36 | 6,575,691 | 8.5 | 269,989,812 | $9\frac{3}{16}$ | $9\frac{7}{16}$ | $9\frac{3}{16}$ | $9\frac{5}{16}$ | 4,116,074 |
| 1886 | 18,454,603 | .35 | 6,505,087 | 8.1 | 309,381,938 | $9\frac{3}{16}$ | $9\frac{9}{16}$ | $10\frac{5}{8}$ | $11\frac{7}{16}$ | 4,338,914 |
| 1887 | 18,641,067 | .38 | 7,046,833 | 8.5 | 337,972,453 | $10\frac{1}{2}$ | $10\frac{5}{8}$ | $9\frac{15}{16}$ | $10\frac{1}{16}$ | 4,528,241 |
| 1888 | 19,058,591 | .36 | 6,938,290 | 8.5 | 354,454,340 | $9\frac{3}{4}$ | $9\frac{7}{8}$ | 11 | $11\frac{3}{16}$ | 4,769,633 |
| 1889 | 20,171,896 | .36 | 7,311,322 | 8.3 | 402,951,814 | $10\frac{1}{4}$ | $10\frac{1}{4}$ | $11\frac{15}{16}$ | $12\frac{3}{4}$ | 4,943,599 |
| 1890 | 20,809,053 | .42 | 8,652,597 | 8.6 | 369,568,858 | $9\frac{3}{16}$ | $9\frac{7}{16}$ | $8\frac{3}{4}$ | $8\frac{15}{16}$ | 5,814,717 |
| 1891 | 20,714,937 | .44 | 9,035,379 | 7.3 | 326,513,298 | $7\frac{3}{4}$ | $8\frac{1}{16}$ | $7\frac{1}{4}$ | $7\frac{7}{16}$ | 5,870,439 |
| 1892 | 18,067,924 | .37 | 6,700,365 | 8.4 | 262,252,286 | $9\frac{5}{8}$ | 10 | $7\frac{5}{8}$ | $7\frac{13}{16}$ | 4,424,230 |
| 1893 | 19,525,000 | .39 | 7,549,817 | 7.0 | 274,479,637 | $7\frac{13}{16}$ | $8\frac{1}{16}$ | $7\frac{1}{8}$ | $7\frac{5}{8}$ | 5,366,564 |
| 1894 | 23,687,950 | .42 | 9,901,251 | 4.6 | 287,120,818 | $5\frac{11}{16}$ | $5\frac{13}{16}$ | $6\frac{3}{4}$ | $7\frac{5}{8}$ | 7,034,866 |
| 1895 | 20,184,808 | .36 | 7,161,094 | 7.6 | 260,338,096 | $8\frac{1}{4}$ | $8\frac{9}{16}$ | 8 | $8\frac{5}{8}$ | 4,670,452 |
| 1896 | 23,273,209 | .37 | 8,532,705 | 6.6 | 291,811,564 | $7\frac{1}{16}$ | $7\frac{11}{16}$ | $7\frac{5}{8}$ | $7\frac{13}{16}$ | 6,207,509 |
| 1897 | 24,319,584 | .45 | 10,897,857 | 6.6 | 319,491,412 | $5\frac{13}{16}$ | $5\frac{15}{16}$ | $6\frac{5}{16}$ | $6\frac{9}{16}$ | 7,700,528 |
| 1898 | 24,967,295 | .45 | 11,189,205 | 5.7 | 305,467,041 | $5\frac{5}{8}$ | $5\frac{7}{8}$ | $6\frac{1}{8}$ | $6\frac{1}{4}$ | 7,546,820 |

*Acreage, production, value, and distribution of the principal crops of the United States in 1899, by States.*

CORN.

| States and Territories. | Crop of 1899. Acreage. | Crop of 1899. Production. | Crop of 1899. Value. | Stock on hand Mar. 1, 1900. | | Shipped out of county where grown. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Dollars.* | *Bushels.* | *Per ct.* | *Bushels.* |
| Maine | 11,873 | 427,428 | 213,714 | 98,308 | 23 | 0 |
| New Hampshire | 25,014 | 975,546 | 478,018 | 243,886 | 25 | 0 |
| Vermont | 47,526 | 1,710,936 | 804,140 | 564,609 | 33 | 0 |
| Massachusetts | 40,264 | 1,449,504 | 739,247 | 434,851 | 30 | 0 |
| Rhode Island | 8,116 | 251,596 | 133,346 | 108,186 | 43 | 7,548 |
| Connecticut | 46,149 | 1,799,811 | 899,906 | 647,932 | 36 | 0 |
| New York | 503,389 | 15,605,059 | 7,022,277 | 5,305,720 | 34 | 156,051 |
| New Jersey | 254,816 | 9,937,824 | 3,975,130 | 4,273,264 | 43 | 1,391,295 |
| Pennsylvania | 1,257,996 | 40,255,872 | 16,504,908 | 15,699,790 | 39 | 3,220,470 |
| Delaware | 206,696 | 4,547,312 | 1,546,086 | 2,137,237 | 47 | 1,273,247 |
| Maryland | 580,076 | 18,562,432 | 6,682,476 | 6,682,476 | 36 | 6,125,603 |
| Virginia | 1,744,045 | 34,880,900 | 13,254,742 | 12,905,933 | 37 | 2,441,663 |
| North Carolina | 2,457,936 | 31,953,168 | 15,017,989 | 14,698,457 | 46 | 1,597,658 |
| South Carolina | 1,857,021 | 16,715,189 | 8,356,594 | 7,520,935 | 45 | 334,264 |
| Georgia | 3,249,479 | 32,494,790 | 16,247,395 | 15,922,447 | 49 | 1,949,687 |
| Florida | 509,337 | 5,093,370 | 2,699,486 | 1,935,481 | 38 | 203,735 |
| Alabama | 2,751,260 | 33,015,120 | 15,517,106 | 15,517,106 | 47 | 990,454 |
| Mississippi | 2,440,232 | 39,043,712 | 17,960,108 | 19,131,419 | 49 | 780,874 |
| Louisiana | 1,438,707 | 25,896,726 | 11,394,559 | 10,876,625 | 42 | 1,035,869 |
| Texas | 4,508,411 | 81,151,398 | 29,214,503 | 29,214,503 | 36 | 10,549,682 |
| Arkansas | 2,404,357 | 48,087,140 | 18,273,113 | 20,196,599 | 42 | 3,366,100 |
| Tennessee | 2,999,888 | 59,997,760 | 23,399,126 | 21,599,194 | 36 | 5,999,776 |
| West Virginia | 693,984 | 18,043,584 | 8,119,613 | 6,134,819 | 34 | 1,082,615 |
| Kentucky | 2,637,747 | 55,392,687 | 20,495,294 | 18,833,514 | 34 | 3,323,561 |
| Ohio | 2,751,356 | 99,048,816 | 29,714,645 | 34,667,086 | 35 | 19,809,763 |
| Michigan | 1,059,054 | 26,476,350 | 9,531,486 | 9,001,959 | 34 | 1,588,581 |
| Indiana | 3,732,963 | 141,852,594 | 38,300,200 | 52,485,460 | 37 | 38,300,200 |
| Illinois | 6,865,287 | 247,150,332 | 64,259,086 | 88,974,120 | 36 | 79,088,106 |
| Wisconsin | 1,191,039 | 41,686,365 | 12,505,910 | 13,756,500 | 33 | 2,084,318 |
| Minnesota | 944,584 | 31,171,272 | 7,481,105 | 12,156,796 | 39 | 4,052,265 |
| Iowa | 7,814,511 | 242,249,841 | 55,717,463 | 84,787,444 | 35 | 36,337,476 |
| Missouri | 6,265,964 | 162,915,064 | 48,874,519 | 55,391,122 | 34 | 11,404,054 |
| Kansas | 8,800,786 | 237,621,222 | 59,405,306 | 92,672,277 | 39 | 54,652,881 |
| Nebraska | 8,013,331 | 224,373,268 | 51,605,852 | 85,261,842 | 38 | 44,874,654 |
| South Dakota | 1,154,516 | 30,017,416 | 7,804,528 | 9,305,309 | 31 | 8,404,876 |
| North Dakota | 24,065 | 553,495 | 182,653 | 160,514 | 29 | 5,535 |
| Montana | 1,582 | 36,386 | 18,921 | 3,639 | 10 | 0 |
| Wyoming | 2,452 | 53,944 | 23,196 | 10,789 | 20 | 0 |

*Acreage, production, value, and distribution of the principal crops of the United States in 1899, by States*—Continued.

CORN—Continued.

| States and Territories. | Crop of 1899. Acreage. | Crop of 1899. Production. | Crop of 1899. Value. | Stock on hand Mar. 1, 1900. | | Shipped out of county where grown. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Dollars.* | *Bushels.* | *Per ct.* | *Bushels.* |
| Colorado | 171,264 | 2,911,488 | 1,251,940 | 756,987 | 26 | 116,460 |
| New Mexico | 24,015 | 480,300 | 278,574 | 57,636 | 12 | 33,621 |
| Utah | 8,134 | 162,680 | 95,981 | 32,536 | 20 | 1,627 |
| Washington | 5,586 | 128,478 | 70,663 | 37,259 | 29 | 0 |
| Oregon | 13,519 | 297,418 | 190,348 | 56,509 | 19 | 17,845 |
| California | 56,925 | 1,536,975 | 922,185 | 430,353 | 28 | 76,849 |
| Oklahoma | 533,335 | 10,133,365 | 2,026,673 | 3,040,010 | 30 | 1,418,671 |
| United States | 82,108,587 | 2,078,143,933 | 629,210,110 | 773,729,528 | 37.2 | 348,097,934 |

WHEAT.

| | | | | | | |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Dollars.* | *Bushels.* | *Per ct.* | *Bushels.* |
| Maine | 1,953 | 43,942 | 39,987 | 11,425 | 26 | 439 |
| New Hampshire | 511 | 8,789 | 8,350 | 1,055 | 12 | 0 |
| Vermont | 3,560 | 78,320 | 66,572 | 25,062 | 32 | 783 |
| Connecticut | 300 | 5,490 | 5,216 | 1,702 | 31 | 0 |
| New York | 378,690 | 7,005,765 | 5,604,612 | 2,522,075 | 36 | 1,261,038 |
| New Jersey | 123,370 | 1,788,865 | 1,341,649 | 518,771 | 29 | 339,884 |
| Pennsylvania | 1,505,362 | 20,472,923 | 13,512,129 | 7,165,523 | 35 | 5,118,231 |
| Delaware | 72,856 | 932,557 | 634,139 | 233,139 | 25 | 531,557 |
| Maryland | 759,643 | 10,710,966 | 7,283,457 | 2,463,522 | 23 | 5,569,702 |
| Virginia | 753,625 | 6,330,450 | 4,368,010 | 1,519,308 | 24 | 2,215,658 |
| North Carolina | 521,731 | 3,495,598 | 2,866,390 | 978,767 | 28 | 174,780 |
| South Carolina | 148,271 | 963,762 | 954,124 | 154,202 | 16 | 0 |
| Georgia | 297,239 | 2,021,225 | 1,980,800 | 384,033 | 19 | 101,061 |
| Alabama | 56,735 | 431,186 | 383,756 | 68,990 | 16 | 4,312 |
| Mississippi | 3,248 | 25,010 | 19,508 | 6,002 | 24 | 0 |
| Texas | 814,832 | 9,044,635 | 6,150,352 | 1,356,695 | 15 | 2,080,266 |
| Arkansas | 227,135 | 1,953,361 | 1,250,151 | 507,874 | 26 | 312,538 |
| Tennessee | 953,187 | 8,292,727 | 6,468,327 | 1,824,400 | 22 | 1,824,400 |
| West Virginia | 417,285 | 3,880,751 | 2,755,333 | 1,280,648 | 33 | 853,765 |
| Kentucky | 901,272 | 8,201,575 | 5,413,040 | 1,804,346 | 22 | 1,886,362 |
| Ohio | 2,816,761 | 39,998,006 | 25,598,724 | 14,399,282 | 36 | 17,599,123 |
| Michigan | 1,587,523 | 13,335,193 | 8,667,875 | 4,000,558 | 30 | 6,400,893 |
| Indiana | 2,587,875 | 25,361,175 | 16,231,152 | 6,086,682 | 24 | 11,412,529 |
| Illinois | 1,266,541 | 12,665,410 | 7,979,208 | 2,026,466 | 16 | 3,546,315 |
| Wisconsin | 759,573 | 11,773,382 | 7,181,763 | 4,356,151 | 37 | 2,354,676 |
| Minnesota | 5,091,312 | 68,223,581 | 37,522,969 | 23,196,018 | 34 | 53,896,629 |
| Iowa | 1,399,653 | 18,195,489 | 10,007,519 | 5,822,556 | 32 | 4,912,782 |
| Missouri | 1,151,384 | 11,398,702 | 7,067,195 | 2,507,714 | 22 | 2,507,714 |
| Kansas | 3,721,229 | 36,468,044 | 18,963,383 | 9,481,691 | 26 | 22,974,868 |
| Nebraska | 2,018,619 | 20,791,776 | 10,187,970 | 6,653,368 | 32 | 10,395,888 |
| South Dakota | 3,526,013 | 37,728,339 | 18,864,170 | 10,186,652 | 27 | 29,805,388 |
| North Dakota | 4,043,643 | 51,758,630 | 26,396,901 | 11,386,899 | 22 | 45,547,594 |
| Montana | 69,764 | 1,792,935 | 1,093,690 | 573,739 | 32 | 645,457 |
| Wyoming | 21,029 | 395,345 | 264,881 | 59,302 | 15 | 19,767 |
| Colorado | 309,611 | 7,337,781 | 4,182,535 | 2,054,579 | 28 | 2,935,112 |
| New Mexico | 186,946 | 2,579,855 | 1,573,712 | 412,777 | 16 | 103,194 |
| Arizona | 22,362 | 342,139 | 218,969 | 30,793 | 9 | 78,692 |
| Utah | 180,505 | 3.736,454 | 1,980,321 | 934,114 | 25 | 822,020 |
| Nevada | 38,167 | 687,006 | 522,125 | 109,921 | 16 | 151,141 |
| Idaho | 142,153 | 3,440,163 | 1,720,052 | 1,238,437 | 36 | 1,926,458 |
| Washington | 956,405 | 21,710,394 | 11,072,301 | 7,815,742 | 36 | 16,934,107 |
| Oregon | 1,143,205 | 21,949,536 | 11,633,254 | 7,682,338 | 35 | 13,608,712 |
| California | 2,393,185 | 33,743,909 | 20,921,223 | 12,147,807 | 36 | 23,958,175 |
| Oklahoma | 1,218,253 | 16,202,765 | 8,587,465 | 2,754,470 | 17 | 10,207,742 |
| United States | 44,592,516 | 547,303,846 | 319,545,259 | 158,745,595 | 29.0 | 305,019,752 |

OATS.

| | | | | | | |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Dollars.* | *Bushels.* | *Per ct.* | *Bushels.* |
| Maine | 141,619 | 4,956,665 | 1,883,533 | 1,685,266 | 34 | 99,133 |
| New Hampshire | 29,927 | 1,047,445 | 408,504 | 366,606 | 35 | 20,949 |
| Vermont | 107,009 | 3,959,333 | 1,464,953 | 1,544,140 | 39 | 39,593 |
| Massachusetts | 14,819 | 489,027 | 185,830 | 151,598 | 31 | 0 |
| Rhode Island | 3,668 | 95,368 | 35,286 | 27,657 | 29 | 954 |
| Connecticut | 18,752 | 525,056 | 194,271 | 152,266 | 29 | 10,501 |
| New York | 1,464,568 | 45,401,608 | 14,982,531 | 20,430,724 | 45 | 3,632,129 |
| New Jersey | 95,193 | 2,284,632 | 753,929 | 891,006 | 39 | 228,463 |

*Acreage, production, value, and distribution of the principal crops of the United States in 1899, by States*—Continued.

OATS—Continued.

| States and Territories. | Crop of 1899. | | | Stock on hand Mar. 1, 1900. | | Shipped out of county where grown. |
|---|---|---|---|---|---|---|
| | Acreage. | Production | Value. | | | |
| | *Acres.* | *Bushels.* | *Dollars.* | *Bushels.* | *Per ct.* | *Bushels.* |
| Pennsylvania | 1,186,304 | 39,148,032 | 11,352,929 | 17,225,134 | 44 | 1,565,921 |
| Delaware | 16,004 | 320,080 | 80,020 | 105,626 | 33 | 25,606 |
| Maryland | 72,852 | 1,675,596 | 502,679 | 452,411 | 27 | 301,607 |
| Virginia | 367,537 | 5,145,518 | 1,698,021 | 1,543,655 | 30 | 257,276 |
| North Carolina | 398,934 | 4,787,208 | 1,962,755 | 957,442 | 20 | 143,616 |
| South Carolina | 251,998 | 3,023,976 | 1,421,269 | 241,918 | 8 | 30,240 |
| Georgia | 476,873 | 4,291,857 | 2,060,091 | 557,941 | 13 | 42,919 |
| Florida | 35,606 | 320,454 | 160,227 | 41,659 | 13 | 9,614 |
| Alabama | 301,207 | 3,012,070 | 1,295,190 | 421,690 | 14 | 30,121 |
| Mississippi | 136,574 | 1,365,740 | 682,870 | 136,574 | 10 | 13,657 |
| Louisiana | 30,738 | 553,284 | 221,314 | 55,328 | 10 | 5,533 |
| Texas | 682,719 | 17,067,975 | 5,120,392 | 3,072,236 | 18 | 3,413,595 |
| Arkansas | 313,918 | 5,964,442 | 2,027,910 | 1,789,333 | 30 | 178,933 |
| Tennessee | 380,446 | 5,326,244 | 1,704,398 | 1,491,348 | 28 | 106,525 |
| West Virginia | 137,324 | 3,158,452 | 1,105,458 | 979,120 | 31 | 126,338 |
| Kentucky | 455,267 | 8,194,806 | 2,622,338 | 2,376,494 | 29 | 409,740 |
| Ohio | 915,166 | 32,945,976 | 8,236,494 | 11,531,092 | 35 | 7,907,034 |
| Michigan | 899,972 | 30,599,048 | 8,567,733 | 11,627,638 | 38 | 7,037,781 |
| Indiana | 1,071,914 | 34,301,248 | 7,889,287 | 10,976,399 | 32 | 12,691,462 |
| Illinois | 3,349,446 | 127,278,948 | 28,001,369 | 44,547,632 | 35 | 62,366,685 |
| Wisconsin | 1,880,205 | 67,687,380 | 15,568,097 | 27,751,826 | 41 | 18,952,466 |
| Minnesota | 1,646,513 | 52,688,416 | 11,591,452 | 25,290,440 | 48 | 12,645,220 |
| Iowa | 3,848,053 | 126,985,749 | 24,127,292 | 38,095,725 | 30 | 50,794,300 |
| Missouri | 811,974 | 20,299,350 | 4,871,844 | 7,104,772 | 35 | 1,826,942 |
| Kansas | 1,349,290 | 39,129,410 | 8,608,470 | 15,651,764 | 40 | 8,608,470 |
| Nebraska | 1,715,804 | 51,474,120 | 11,324,306 | 19,560,166 | 38 | 19,560,166 |
| South Dakota | 589,703 | 15,332,278 | 3,526,424 | 7,206,171 | 47 | 3,219,778 |
| North Dakota | 599,589 | 17,987,670 | 4,856,671 | 8,813,958 | 49 | 2,158,520 |
| Montana | 60,986 | 2,317,468 | 903,813 | 834,288 | 36 | 556,192 |
| Wyoming | 14,743 | 442,290 | 176,916 | 66,344 | 15 | 0 |
| Colorado | 90,698 | 2,448,846 | 1,028,515 | 832,608 | 34 | 587,723 |
| New Mexico | 7,418 | 178,032 | 78,334 | 21,364 | 12 | 35,606 |
| Utah | 25,654 | 872,236 | 348,894 | 174,447 | 20 | 43,612 |
| Idaho | 32,352 | 1,099,968 | 417,988 | 483,986 | 44 | 384,989 |
| Washington | 81,945 | 3,031,965 | 1,152,147 | 1,091,507 | 36 | 1,121,827 |
| Oregon | 170,622 | 5,118,660 | 2,098,651 | 2,098,651 | 41 | 1,637,971 |
| California | 59,477 | 1,843,787 | 866,580 | 479,385 | 26 | 184,379 |
| United States | 26,341,380 | 796,177,713 | 198,167,975 | 290,937,335 | 36.5 | 223,014,086 |

*Acreage, production, and value of barley, rye, buckwheat, potatoes, and hay in the United States in 1899.*

BARLEY.

| States and Territories. | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* | *Dollars.* |
| Maine | 11,988 | 29 | 347,652 | 59 | 17.11 | 205,115 |
| New Hampshire | 4,620 | 25 | 115,500 | 65 | 16.25 | 75,075 |
| Vermont | 17,384 | 31 | 538,904 | 52 | 16.12 | 280,230 |
| Massachusetts | 1,695 | 30 | 50,850 | 68 | 20.40 | 34,578 |
| Rhode Island | 315 | 29 | 9,135 | 70 | 20.30 | 6,394 |
| New York | 168,853 | 24 | 4,052,472 | 50 | 12.00 | 2,026,236 |
| Pennsylvania | 8,564 | 21 | 179,844 | 49 | 10.29 | 88,124 |
| Texas | 1,970 | 18 | 35,460 | 66 | 11.88 | 23,404 |
| Tennessee | 1,779 | 11 | 19,569 | 64 | 7.04 | 12,524 |
| Kentucky | 1,381 | 21 | 29,001 | 43 | 9.03 | 12,470 |
| Ohio | 21,550 | 28 | 603,400 | 45 | 12.60 | 271,530 |
| Michigan | 38,631 | 24 | 927,144 | 48 | 11.52 | 445,029 |
| Indiana | 6,132 | 25 | 153,300 | 45 | 11.25 | 68,985 |
| Illinois | 13,638 | 29 | 395,502 | 47 | 13.63 | 185,886 |
| Wisconsin | 255,685 | 30 | 7,670,550 | 40 | 12.00 | 3,068,220 |
| Minnesota | 325,765 | 25 | 8,144,125 | 31 | 7.75 | 2,524,679 |
| Iowa | 461,996 | 26 | 12,011,896 | 31 | 8.06 | 3,723,688 |
| Missouri | 720 | 18 | 12,960 | 42 | 7.56 | 5,443 |
| Kansas | 187,245 | 17 | 3,183,165 | 27 | 4.59 | 859,455 |
| Nebraska | 36,276 | 26 | 943,176 | 30 | 7.80 | 282,953 |

*Acreage, production, and value of barley, rye, buckwheat, potatoes, and hay in the United States in 1899*—Continued.

BARLEY—Continued.

| States and Territories | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* | *Dollars.* |
| South Dakota | 104,798 | 23 | 2,410,354 | 29 | 6.67 | 699,003 |
| North Dakota | 246,223 | 24 | 5,909,352 | 33 | 7.92 | 1,950,086 |
| Montana | 6,183 | 35 | 216,405 | 51 | 17.85 | 110,367 |
| Colorado | 12,069 | 28 | 337,932 | 55 | 15.40 | 185,863 |
| New Mexico | 1,109 | 32 | 35,488 | 61 | 19.52 | 21,648 |
| Utah | 5,905 | 33 | 194,865 | 52 | 17.16 | 101,330 |
| Idaho | 11,586 | 35 | 405,510 | 46 | 16.10 | 186,535 |
| Washington | 40,296 | 35 | 1,410,360 | 44 | 15.40 | 620,558 |
| Oregon | 28,497 | 28 | 797,916 | 50 | 14.00 | 398,958 |
| California | 855,376 | 26 | 22,239,776 | 50 | 13.00 | 11,119,888 |
| United States | 2,878,229 | 25.5 | 73,381,563 | 40.3 | 10.28 | 29,594,254 |

RYE.

| States and Territories | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* | *Dollars.* |
| Maine | 983 | 15 | 14,745 | 84 | 12.60 | 12,386 |
| New Hampshire | 924 | 15 | 13,860 | 81 | 12.15 | 11,227 |
| Vermont | 3,173 | 17 | 53,941 | 62 | 10.54 | 33,443 |
| Massachusetts | 8,331 | 16 | 133,296 | 79 | 12.64 | 105,304 |
| Connecticut | 14,248 | 18 | 256,464 | 64 | 11.52 | 164,137 |
| New York | 227,100 | 16 | 3,633,600 | 56 | 8.96 | 2,034,816 |
| New Jersey | 66,719 | 15 | 1,000,785 | 55 | 8.25 | 550,432 |
| Pennsylvania | 262,406 | 15 | 3,936,090 | 51 | 7.65 | 2,007,406 |
| Maryland | 25,234 | 14 | 353,276 | 57 | 7.98 | 201,367 |
| Virginia | 36,719 | 9 | 330,471 | 53 | 4.77 | 175,150 |
| North Carolina | 45,754 | 7 | 320,278 | 75 | 5.25 | 240,208 |
| South Carolina | 3,825 | 5 | 19,125 | 109 | 5.45 | 20,846 |
| Georgia | 15,805 | 6 | 94,830 | 112 | 6.72 | 106,210 |
| Alabama | 1,822 | 8 | 14,576 | 104 | 8.32 | 15,159 |
| Texas | 3,766 | 10 | 37,660 | 82 | 8.20 | 30,881 |
| Arkansas | 1,732 | 11 | 19,052 | 74 | 8.14 | 14,098 |
| Tennessee | 11,892 | 9 | 107,028 | 67 | 6.03 | 71,709 |
| West Virginia | 13,229 | 10 | 132,290 | 62 | 6.20 | 82,020 |
| Kentucky | 24,443 | 10 | 244,430 | 70 | 7.00 | 171,101 |
| Ohio | 39,120 | 16 | 625,920 | 55 | 8.80 | 344,256 |
| Michigan | 78,358 | 14 | 1,097,012 | 52 | 7.28 | 570,446 |
| Indiana | 35,741 | 13 | 464,633 | 48 | 6.24 | 223,024 |
| Illinois | 76,955 | 15 | 1,154,325 | 47 | 7.05 | 542,533 |
| Wisconsin | 204,875 | 15 | 3,073,125 | 48 | 7.20 | 1,475,100 |
| Minnesota | 61,804 | 18 | 1,112,472 | 42 | 7.56 | 467,238 |
| Iowa | 112,770 | 18 | 2,029,860 | 40 | 7.20 | 811,944 |
| Missouri | 9,803 | 13 | 127,439 | 50 | 6.50 | 63,720 |
| Kansas | 140,532 | 11 | 1,545,852 | 42 | 4.62 | 649,258 |
| Nebraska | 62,319 | 16 | 997,104 | 38 | 6.08 | 378,900 |
| South Dakota | 2,451 | 15 | 36,765 | 37 | 5.55 | 13,603 |
| North Dakota | 16,315 | 15 | 244,725 | 37 | 5.55 | 90,548 |
| Colorado | 2,374 | 14 | 33,236 | 48 | 6.72 | 15,953 |
| Utah | 3,452 | 17 | 58,684 | 48 | 8.16 | 28,168 |
| Washington | 2,246 | 16 | 35,936 | 60 | 9.60 | 21,562 |
| Oregon | 5,616 | 11 | 61,776 | 70 | 7.70 | 43,243 |
| California | 36,472 | 15 | 547,080 | 70 | 11.70 | 426,722 |
| United States | 1,659,308 | 14.4 | 23,961,741 | 51.0 | 7.36 | 12,214,118 |

BUCKWHEAT.

| States and Territories | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* | *Dollars.* |
| Maine | 23,754 | 22 | 522,588 | 44 | 9.68 | 229,939 |
| New Hampshire | 2,827 | 20 | 56,540 | 50 | 10.00 | 28,270 |
| Vermont | 9,348 | 23 | 215,004 | 52 | 11.96 | 111,802 |
| Massachusetts | 2,209 | 20 | 44,180 | 70 | 14.00 | 30,926 |
| Connecticut | 3,807 | 19 | 72,333 | 63 | 11.97 | 45,570 |
| New York | 241,543 | 13 | 3,140,059 | 59 | 7.67 | 1,852,635 |
| New Jersey | 10,422 | 21 | 218,862 | 56 | 11.76 | 122,563 |
| Pennsylvania | 242,280 | 20 | 4,845,600 | 54 | 10.80 | 2,616,624 |
| Delaware | 273 | 18 | 4,914 | 49 | 8.82 | 2,408 |
| Maryland | 7,510 | 13 | 97,630 | 56 | 7.28 | 54,673 |
| Virginia | 4,616 | 14 | 64,624 | 54 | 7.56 | 34,897 |
| North Carolina | 1,685 | 17 | 28,645 | 49 | 8.33 | 14,036 |
| Tennessee | 1,005 | 12 | 12,060 | 57 | 6.84 | 6,874 |

*Acreage, production, and value of barley, rye, buckwheat, potatoes, and hay in the United States in 1899*—Continued.

BUCKWHEAT—Continued.

| States and Territories. | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* | *Dollars* |
| West Virginia | 14,015 | 17 | 238,255 | 56 | 9.52 | 133,423 |
| Ohio | 9,415 | 16 | 150,640 | 58 | 9.28 | 87,371 |
| Michigan | 23,083 | 11 | 253,913 | 55 | 6.05 | 139,652 |
| Indiana | 5,331 | 16 | 85,296 | 59 | 9.44 | 50,325 |
| Illinois | 4,762 | 15 | 71,430 | 58 | 8.70 | 41,429 |
| Wisconsin | 30,936 | 15 | 464,040 | 63 | 9.45 | 292,345 |
| Minnesota | 11,386 | 17 | 193,562 | 52 | 8.84 | 100,652 |
| Iowa | 12,098 | 16 | 193,568 | 58 | 9.28 | 112,269 |
| Missouri | 2,499 | 14 | 34,986 | 61 | 8.54 | 21,341 |
| Nebraska | 5,104 | 16 | 81,664 | 62 | 9.92 | 50,632 |
| Oregon | 240 | 17 | 4,080 | 74 | 12.58 | 3,019 |
| United States | 670,148 | 16.6 | 11,094,473 | 55.7 | 9.23 | 6,183,675 |

POTATOES.

| States and Territories. | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Bushels.* | *Cents.* | *Dollars.* | *Dollars.* |
| Maine | 46,865 | 139 | 6,514,235 | 42 | 58.38 | 2,735,979 |
| New Hampshire | 18,662 | 127 | 2,370,074 | 46 | 58.42 | 1,090,234 |
| Vermont | 24,915 | 132 | 3,288,780 | 36 | 47.52 | 1,183,961 |
| Massachusetts | 28,065 | 134 | 3,760,710 | 57 | 76.38 | 2,143,605 |
| Rhode Island | 7,212 | 142 | 1,024,104 | 50 | 71.00 | 512,052 |
| Connecticut | 25,562 | 130 | 3,323,060 | 46 | 59.80 | 1,528,608 |
| New York | 326,227 | 88 | 28,707,976 | 40 | 35.20 | 11,483,190 |
| New Jersey | 47,955 | 83 | 3,980,265 | 51 | 42.33 | 2,029,935 |
| Pennsylvania | 179,339 | 85 | 15,243,815 | 43 | 36.55 | 6,554,840 |
| Delaware | 5,239 | 52 | 272,428 | 51 | 26.52 | 138,938 |
| Maryland | 22,193 | 64 | 1,420,352 | 51 | 32.64 | 724,380 |
| Virginia | 36,515 | 66 | 2,409,990 | 56 | 36.96 | 1,349,594 |
| North Carolina | 16,293 | 57 | 928,701 | 66 | 37.62 | 612,943 |
| South Carolina | 4,141 | 56 | 231,896 | 104 | 58.24 | 241,172 |
| Georgia | 5,594 | 46 | 257,324 | 83 | 38.18 | 213,579 |
| Florida | 1,704 | 69 | 117,576 | 124 | 85.56 | 145,794 |
| Alabama | 5,997 | 56 | 335,832 | 87 | 48.72 | 292,174 |
| Mississippi | 5,312 | 61 | 324,032 | 102 | 62.22 | 330,513 |
| Louisiana | 7,947 | 60 | 476,820 | 81 | 48.60 | 386,224 |
| Texas | 14,499 | 64 | 927,936 | 91 | 58.24 | 844,422 |
| Arkansas | 28,146 | 63 | 1,773,198 | 71 | 44.73 | 1,258,971 |
| Tennessee | 25,806 | 44 | 1,135,464 | 65 | 28.60 | 738,052 |
| West Virginia | 37,122 | 72 | 2,672,784 | 52 | 37.44 | 1,389,848 |
| Kentucky | 39,710 | 51 | 2,025,210 | 61 | 31.11 | 1,235,378 |
| Ohio | 162,043 | 71 | 11,505,053 | 43 | 30.53 | 4,947,173 |
| Michigan | 173,185 | 66 | 11,430,210 | 32 | 21.12 | 3,657,667 |
| Indiana | 108,082 | 76 | 8,214,232 | 43 | 32.68 | 3,532,120 |
| Illinois | 163,002 | 96 | 15,648,192 | 41 | 39.36 | 6,415,759 |
| Wisconsin | 156,337 | 103 | 16,102,711 | 26 | 26.78 | 4,186,705 |
| Minnesota | 113,423 | 96 | 10,888,608 | 25 | 24.00 | 2,722,152 |
| Iowa | 198,478 | 100 | 19,847,800 | 23 | 23.00 | 4,564,994 |
| Missouri | 105,512 | 83 | 8,757,496 | 40 | 33.20 | 3,502,998 |
| Kansas | 99,646 | 95 | 9,466,370 | 45 | 42.75 | 4,259,866 |
| Nebraska | 143,560 | 94 | 13,494,640 | 25 | 23.50 | 3,373,660 |
| South Dakota | 56,925 | 78 | 4,440,150 | 27 | 21.06 | 1,198,840 |
| North Dakota | 29,854 | 103 | 3,074,962 | 27 | 27.81 | 830,240 |
| Montana | 4,597 | 141 | 648,177 | 53 | 74.73 | 343,534 |
| Wyoming | 3,770 | 125 | 471,250 | 61 | 76.25 | 287,462 |
| Colorado | 32,304 | 84 | 2,713,536 | 55 | 46.20 | 1,492,445 |
| New Mexico | 734 | 49 | 35,966 | 68 | 33.32 | 24,457 |
| Utah | 5,446 | 120 | 653,520 | 55 | 66.00 | 359,436 |
| Nevada | 1,771 | 102 | 180,642 | 90 | 91.80 | 162,578 |
| Idaho | 4,790 | 124 | 593,960 | 61 | 75.64 | 362,316 |
| Washington | 15,397 | 144 | 2,217,168 | 50 | 72.00 | 1,108,584 |
| Oregon | 14,934 | 115 | 1,717,410 | 49 | 56.35 | 841,531 |
| California | 26,543 | 119 | 3,158,617 | 63 | 74.97 | 1,989,929 |
| United States | 2,581,353 | 88.6 | 228,783,232 | 39.0 | 34.60 | 89,328,832 |

*Acreage, production, and value of barley, rye, buckwheat, potatoes, and hay in the United States in 1899*—Concluded.

HAY.

| States and Territories. | Acreage. | Average yield per acre. | Production. | Average farm price, Dec. 1. | Average value per acre. | Farm value, Dec. 1. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Tons.* | *Tons.* | *Dollars.* | *Dollars.* | *Dollars.* |
| Maine | 976, 848 | 0. 90 | 879, 163 | 10. 10 | 9. 09 | 8, 879, 546 |
| New Hampshire | 602, 097 | . 89 | 535, 866 | 11. 75 | 10. 46 | 6, 296, 426 |
| Vermont | 843, 235 | 1. 14 | 961, 288 | 9. 25 | 10. 55 | 8, 891, 914 |
| Massachusetts | 590, 707 | 1. 13 | 667, 499 | 15. 50 | 17. 52 | 10, 346, 234 |
| Rhode Island | 73, 003 | . 89 | 64, 977 | 17. 25 | 15. 35 | 1, 120, 853 |
| Connecticut | 475, 482 | . 94 | 446, 953 | 14. 50 | 13. 63 | 6, 480, 818 |
| New York | 4, 356, 064 | 1. 04 | 4, 530, 307 | 10. 45 | 10. 87 | 47, 341, 708 |
| New Jersey | 392, 191 | . 83 | 325, 519 | 15. 35 | 12. 74 | 4, 996, 717 |
| Pennsylvania | 2, 557, 475 | 1. 20 | 3, 068, 970 | 11. 50 | 13. 80 | 35, 293, 155 |
| Delaware | 46, 750 | 1. 04 | 48, 620 | 11. 65 | 12. 12 | 566, 423 |
| Maryland | 282, 992 | 1. 13 | 319, 781 | 12. 15 | 13. 73 | 3, 885, 339 |
| Virginia | 534, 603 | 1. 10 | 588, 063 | 10. 25 | 11. 27 | 6, 027, 646 |
| North Carolina | 130, 526 | 1. 50 | 195, 789 | 10. 10 | 15. 15 | 1, 977, 469 |
| South Carolina | 144, 354 | 1. 22 | 176, 112 | 10. 30 | 12. 56 | 1, 813, 954 |
| Georgia | 109, 287 | 1. 45 | 158, 466 | 13. 15 | 19. 07 | 2, 083, 828 |
| Florida | 5, 942 | 1. 46 | 8, 675 | 15. 35 | 22. 41 | 133, 161 |
| Alabama | 49, 847 | 1. 66 | 82, 746 | 11. 40 | 18. 92 | 943, 304 |
| Mississippi | 54, 902 | 1. 44 | 79, 059 | 9. 25 | 13. 32 | 731, 296 |
| Louisiana | 25, 405 | 1. 95 | 49, 540 | 9. 70 | 18. 92 | 480, 538 |
| Texas | 311, 156 | 1. 43 | 444, 953 | 7. 10 | 10. 15 | 3, 159, 166 |
| Arkansas | 138, 845 | 1. 48 | 205, 491 | 8. 65 | 12. 80 | 1, 777, 497 |
| Tennessee | 243, 348 | 1. 31 | 318, 786 | 11. 25 | 14. 74 | 3, 586, 342 |
| West Virginia | 498, 998 | 1. 29 | 643, 707 | 9. 45 | 12. 19 | 6, 083, 031 |
| Kentucky | 306, 173 | 1. 29 | 394, 963 | 10. 40 | 13. 42 | 4, 107, 615 |
| Ohio | 1, 641, 307 | 1. 30 | 2, 133, 699 | 8. 95 | 11. 63 | 19, 096, 606 |
| Michigan | 1, 352, 766 | 1. 22 | 1, 650, 375 | 8. 50 | 10. 37 | 14, 028, 188 |
| Indiana | 1, 562, 221 | 1. 34 | 2, 093, 376 | 7. 80 | 10. 45 | 16, 328, 333 |
| Illinois | 1, 833, 884 | 1. 29 | 2, 365, 710 | 7. 75 | 10. 00 | 18, 334, 252 |
| Wisconsin | 1, 324, 298 | 1. 47 | 1, 946, 718 | 6. 85 | 10. 07 | 13, 335, 018 |
| Minnesota | 1, 514, 841 | 1. 70 | 2, 575, 230 | 4. 35 | 7. 40 | 11, 202, 250 |
| Iowa | 3, 750, 727 | 1. 34 | 5, 025, 974 | 5. 30 | 7. 10 | 26, 637, 662 |
| Missouri | 2, 258, 682 | 1. 37 | 3, 094, 394 | 6. 25 | 8. 56 | 19, 339, 962 |
| Kansas | 3, 284, 018 | 1. 57 | 5, 155, 908 | 3. 50 | 5. 49 | 18, 045, 678 |
| Nebraska | 2, 034, 758 | 1. 66 | 3, 377, 698 | 3. 70 | 6. 14 | 12, 497, 483 |
| South Dakota | 1, 943, 688 | 1. 43 | 2, 779, 474 | 3. 10 | 4. 43 | 8, 616, 369 |
| North Dakota | 384, 048 | 1. 58 | 606, 796 | 3. 30 | 5. 21 | 2, 002, 427 |
| Montana | 361, 923 | 1. 42 | 513, 931 | 7. 70 | 10. 93 | 3, 957, 269 |
| Wyoming | 271, 961 | 1. 47 | 399, 783 | 6. 60 | 9. 70 | 2, 638, 568 |
| Colorado | 776, 321 | 2. 10 | 1, 630, 274 | 7. 35 | 15. 43 | 11, 982, 514 |
| New Mexico | 38, 310 | 1. 70 | 65, 127 | 10. 60 | 18. 02 | 690, 346 |
| Arizona | 27, 624 | 2. 63 | 72, 651 | 10. 35 | 27. 22 | 751, 938 |
| Utah | 194, 341 | 2. 50 | 485, 852 | 7. 10 | 17. 75 | 3, 449, 549 |
| Nevada | 157, 480 | 1. 87 | 294, 488 | 7. 65 | 14. 31 | 2, 252, 833 |
| Idaho | 215, 958 | 2. 50 | 539, 895 | 6. 30 | 15. 75 | 3, 401, 338 |
| Washington | 303, 794 | 2. 02 | 613, 664 | 8. 90 | 17. 98 | 5, 461, 610 |
| Oregon | 637, 190 | 1. 97 | 1, 255, 264 | 6. 85 | 13. 49 | 8, 598, 558 |
| California | 1, 708, 087 | 1. 63 | 2, 784, 182 | 8. 00 | 13. 04 | 22, 273, 456 |
| United States | 41, 328, 462 | 1. 35 | 56, 655, 756 | 7. 27 | 9. 97 | 411, 926, 187 |

TOBACCO STATISTICS.

The following table contains statistics of tobacco production in the United States based upon information in possession of the office of the Commissioner of Internal Revenue and of the Bureau of Statistics of the Treasury Department. It is the intention of the Department of Agriculture to resume the annual collection of statistics of production as soon as the Twelfth Census has furnished a new basis for that work in the results of its careful and systematic investigations:

*Production of tobacco in the United States, 1892 to 1898, as compiled from the reports of the Bureau of Internal Revenue and of the Bureau of Statistics of the Treasury Department.*

| | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. |
|---|---|---|---|---|---|---|---|
| Tobacco manufactured: | | | | | | | |
| Chewing, smoking, and snuff *a* | *Pounds.* 234,081,332 | *Pounds.* 249,858,869 | *Pounds.* 250,994,675 | *Pounds.* 234,561,904 | *Pounds.* 265,871,158 | *Pounds.* 247,358,414 | *Pounds.* *b*286,453,738 |
| Cigars and cigarettes *a* | 96,925,980 | 89,973,814 | 93,639,213 | 95,053,056 | 96,213,473 | 102,519,323 | *b*106,855,524 |
| Exports, domestic *a* | 277,258,871 | 304,797,808 | 293,637,217 | 300,047,687 | 281,074,422 | 269,966,833 | 346,823,677 |
| Exports, foreign *a* | 1,611,863 | 1,776,636 | 3,060,385 | 2,767,454 | 1,779,103 | 2,323,516 | 1,847,637 |
| | 609,878,046 | 646,407,127 | 641,331,490 | 632,430,101 | 644,938,156 | 622,168,086 | 741,980,576 |
| Less imports *a* | 22,093,270 | 24,899,175 | 31,355,899 | 20,258,704 | 12,848,743 | 11,307,830 | 17,107,839 |
| | 587,784,776 | 621,507,952 | 609,975,591 | 612,171,397 | 632,089,413 | 610,860,256 | 724,872,737 |

*a* For calendar year following. *b* Preliminary estimates.

UNITED STATES TREASURY DEPARTMENT,
OFFICE OF THE COMMISSIONER OF INTERNAL REVENUE,
*Washington, D. C., March 14, 1900.*

I have made a careful examination and study of the statement of the production of leaf tobacco in the United States for the years 1892 to 1898, inclusive, as compiled by the Division of Statistics, Department of Agriculture, from the reports of this office and the Bureau of Statistics of this Department, and am of the opinion that the statement is as complete and correct as is possible to be made.

H. C. JONES, *Chief, Tobacco Division.*

## CONSUMPTION OF AMERICAN COTTON BY FOREIGN COUNTRIES.

The comparative figures in the following table are compiled from the reports of the Bureau of Statistics of the Treasury Department, and are for fiscal years ended June 30. They show the number of bales of cotton exported to each foreign country in 1889, as compared with the years 1898 and 1899. As the exports contain sea-island as well as some light-weight round bales, all bales are reduced to the uniform weight of 500 pounds each.

*Exports of cotton from United States to foreign countries.*

[In bales of 500 pounds.]

| Countries. | Year ending June 30, 1889. | | Year ending June 30, 1898. | | Year ending June 30, 1899. | |
|---|---|---|---|---|---|---|
| | Bales. | Value. | Bales. | Value. | Bales. | Value. |
| Austria-Hungary | 5 610 | $275,275 | 35,614 | $987,724 | 57,127 | $1,576,175 |
| Belgium | 147,807 | 7,556,687 | 161,942 | 4,809,609 | 129,525 | 3,599,471 |
| Denmark | | | 24,741 | 732,810 | 39,249 | 1,078,300 |
| France | 400,196 | 20,174,839 | 842,038 | 24,599,724 | 803,406 | 21,946,691 |
| Germany | 660,756 | 32,308,593 | 1,858,524 | 54,886,245 | 1,728,975 | 47,346,679 |
| Italy | 131,068 | 6,460,413 | 387,581 | 11,468,025 | 417,353 | 11,652,768 |
| Netherlands | 44,354 | 2,188,771 | 43,509 | 1,292,788 | 51,621 | 1,401,040 |
| Portugal | | | 18,835 | 588,923 | 21,627 | 612,132 |
| Russia | 144,036 | 7,506,201 | 103,825 | 3,133,758 | 95,011 | 2,796,793 |
| Spain | 181,533 | 9,200,998 | 263,648 | 8,180,970 | 248,635 | 7,194,000 |
| Sweden and Norway | 8,717 | 420,412 | 25,613 | 744,287 | 23,624 | 703,503 |
| United Kingdom | 2,940,800 | 146,605,505 | 3,532,101 | 105,853,614 | 3,609,444 | 99,709,352 |
| Other Europe | 9,547 | 475,182 | | | | |
| Dominion of Canada | 61,143 | 2,980,556 | 122,495 | 3,961,586 | 98,230 | 2,994,674 |
| Mexico | 33,803 | 1,607,395 | 42,433 | 1,321,473 | 36,130 | 1,043,473 |
| West Indies (French) | | | 17 | 653 | 5 | 187 |
| China | | | 11,302 | 370,670 | 4,060 | 131,734 |
| East Indies (British) | | | 297 | 9,130 | 9 | 308 |
| Hongkong | | | 1,800 | 72,000 | 56 | 1,710 |
| Japan | 47 | 2,341 | 224,214 | 7,428,226 | 182,734 | 5,774,784 |
| All other countries | 216 | 12,102 | | | | |
| Total | 4,769,633 | 237,775,270 | 7,700,529 | 230,442,215 | 7,546,821 | 209,564,774 |

Except in the cases of Belgium and Russia, the increase in exports has been very large, in some cases the amount being more than double what it was eight or ten years ago. The decrease in exports to Russia of 40,211 bales in 1898 as compared with 1889, and of 49,025 in 1899, is additional evidence of the growth of cotton culture in the trans-Caucasian provinces of that Empire, and of the effort to become independent of the United States.

There is a decrease in the consumption of American cotton in 1899 as compared with 1898 in all countries except Austria-Hungary, Denmark, Italy, the Netherlands, Portugal, and the United Kingdom. The most notable reductions are 129,549 bales in Germany, 41,480 in Japan, 38,632 in France, and 32,417 bales in Belgium. On the other hand the countries showing an increase are as follows: United Kingdom 77,343 bales, Italy 29,772, Austria-Hungary 21,513, Denmark 14,508, the Netherlands 8,112, and Portugal 2,792 bales. But notwithstanding a net decrease of 153,708 bales last year, as compared with the year previous, 1898 and 1899 are conspicuous as having recorded the largest exports of cotton in the history of our commerce. The extremely low prices in 1897-98 and 1898-99 reduced the export values $7,333,055 in the former and $28,210,496 in the latter year, as compared with those of 1889, although the number of bales exported in 1898 was 2,930,896 and in 1899 was 2,777,188 greater than in 1889.

### THE WORLD'S CONSUMPTION OF COTTON.

While there are no available statistics showing the annual crops of all the cotton-producing countries, the consumption of the mills in Great Britain, the continent of Europe, the United States, India, Japan, Canada, Mexico, and other countries fairly approximates the world's production, the unknown quantity being the domestic consumption in China and a few other countries in the Orient that produce comparatively small crops.

The following statistics, taken from Mr. Thomas Ellison's Annual Review of the Cotton Trade, issued in Liverpool, November 1, 1899, show the number of bales of cotton consumed by the mills of the world from 1890-91 to 1898-99, inclusive:

*The world's consumption of cotton, 1890-91 to 1898-99.*

[In bales of 500 pounds.]

| Year ended Sept. 30— | Great Britain. | Continent of Europe. | United States. | India. | All other countries. | Total. |
|---|---|---|---|---|---|---|
| 1891 | 3,384,000 | 3,631,000 | 2,367,000 | 924,000 | 150,000 | 10,456,000 |
| 1892 | 3,181,000 | 3,640,000 | 2,576,000 | 914,000 | 160,000 | 10,471,000 |
| 1893 | 2,866,000 | 3,692,000 | 2,551,000 | 918,000 | 220,000 | 10,247,000 |
| 1894 | 3,233,000 | 3,848,000 | 2,264,000 | 959,000 | 250,000 | 10,554,000 |
| 1895 | 3,250,000 | 4,030,000 | 2,743,000 | 1,074,000 | 300,000 | 11,397,000 |
| 1896 | 3,276,000 | 4,160,000 | 2,572,000 | 1,105,000 | 419,000 | 11,532,000 |
| 1897 | 3,224,000 | 4,368,000 | 2,738,000 | 1,004,000 | 488,000 | 11,822,000 |
| 1898 | 3,432,000 | 4,628,000 | 2,962,000 | 1,141,000 | 713,000 | 12,876,000 |
| 1899 | 3,519,000 | 4,836,000 | 3,553,000 | 1,297,000 | 727,000 | 13,932,000 |

These figures certainly show a very gratifying increase in the consumption of cotton, the increase in all countries in 1898-99 over the previous year amounting to 1,056,000 bales, of which more than one-half was in the United States, while the increase in all countries since 1890-91 amounts to 3,476,000 bales. But it is especially gratifying when the increase in the United States is compared with that of other countries. In 1898-99 this increase, as compared with the previous year, amounts to 591,000 bales, as against 208,000 in all continental European countries, 156,000 in India, and 87,000 in Great Britain. Since 1890-91 the United States shows an increase of 1,186,000 bales, as compared with 1,205,000, in all continental European countries, 373,000 in India, and 135,000 in Great Britain.

*Cotton crop of 1898–99.*

[In commercial bales.]

| States and Territories. | Movement and mill purchases. | | | Taken from other States and ports. | | | Total crop. |
|---|---|---|---|---|---|---|---|
| | Forwarded by rail, etc. | Bought by mills. | Total. | Taken from other States. | Taken from ports. | Total. | |
| Alabama | 1,079,871 | 121,128 | 1,200,999 | 22,986 | 1,971 | 24,957 | 1,176,042 |
| Arkansas | 940,773 | 3,288 | 944,061 | 24,592 | ---------- | 24,592 | 919,469 |
| Florida | 35,064 | ---------- | 35,064 | ---------- | ---------- | ---------- | 35,064 |
| Georgia | 1,232,810 | 281,527 | 1,514,337 | 135,589 | 17 | 135,606 | 1,378,731 |
| Indian Territory | 215,269 | ---------- | 215,269 | 7,431 | ---------- | 7,431 | 207,838 |
| Kansas | 3 | ---------- | 3 | ---------- | ---------- | ---------- | 3 |
| Kentucky | 50 | 25,447 | 25,497 | 25,447 | ---------- | 25,447 | 50 |
| Louisiana | 879,264 | 18,749 | 898,013 | 160,414 | 19,852 | 180,266 | 717,747 |
| Mississippi | 1,302,420 | 21,650 | 1,324,070 | 76,942 | ---------- | 76,942 | 1,247,128 |
| Missouri | 33,120 | 3,017 | 36,137 | 3,017 | ---------- | 3,017 | 33,120 |
| North Carolina | 336,407 | 374,891 | 711,298 | 79,113 | 2,565 | 81,678 | 629,620 |
| Oklahoma | 109,479 | ---------- | 109,479 | 453 | ---------- | 453 | 109,026 |
| South Carolina | 581,788 | 466,181 | 1,047,969 | 10,953 | 1,602 | 12,555 | 1,035,414 |
| Tennessee | 311,321 | 36,358 | 347,679 | 24,859 | ---------- | 24,859 | 322,820 |
| Texas | 3,413,245 | 17,156 | 3,430,401 | 60,493 | 6,799 | 67,292 | 3,363,109 |
| Utah | ---------- | 34 | 34 | ---------- | ---------- | ---------- | 34 |
| Virginia | 13,990 | 44,502 | 58,492 | 44,502 | ---------- | 44,502 | 13,990 |
| Total | 10,484,874 | 1,413,928 | 11,898,802 | 676,791 | 32,806 | 709,597 | 11,189,205 |

*Comparative acreage and production, 1897 and 1898.*

[In commercial bales.]

| States and Territories. | Acres. | | Bales. | | Acres. | | Bales. | |
|---|---|---|---|---|---|---|---|---|
| | 1897. | 1898. | 1897–98. | 1898–99. | Increase. | Decrease. | Increase. | Decrease. |
| Alabama | 2,709,460 | 3,003,176 | 1,112,681 | 1,176,042 | 293,716 | ---------- | 63,361 | ---------- |
| Arkansas | 1,619,785 | 1,876,467 | 942,267 | 919,469 | 256,682 | ---------- | ---------- | 22,798 |
| Florida | 251,109 | 152,452 | 53,657 | 35,064 | ---------- | 98,657 | ---------- | 18,593 |
| Georgia | 3,537,702 | 3,535,205 | 1,350,781 | 1,378,731 | ---------- | 2,497 | 27,950 | ---------- |
| Indian Territory | 317,992 | 314,906 | 207,386 | 207,838 | ---------- | 3,086 | 452 | ---------- |
| Kansas | 285 | 8 | 139 | 3 | ---------- | 277 | ---------- | 136 |
| Kentucky | 105 | 137 | 35 | 50 | 32 | ---------- | 15 | ---------- |
| Louisiana | 1,245,399 | 1,281,691 | 788,325 | 717,747 | 36,292 | ---------- | ---------- | 70,578 |
| Mississippi | 2,778,610 | 2,900,298 | 1,524,771 | 1,247,128 | 121,688 | ---------- | ---------- | 277,643 |
| Missouri | 83,319 | 82,318 | 26,848 | 33,120 | ---------- | 1,001 | 6,272 | ---------- |
| North Carolina | 1,302,437 | 1,311,708 | 646,726 | 629,620 | 9,271 | ---------- | ---------- | 17,106 |
| Oklahoma | 216,664 | 215,893 | 110,175 | 109,026 | ---------- | 771 | ---------- | 1,149 |
| South Carolina | 2,074,778 | 2,353,213 | 1,030,085 | 1,035,414 | 278,435 | ---------- | 5,329 | ---------- |
| Tennessee | 967,077 | 896,722 | 268,635 | 322,820 | ---------- | 70,355 | 54,185 | ---------- |
| Texas | 7,164,175 | 6,991,904 | 2,822,408 | 3,363,109 | ---------- | 172,271 | 540,701 | ---------- |
| Utah | 75 | 35 | 60 | 34 | ---------- | 40 | ---------- | 26 |
| Virginia | 50,612 | 51,162 | 12,878 | 13,990 | 550 | ---------- | 1,112 | ---------- |
| Total | 24,319,584 | 24,967,295 | 10,897,857 | 11,189,205 | *a*647,711 | ---------- | *a*291,348 | ---------- |

*a* Net increase.

*United States crops, exports, imports, and consumption of cotton, 1888–89 to 1898–99.*

| Years. | United States crop (commercial bales). | Exports (commercial bales). *a* | Consumed by United States mills (commercial bales). | Average net weight per bale. | Average price (middling upland), New York. | Imports (500-pound bales). *a* |
|---|---|---|---|---|---|---|
| | | | | *Pounds.* | *Cents.* | |
| 1888–89 | 6,938,290 | 4,830,463 | 2,314,091 | 470 | 10.71 | 15,946 |
| 1889–90 | 7,311,322 | 5,003,879 | 2,390,959 | 471 | 11.53 | 17,212 |
| 1890–91 | 8,652,597 | 5,856,194 | 2,632,023 | 473 | 9.03 | 41,818 |
| 1891–92 | 9,035,379 | 5,917,249 | 2,876,846 | 473 | 7.64 | 57,328 |
| 1892–93 | 6,700,365 | 4,494,047 | 2,431,134 | 475 | 8.24 | 86,736 |
| 1893–94 | 7,549,817 | 5,336,553 | 2,319,688 | 474 | 7.67 | 55,412 |
| 1894–95 | 9,901,251 | 6,889,577 | 2,946,677 | 484 | 6.50 | 98,644 |
| 1895–96 | *b*7,161,094 | 4,751,602 | 2,504,972 | 477 | 8.16 | 110,701 |
| 1896–97 | *b*8,532,075 | 6,092,537 | 2,847,351 | 477 | 7.72 | 103,798 |
| 1897–98 | *b*10,897,857 | 7,690,477 | 3,443,581 | 482 | 6.22 | 105,321 |
| 1898–99 | *b*11,189,205 | *c*7,424,913 | 3,589,494 | 489 | 6.00 | 112,361 |

*a* From Bureau of Statistics, Treasury Department.
*b* Estimates of Department; other figures for production are those of Latham & Co.
*c* Preliminary estimate.

*Condition of crops in the United States, monthly, 1885-1899.*

| Year. | Winter wheat. | | | | | Spring wheat. | | | | Corn. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | April. | May. | June. | July. | When harvested. | June. | July. | August. | When harvested. | July. | August. | September. | October. |
| 1885 | 76.3 | 70.0 | 62.0 | 65.0 | 66.0 | 97.0 | 96.0 | 95.0 | 86.0 | 94.0 | 96.0 | 95.0 | 95.0 |
| 1886 | 94.1 | 94.9 | 92.7 | 91.2 | 90.8 | 98.5 | 83.3 | 80.1 | 83.5 | 95.2 | 80.7 | 76.6 | 80.0 |
| 1887 | 88.1 | 85.8 | 84.9 | 83.5 | 84.0 | 87.3 | 79.3 | 78.8 | 78.1 | 97.7 | 80.5 | 72.3 | 72.8 |
| 1888 | 82.0 | 73.1 | 73.3 | 75.6 | 77.4 | 92.8 | 95.9 | 87.3 | 77.2 | 93.0 | 95.5 | 94.2 | 92.0 |
| 1889 | 94.0 | 96.0 | 93.1 | 92.0 | 89.4 | 94.4 | 83.3 | 81.2 | 83.8 | 90.3 | 94.8 | 90.9 | 91.7 |
| 1890 | 81.0 | 80.0 | 78.1 | 76.2 | 73.5 | 91.3 | 94.4 | 83.2 | 79.8 | 93.1 | 73.3 | 70.1 | 70.6 |
| 1891 | 96.9 | 97.9 | 96.6 | 96.2 | 96.7 | 92.6 | 94.1 | 95.5 | 97.2 | 92.8 | 90.8 | 91.1 | 92.5 |
| 1892 | 81.2 | 84.0 | 88.3 | 89.6 | 87.6 | 92.3 | 90.9 | 87.3 | 81.2 | 81.1 | 82.5 | 79.6 | 79.8 |
| 1893 | 77.4 | 75.3 | 75.5 | 77.7 | *a*74.0 | 86.4 | 74.1 | 67.0 | ...... | 93.2 | 87.0 | 76.7 | 75.1 |
| 1894 | 86.7 | 81.4 | 83.2 | 83.9 | *a*83.7 | 88.0 | 68.4 | 67.1 | ...... | 95.0 | 69.1 | 63.4 | 64.2 |
| 1895 | 81.4 | 82.9 | 71.1 | 65.8 | *a*75.4 | 97.8 | 102.2 | 95.9 | ...... | 99.3 | 102.5 | 96.4 | 95.5 |
| 1896 | 77.1 | 82.7 | 77.9 | 75.6 | *a*74.6 | 99.9 | 93.3 | 78.9 | ...... | 92.4 | 96.0 | 91.0 | 90.5 |
| 1897 | 81.4 | 80.2 | 78.5 | 81.2 | *a*85.7 | 89.6 | 91.2 | 86.7 | ...... | 82.9 | 84.2 | 79.3 | 77.1 |
| 1898 | 86.7 | 86.5 | 90.8 | 85.7 | *a*86.7 | 100.9 | 95.0 | 96.5 | ...... | 90.5 | 87.0 | 84.1 | 82.0 |
| 1899 | 77.9 | 76.2 | 67.3 | 65.6 | *a*70.9 | 91.4 | 91.7 | 83.6 | ...... | 86.5 | 89.9 | 85.2 | 82.7 |

| Year. | Oats. | | | | Rye. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | June. | July. | August. | September. | April. | May. | June. | July. | August. | When harvested. |
| 1885 | 94.0 | 97.0 | 96.0 | 93.0 | 87.7 | 86.0 | 83.0 | 87.0 | 94.0 | ...... |
| 1886 | 95.9 | 88.8 | 87.4 | 90.9 | 96.6 | 95.7 | 94.4 | 95.6 | 88.6 | 93.4 |
| 1887 | 91.0 | 85.9 | 85.6 | 83.4 | 92.0 | 90.8 | 88.9 | 88.0 | 84.6 | 82.2 |
| 1888 | 95.4 | 95.2 | 91.7 | 87.2 | 93.5 | 92.9 | 93.9 | 95.1 | 91.4 | 92.8 |
| 1889 | 93.8 | 94.1 | 92.3 | 90.0 | 93.9 | 96.5 | 95.2 | 96.7 | 95.4 | 91.6 |
| 1890 | 89.8 | 81.6 | 70.1 | 64.4 | 92.8 | 93.5 | 92.3 | 92.0 | 86.8 | 85.4 |
| 1891 | 85.1 | 87.6 | 89.5 | 90.7 | 95.4 | 97.2 | 95.4 | 93.9 | 89.6 | 95.1 |
| 1892 | 88.5 | 87.2 | 86.2 | 78.9 | 87.0 | 88.9 | 91.0 | 92.9 | 89.8 | 88.5 |
| 1893 | 88.9 | 88.8 | 78.3 | 74.9 | 85.7 | 82.7 | 84.6 | 83.8 | 78.5 | 82.0 |
| 1894 | 87.0 | 77.7 | 76.5 | 77.8 | 94.4 | 90.7 | 93.2 | 93.9 | 79.8 | 86.9 |
| 1895 | 84.3 | 83.2 | 84.5 | 86.0 | 87.0 | 88.7 | 85.7 | 82.2 | 84.0 | 83.7 |
| 1896 | 98.8 | 96.3 | 77.3 | 74.0 | 82.9 | 87.7 | 85.2 | 83.8 | 88.0 | 82.0 |
| 1897 | 89.0 | 87.5 | 86.0 | 84.6 | 88.9 | 88.0 | 89.9 | 95.0 | 89.8 | 90.1 |
| 1898 | 98.0 | 92.8 | 84.2 | 79.0 | 92.1 | 94.5 | 97.1 | 93.8 | 93.7 | 89.4 |
| 1899 | 88.7 | 90.0 | 90.8 | 87.2 | 84.9 | 85.2 | 84.5 | 83.3 | 89.0 | 82.0 |

| Year. | Barley. | | | | | Buckwheat. | | | Potatoes. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | May. | June. | July. | August. | September. | August. | September. | October. | July. | August | September. | October. |
| 1885 | 82.0 | ...... | 92.0 | 92.0 | ...... | 94.0 | ...... | 92.0 | 97.0 | 95.0 | 93.0 | 82.0 |
| 1886 | 96.7 | 100.0 | 89.7 | 90.9 | 92.7 | 94.1 | 89.8 | 86.5 | 96.6 | 88.3 | 81.4 | 81.0 |
| 1887 | 87.8 | 87.0 | 82.8 | 86.2 | 83.0 | 93.3 | 89.1 | 76.6 | 93.2 | 80.8 | 67.3 | 61.5 |
| 1888 | 88.3 | 88.8 | 91.0 | 89.4 | 86.9 | 92.5 | 93.7 | 79.1 | 95.7 | 93.2 | 91.6 | 86.8 |
| 1889 | 96.9 | 95.6 | 91.9 | 90.6 | 88.9 | 95.2 | 92.1 | 90.0 | 95.1 | 94.3 | 81.7 | 77.9 |
| 1890 | 84.6 | 86.4 | 88.3 | 82.8 | 78.6 | 90.1 | 90.5 | 90.7 | 91.7 | 77.4 | 65.7 | 61.7 |
| 1891 | 96.2 | 90.3 | 90.9 | 93.8 | 94.3 | 97.3 | 96.6 | 92.7 | 95.3 | 96.5 | 94.8 | 91.3 |
| 1892 | 92.8 | 92.1 | 92.0 | 91.1 | 87.4 | 92.9 | 89.0 | 85.6 | 90.0 | 86.8 | 74.8 | 67.7 |
| 1893 | 88.6 | 88.3 | 88.8 | 84.6 | 83.8 | 88.8 | 77.5 | 73.5 | 94.8 | 86.0 | 71.8 | 71.2 |
| 1894 | 62.3 | 82.2 | 76.8 | 69.8 | 71.5 | 82.3 | 69.2 | 72.0 | 92.3 | 74.0 | 62.4 | 64.3 |
| 1895 | 94.0 | 90.3 | 91.9 | 87.2 | 87.6 | 85.2 | 87.5 | 84.8 | 91.5 | 89.7 | 90.8 | 87.4 |
| 1896 | 89.2 | 98.0 | 88.1 | 82.9 | 83.1 | 96.0 | 93.2 | 86.0 | 99.0 | 94.8 | 83.2 | 81.7 |
| 1897 | 96.4 | 87.4 | 88.5 | 87.5 | 86.4 | 94.9 | 95.1 | 90.8 | 87.8 | 77.9 | 66.7 | 61.6 |
| 1898 | ...... | 78.8 | 85.7 | 79.3 | 79.2 | 87.2 | 88.8 | 76.2 | 95.5 | 83.9 | 77.7 | 72.5 |
| 1899 | ...... | 91.4 | 92.0 | 93.6 | 86.7 | 93.2 | 75.2 | 70.2 | 93.8 | 93.0 | 86.3 | 81.7 |

*a* Includes winter and spring.

*Condition of crops in the United States, monthly, 1885–1899*—Continued.

| Year. | Hay. | | | | Cotton. | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Clover. | | Timothy. | | | | | | |
| | June. | July. | July. | Aug. | June. | July. | August. | September. | October. |
| 1885 | | | | | 92.0 | 96.0 | 96.5 | 87.0 | 78.0 |
| 1886 | | | | 91.2 | 88.7 | 86.1 | 81.3 | 82.1 | 79.3 |
| 1887 | | | | 80.6 | 96.9 | 96.9 | 93.3 | 82.8 | 76.5 |
| 1888 | | | | | 88.2 | 86.7 | 87.3 | 83.8 | 78.9 |
| 1889 | | | | 94.5 | 86.4 | 87.6 | 89.3 | 85.6 | 81.5 |
| 1890 | 95.1 | 94.0 | 93.9 | 93.6 | 88.8 | 91.4 | 89.5 | 85.5 | 80.0 |
| 1891 | 91.0 | 89.3 | 87.4 | 90.9 | 85.7 | 88.6 | 88.9 | 82.7 | 75.7 |
| 1892 | 94.9 | 95.5 | 96.8 | 93.2 | 85.9 | 86.9 | 82.3 | 76.8 | 73.3 |
| 1893 | 92.7 | 92.6 | 89.8 | 89.6 | 85.6 | 82.7 | 80.4 | 73.4 | 70.7 |
| 1894 | 87.8 | 80.2 | 77.3 | 75.6 | 88.3 | 89.6 | 91.8 | 85.9 | 82.7 |
| 1895 | 82.8 | 73.9 | 70.8 | 69.9 | 81.0 | 82.3 | 77.9 | 70.8 | 65.1 |
| 1896 | 88.4 | 83.7 | 84.8 | 87.5 | 97.2 | 92.5 | 80.1 | 64.2 | 60.7 |
| 1897 | 96.0 | | | | 83.5 | 86.0 | 86.9 | 78.3 | 70.0 |
| 1898 | | | | 99.3 | 89.0 | 91.2 | 91.2 | 79.8 | 75.4 |
| 1899 | | | | 86.7 | 85.7 | 87.8 | 84.0 | 68.5 | 62.4 |

*Corn crop of the countries named, 1894–1898.*[1]

| Countries. | 1894. | 1895. | 1896. | 1897. | 1898. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| United States | 1,212,770,000 | 2,151,138,000 | 2,283,175,000 | 1,902,968,000 | 1,924,185,000 |
| Ontario | 16,788,000 | 25,602,000 | 24,830,000 | 25,441,000 | 24,181,000 |
| Mexico | 77,273,000 | 71,906,000 | 76,264,000 | 121,893,000 | 100,000,000 |
| Total North America | 1,306,831,000 | 2,248,646,000 | 2,384,269,000 | 2,050,302,000 | 2,048,366,000 |
| Chile | 5,000,000 | 9,000,000 | 9,000,000 | 8,000,000 | 9,932,000 |
| Argentina | 16,000,000 | 72,000,000 | 80,000,000 | 40,000,000 | 56,000,000 |
| Uruguay | 5,252,000 | 5,840,000 | 5,000,000 | 4,000,000 | 4,000,000 |
| Total South America | 26,252,000 | 86,840,000 | 94,000,000 | 52,000,000 | 69,932,000 |
| France | 27,419,000 | 26,163,000 | 30,426,000 | 30,401,000 | 23,496,000 |
| Spain | 19,085,000 | 15,714,000 | 18,252,000 | 17,000,000 | 18,000,000 |
| Portugal | 15,000,000 | 15,000,000 | 15,000,000 | 15,500,000 | 15,500,000 |
| Italy | 59,603,000 | 70,483,000 | 79,910,000 | 65,891,000 | 79,640,000 |
| Austria | 13,795,000 | 18,720,000 | 17,492,000 | 14,757,000 | 16,074,000 |
| Hungary | 68,448,000 | 142,743,000 | 128,866,000 | 102,239,000 | 127,639,000 |
| Croatia-Slavonia | 12,092,000 | 17,454,000 | 17,617,000 | 14,162,000 | 17,500,000 |
| Total Austria-Hungary | 94,335,000 | 178,917,000 | 163,975,000 | 131,158,000 | 161,213,000 |
| Roumania | 29,892,000 | 71,323,000 | 65,428,000 | 79,753,000 | 101,870,000 |
| Bulgaria and E. Roumelia | 8,000,000 | 8,000,000 | 6,400,000 | 5,000,000 | 7,000,000 |
| Servia | 17,414,000 | 17,000,000 | 16,000,000 | 16,000,000 | 17,000,000 |
| Russia | 23,275,000 | 31,693,000 | 23,773,000 | 51,966,000 | 47,918,000 |
| Total Europe | 294,023,000 | 434,293,000 | 419,164,000 | 412,669,000 | 471,637,000 |
| Algeria | 322,000 | 493,000 | 451,000 | 450,000 | 333,000 |
| Egypt | 32,000,000 | 33,600,000 | 34,000,000 | 35,000,000 | 32,000,000 |
| Cape Colony | 2,761,000 | 2,378,000 | 1,650,000 | 2,761,000 | 2,061,000 |
| Total Africa | 35,083,000 | 36,471,000 | 36,101,000 | 38,211,000 | 34,394,000 |
| Australasia | 9,118,000 | 8,500,000 | 10,201,000 | 9,412,000 | 9,780,000 |

RECAPITULATION BY CONTINENTS.

| | | | | | |
|---|---|---|---|---|---|
| North America | 1,306,831,000 | 2,248,646,000 | 2,384,269,000 | 2,050,302,000 | 2,048,366,000 |
| South America | 26,252,000 | 86,840,000 | 94,000,000 | 52,000,000 | 69,932,000 |
| Europe | 294,023,000 | 434,293,000 | 419,164,000 | 412,669,000 | 471,637,000 |
| Africa | 35,083,000 | 36,471,000 | 36,101,000 | 38,211,000 | 34,394,000 |
| Australasia | 9,118,000 | 8,500,000 | 10,201,000 | 9,412,000 | 9,780,000 |
| Total | 1,671,307,000 | 2,814,750,000 | 2,943,735,000 | 2,562,594,000 | 2,634,109,000 |

[1] This and the following tables embody such official figures as are available in regard to wheat, rye, barley, oats, maize, rice, sugar, and flax, together with commercial or other estimates for a number of countries for which official data are not furnished. There are many countries which not only issue no official figures, but for which not even rough estimates, or information upon which to base them, can be had; and these are necessarily omitted from the tables. They are, however, for the most part countries whose production enters to a very limited extent into the world's commerce in the articles named, and the part of the world's production covered by the tables embraces substantially all that is of much commercial importance.

*Wheat crop of the world, 1895–1899.*

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| United States | 467,103,000 | 427,684,000 | 530,149,000 | 675,149,000 | 547,304,000 |
| Ontario | 18,183,000 | 19,184,000 | 29,765,000 | 33,042,000 | 22,158,000 |
| Manitoba | 32,777,000 | 14,825,000 | 18,837,000 | 26,112,000 | 28,802,000 |
| Rest of Canada | 6,500,000 | 6,800,000 | 7,500,000 | 9,000,000 | 9,000,000 |
| Total Canada | 57,460,000 | 40,809,000 | 56,102,000 | 68,154,000 | 59,960,000 |
| Mexico | 10,035,000 | 22,555,000 | 9,700,000 | 15,000,000 | 15,000,000 |
| Total North America | 534,598,000 | 491,048,000 | 595,951,000 | 758,303,000 | 622,264,000 |
| Chile | 15,000,000 | 12,000,000 | 10,500,000 | 14,000,000 | 13,000,000 |
| Argentina | 60,000,000 | 41,433,000 | 25,410,000 | 46,603,000 | 92,167,000 |
| Uruguay | 8,915,000 | 4,059,000 | 3,600,000 | 6,000,000 | 7,164,000 |
| Total South America | 83,915,000 | 57,492,000 | 39,510,000 | 66,603,000 | 112,331,000 |
| Great Britain | 38,348,000 | 58,851,000 | 56,672,000 | 75,330,000 | 67,594,000 |
| Ireland | 1,109,000 | 1,194,000 | 1,355,000 | 1,856,000 | 1,731,000 |
| Total United Kingdom | 39,457,000 | 60,045,000 | 58,027,000 | 77,186,000 | 69,325,000 |
| Norway | 260,000 | 300,000 | 300,000 | 300,000 | 260,000 |
| Sweden | 3,705,000 | 4,704,000 | 4,678,000 | 4,542,000 | 4,430,000 |
| Denmark | 3,467,000 | 3,689,000 | 3,474,000 | 2,991,000 | 3,500,000 |
| Netherlands | 4,282,000 | 5,045,000 | 4,290,000 | 5,000,000 | 4,300,000 |
| Belgium | 12,878,000 | 13,748,000 | 11,967,000 | 14,069,000 | 12,400,000 |
| France | 340,432,000 | 339,793,000 | 246,596,000 | 363,498,000 | 366,079,000 |
| Spain | 81,218,000 | 71,892,000 | 94,637,000 | 99,000,000 | 88,000,000 |
| Portugal | 7,000,000 | 5,600,000 | 8,200,000 | 7,800,000 | 6,400,000 |
| Italy | 118,162,000 | 145,233,000 | 86,919,000 | 137,345,000 | 137,912,000 |
| Switzerland | 5,000,000 | 4,800,000 | 4,300,000 | 4,500,000 | 4,200,000 |
| Germany | 116,545,000 | 125,661,000 | 119,903,000 | 132,557,000 | 141,369,000 |
| Austria | 41,770,000 | 44,004,000 | 35,859,000 | 47,357,000 | 42,282,000 |
| Hungary | 158,012,000 | 149,954,000 | 83,590,000 | 128,140,000 | 138,060,000 |
| Croatia-Slavonia | 8,661,000 | 9,614,000 | 6,271,000 | 11,408,000 | 9,500,000 |
| Bosnia-Herzegovina | 2,000,000 | 2,050,000 | 2,000,000 | 2,100,000 | 2,000,000 |
| Total Austria-Hungary | 210,443,000 | 205,622,000 | 127,720,000 | 189,005,000 | 191,842,000 |
| Roumania | 68,502,000 | 71,194,000 | 36,448,000 | 58,457,000 | 26,064,000 |
| Bulgaria | 37,000,000 | 48,275,000 | 30,739,000 | 35,000,000 | 24,000,000 |
| Servia | 9,400,000 | 9,300,000 | 12,500,000 | 11,000,000 | 8,500,000 |
| Montenegro | 220,000 | 220,000 | 200,000 | 220,000 | 200,000 |
| Turkey in Europe | 21,500,000 | 24,000,000 | 17,800,000 | 25,000,000 | 15,000,000 |
| Greece | 4,000,000 | 4,800,000 | 3,200,000 | 4,000,000 | 2,000,000 |
| Russia proper | 292,272,000 | 300,423,000 | 238,557,000 | 334,246,000 | 314,876,000 |
| Poland | 17,387,000 | 19,476,000 | 17,808,000 | 21,691,000 | 21,544,000 |
| North Caucasus | 67,127,000 | 45,148,000 | 29,883,000 | 52,251,000 | 57,313,000 |
| Finland | 100,000 | 98,000 | 90,000 | 100,000 | 90,000 |
| Total Russia in Europe | 376,886,000 | 365,145,000 | 286,338,000 | 408,288,000 | 393,823,000 |
| Total Europe | 1,460,357,000 | 1,509,066,000 | 1,158,236,000 | 1,579,758,000 | 1,499,604,000 |
| Siberia | 30,899,000 | 34,160,000 | 42,835,000 | 36,157,000 | 45,473,000 |
| Central Asia | 7,462,000 | 12,850,000 | 11,087,000 | 14,944,000 | 14,938,000 |
| Trans-Caucasia | 47,000,000 | 42,000,000 | 40,000,000 | 40,000,000 | 33,000,000 |
| Total Russia in Asia | 85,361,000 | 88,990,000 | 93,922,000 | 91,101,000 | 93,411,000 |
| Turkey in Asia | 46,000,000 | 44,000,000 | 48,000,000 | 44,000,000 | 35,200,000 |
| Cyprus | 2,200,000 | 2,400,000 | 2,400,000 | 2,400,000 | 2,000,000 |
| Persia | 22,000,000 | 20,000,000 | 20,000,000 | 17,600,000 | 16,000,000 |
| British India | 255,244,000 | 205,743,000 | 191,257,000 | 259,670,000 | 232,585,000 |
| Japan | 20,341,000 | 18,187,000 | 19,509,000 | 20,000,000 | 20,000,000 |
| Total Asia | 431,146,000 | 379,320,000 | 375,088,000 | 434,771,000 | 399,196,000 |
| Algeria | 26,793,000 | 23,631,000 | 18,000,000 | 24,118,000 | 15,000,000 |
| Tunis | 7,500,000 | 5,600,000 | 5,000,000 | 6,500,000 | 4,800,000 |
| Egypt | 14,000,000 | 12,000,000 | 12,000,000 | 14,000,000 | 14,000,000 |
| Cape Colony | 2,542,000 | 2,257,000 | 2,200,000 | 2,012,000 | 2,000,000 |
| Total Africa | 50,835,000 | 43,488,000 | 37,200,000 | 46,630,000 | 35,830,000 |
| West Australia | 176,000 | 194,000 | 252,000 | 421,000 | 892,000 |
| South Australia | 8,027,000 | 6,116,000 | 2,893,000 | 4,141,000 | 9,056,000 |
| Queensland | 562,000 | 128,000 | 620,000 | 1,041,000 | 626,000 |

*Wheat crop of the world, 1895–1899*—Continued.

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| New South Wales | 7,263,000 | 5,359,000 | 9,132,000 | 10,893,000 | 9,579,000 |
| Victoria | 11,807,000 | 5,848,000 | 7,315,000 | 10,914,000 | 20,198,000 |
| Tasmania | 899,000 | 1,202,000 | 1,327,000 | 1,721,000 | 2,376,000 |
| New Zealand | 3,727,000 | 7,059,000 | 6,113,000 | 5,849,000 | 13,485,000 |
| Total Australasia | 32,461,000 | 25,906,000 | 27,652,000 | 34,980,000 | 56,212,000 |

RECAPITULATION BY CONTINENTS.

| | | | | | |
|---|---|---|---|---|---|
| North America | 534,598,000 | 491,048,000 | 595,951,000 | 758,303,000 | 622,264,000 |
| South America | 83,915,000 | 57,492,000 | 39,510,000 | 66,603,000 | 112,331,000 |
| Europe | 1,460,357,000 | 1,509,066,000 | 1,158,236,000 | 1,579,758,000 | 1,499,604,000 |
| Asia | 431,146,000 | 379,320,000 | 375,088,000 | 434,771,000 | 399,196,000 |
| Africa | 50,835,000 | 43,488,000 | 37,200,000 | 46,630,000 | 35,800,000 |
| Australasia | 32,461,000 | 25,906,000 | 27,652,000 | 34,980,000 | 56,212,000 |
| Total | 2,593,312,000 | 2,506,320,000 | 2,233,637,000 | 2,921,045,000 | 2,725,407,000 |

*Oat crop of the countries named, 1895–1899.*

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| United States | 824,444,000 | 707,346,000 | 698,768,000 | 730,907,000 | 796,178,000 |
| Ontario | 87,367,000 | 85,595,000 | 89,038,000 | 89,596,000 | 92,731,000 |
| Manitoba | 23,267,000 | 12,896,000 | 10,965,000 | 17,854,000 | 23,022,000 |
| Rest of Canada | 8,500,000 | 9,000,000 | 12,000,000 | 13,000,000 | 14,000,000 |
| Total Canada | 119,134,000 | 107,491,000 | 112,003,000 | 120,450,000 | 129,753,000 |
| Total North America | 943,578,000 | 814,837,000 | 810,771,000 | 851,357,000 | 925,931,000 |
| Great Britain | 125,998,000 | 117,609,000 | 120,530,000 | 122,669,000 | 118,363,000 |
| Ireland | 53,977,000 | 50,383,000 | 48,181,000 | 55,348,000 | 51,298,000 |
| Total United Kingdom | 179,975,000 | 167,992,000 | 168,711,000 | 178,017,000 | 169,661,000 |
| Sweden | 70,242,000 | 56,090,000 | 58,473,000 | 70,416,000 | 53,698,000 |
| Denmark | 40,237,000 | 38,521,000 | 35,220,000 | 41,474,000 | 37,500,000 |
| Netherlands | 15,525,000 | 15,340,000 | 16,125,000 | 17,536,000 | 16,504,000 |
| Belgium | 30,050,000 | 26,196,000 | 29,591,000 | 13,417,000 | 10,877,000 |
| France | 269,235,000 | 261,078,000 | 227,595,000 | 278,277,000 | 273,305,000 |
| Spain | 9,863,000 | 7,844,000 | 10,354,000 | 10,872,000 | 9,676,000 |
| Italy | 19,193,000 | 22,265,000 | 19,599,000 | 18,567,000 | 16,504,000 |
| Germany | 430,209,000 | 411,263,000 | 393,983,000 | 465,321,000 | 474,179,000 |
| Austria | 113,545,000 | 104,220,000 | 96,164,000 | 114,189,000 | 113,508,000 |
| Hungary | 69,137,000 | 69,930,000 | 52,644,000 | 78,708,000 | 74,956,000 |
| Croatia-Slavonia | 4,180,000 | 4,820,000 | 4,035,000 | 7,022,000 | 4,500,000 |
| Total Austria-Hungary | 186,862,000 | 178,970,000 | 152,843,000 | 199,919,000 | 192,964,000 |
| Roumania | 10,375,000 | 14,720,000 | 9,852,000 | 17,410,000 | 6,255,000 |
| Russia proper | 673,978,000 | 668,973,000 | 547,323,000 | 559,920,000 | 839,639,000 |
| Poland | 43,334,000 | 47,794,000 | 41,585,000 | 55,515,000 | 56,463,000 |
| North Caucasus | 14,760,000 | 12,201,000 | 6,695,000 | 12,416,000 | 12,546,000 |
| Total Russia in Europe | 732,072,000 | 728,968,000 | 595,603,000 | 627,851,000 | 908,648,000 |
| Total Europe | 1,993,838,000 | 1,929,247,000 | 1,717,949,000 | 1,939,077,000 | 2,169,771,000 |
| Siberia | 43,826,000 | 60,733,000 | 59,550,000 | 51,258,000 | 76,853,000 |
| Central Asia | 3,558,000 | 10,131,000 | 8,559,000 | 8,423,000 | 9,804,000 |
| Total Russia in Asia | 47,384,000 | 70,864,000 | 68,109,000 | 59,681,000 | 86,657,000 |
| Total Asia | 47,384,000 | 70,864,000 | 68,109,000 | 59,681,000 | 86,657,000 |
| Algeria | 4,402,000 | 4,486,000 | 4,126,000 | 5,088,000 | 3,095,000 |
| Cape Colony | 1,008,000 | 1,707,000 | 936,000 | 1,493,000 | 1,500,000 |
| Total Africa | 5,410,000 | 6,193,000 | 5,062,000 | 6,581,000 | 4,595,000 |

*Oat crop of the countries named, 1895-1899*—Continued.

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| West Australia | 21,000 | 20,000 | 19,000 | 30,000 | 58,000 |
| South Australia | (a) | (a) | 196,000 | 211,000 | 314,000 |
| Queensland | 31,000 | 11,000 | 33,000 | 32,000 | 4,000 |
| New South Wales | 580,000 | 386,000 | 861,000 | 561,000 | 287,000 |
| Victoria | 5,811,000 | 2,971,000 | 7,032,000 | 4,961,000 | 5,697,000 |
| Tasmania | 957,000 | 936,000 | 1,003,000 | 1,137,000 | 2,343,000 |
| New Zealand | 10,544,000 | 12,650,000 | 11,587,000 | 10,045,000 | 17,032,000 |
| Total Australasia | 17,944,000 | 16,974,000 | 20,731,000 | 16,977,000 | 25,735,000 |
| **RECAPITULATION BY CONTINENTS.** | | | | | |
| North America | 943,578,000 | 814,837,000 | 810,771,000 | 851,357,000 | 925,931,000 |
| Europe | 1,993,838,000 | 1,929,247,000 | 1,717,949,000 | 1,939,077,000 | 2,169,771,000 |
| Asia | 47,384,000 | 70,864,000 | 68,109,000 | 59,681,000 | 86,657,000 |
| Africa | 5,410,000 | 6,193,000 | 5,062,000 | 6,581,000 | 4,595,000 |
| Australasia | 17,944,000 | 16,974,000 | 20,731,000 | 16,977,000 | 25,735,000 |
| Total | 3,008,154,000 | 2,838,115,000 | 2,622,622,000 | 2,873,673,000 | 3,212,689,000 |

a No returns.

*Barley crop of the countries named, 1895-1899.*

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| United States | 87,073,000 | 69,695,000 | 66,685,000 | 55,792,000 | 73,382,000 |
| Ontario | 12,471,000 | 13,069,000 | 12,401,000 | 13,063,000 | 15,298,000 |
| Manitoba | 5,823,000 | 3,272,000 | 3,284,000 | 4,413,000 | 5,549,000 |
| Rest of Canada | 2,400,000 | 2,500,000 | 2,400,000 | 2,900,000 | 2,950,000 |
| Total Canada | 20,694,000 | 18,841,000 | 18,085,000 | 20,376,000 | 23,797,000 |
| Total North America | 107,767,000 | 88,536,000 | 84,770,000 | 76,168,000 | 97,179,000 |
| Great Britain | 70,814,000 | 73,005,000 | 68,920,000 | 70,197,000 | 69,850,000 |
| Ireland | 6,579,000 | 7,272,000 | 5,982,000 | 6,889,000 | 7,061,000 |
| Total United Kingdom | 77,393,000 | 80,277,000 | 74,902,000 | 77,086,000 | 76,911,000 |
| Sweden | 14,618,000 | 14,390,000 | 14,303,000 | 14,805,000 | 11,691,000 |
| Denmark | 21,794,000 | 21,249,000 | 19,172,000 | 21,868,000 | 21,000,000 |
| Netherlands | 4,291,000 | 4,561,000 | 3,736,000 | 5,000,000 | 4,000,000 |
| Belgium | 3,900,000 | 3,987,000 | 3,457,000 | 4,000,000 | 3,700,000 |
| France | 48,283,000 | 46,088,000 | 41,157,000 | 46,878,000 | 47,782,000 |
| Italy | 7,435,000 | 10,057,000 | 7,700,000 | 8,900,000 | 8,000,000 |
| Germany | 130,549,000 | 127,117,000 | 119,580,000 | 132,019,000 | 139,241,000 |
| Austria | 59,092,000 | 54,818,000 | 49,756,000 | 60,044,000 | 58,740,000 |
| Hungary | 52,456,000 | 57,842,000 | 41,290,000 | 54,774,000 | 54,731,000 |
| Croatia-Slavonia | 2,413,000 | 3,021,000 | 2,143,000 | 3,373,000 | 3,201,000 |
| Total Austria-Hungary | 113,961,000 | 115,681,000 | 93,189,000 | 118,191,000 | 116,672,000 |
| Roumania | 22,388,000 | 31,787,000 | 21,225,000 | 29,656,000 | 4,543,000 |
| Bulgaria | 16,000,000 | 20,000,000 | 11,000,000 | 13,000,000 | 10,000,000 |
| Russia proper | 210,222,000 | 208,449,000 | 203,363,000 | 254,702,000 | 179,850,000 |
| Poland | 15,912,000 | 16,744,000 | 15,967,000 | 19,480,000 | 20,090,000 |
| North Caucasus | 20,397,000 | 19,286,000 | 11,120,000 | 25,107,000 | 18,144,000 |
| Total Russia in Europe | 246,531,000 | 244,479,000 | 230,450,000 | 299,289,000 | 218,084,000 |
| Total Europe | 707,143,000 | 719,673,000 | 639,871,000 | 770,692,000 | 661,624,000 |
| Siberia | 4,833,000 | 6,001,000 | 6,119,000 | 4,904,000 | 5,955,000 |
| Central Asia | 1,490,000 | 3,149,000 | 2,081,000 | 2,728,000 | 2,870,000 |
| Total Russia in Asia | 6,323,000 | 9,150,000 | 8,200,000 | 7,632,000 | 8,825,000 |
| Japan | 43,700,000 | 40,180,000 | 41,099,000 | 44,059,000 | 44,000,000 |
| Total Asia | 50,023,000 | 49,330,000 | 49,299,000 | 51,691,000 | 52,825,000 |

*Barley crop of the countries named, 1895–1999*—Continued.

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| Algeria | 38,637,000 | 31,094,000 | 20,000,000 | 37,000,000 | 20,000,000 |
| Tunis | 8,000,000 | 4,000,000 | 5,000,000 | 11,000,000 | 6,000,000 |
| Cape Colony | 686,000 | 690,000 | 793,000 | 937,000 | 900,000 |
| Total Africa | 47,323,000 | 35,784,000 | 25,793,000 | 48,937,000 | 26,900,000 |
| West Australia | 15,000 | 19,000 | 13,000 | 24,000 | 30,000 |
| South Australia | 121,000 | 92,000 | 111,000 | 167,000 | 241,000 |
| Queensland | 39,000 | 8,000 | 20,000 | 52,000 | 36,000 |
| New South Wales | 185,000 | 99,000 | 114,000 | 103,000 | 66,000 |
| Victoria | 1,647,000 | 738,000 | 841,000 | 782,000 | 1,148,000 |
| Tasmania | 209,000 | 143,000 | 77,000 | 72,000 | 190,000 |
| New Zealand | 1,032,000 | 1,069,000 | 848,000 | 732,000 | 1,731,000 |
| Total Australasia | 3,248,000 | 2,168,000 | 2,024,000 | 1,932,000, | 3,442,000 |
| Total | 915,504,000 | 895,491,000 | 801,757,000 | 949,420,000 | 841,970,000 |

*Rye crop of the countries named, 1895–1899.*

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* | *Bushels.* |
| United States | 27,210,000 | 24,369,000 | 27,363,000 | 25,658,000 | 23,962,000 |
| Ontario | 1,960,000 | 2,301,000 | 3,489,000 | 2,757,000 | 2,357,000 |
| Manitoba | 84,000 | 54,000 | 50,000 | 66,000 | 66,000 |
| Rest of Canada | 260,000 | 400,000 | 470,000 | 420,000 | 400,000 |
| Total Canada | 2,304,000 | 2,755,000 | 4,009,000 | 3,243,000 | 2,823,000 |
| Total North America | 29,514,000 | 27,124,000 | 31,372,000 | 28,901,000 | 26,785,000 |
| Great Britain | 1,619,000 | 2,065,000 | 1,709,000 | 1,782,000 | ---------- |
| Ireland | 308,000 | 349,000 | 283,000 | 316,000 | ---------- |
| Total United Kingdom | 1,927,000 | 2,414,000 | 1,992,000 | 2,098,000 | 2,009,000 |
| Sweden | 20,200,000 | 24,026,000 | 23,599,000 | 21,469,000 | 21,436,000 |
| Denmark | 18,399,000 | 20,081,000 | 18,116,000 | 16,132,000 | 18,000,000 |
| Netherlands | 12,796,000 | 13,571,000 | 11,930,000 | 11,000,000 | 11,500,000 |
| Belgium | 21,213,000 | 22,218,000 | 20,401,000 | 18,000,000 | 22,000,000 |
| France | 71,418,000 | 69,424,000 | 48,139,000 | 66,755,000 | 68,255,000 |
| Spain | 17,340,000 | 15,381,000 | 18,000,000 | 21,000,000 | 15,000,000 |
| Italy | 4,010,000 | 4,000,000 | 4,000,000 | 4,000,000 | 2,700,000 |
| Germany | 304,116,000 | 335,970,000 | 321,659,000 | 355,581,000 | 341,551,000 |
| Austria | 66,629,000 | 76,696,000 | 65,828,000 | 81,620,000 | 75,199,000 |
| Hungary | 45,066,000 | 48,426,000 | 35,309,000 | 43,179,000 | 47,268,000 |
| Croatia-Slavonia | 1,939,000 | 3,021,000 | 2,369,000 | 3,551,000 | 2,848,000 |
| Total Austria-Hungary | 113,634,000 | 128,143,000 | 103,506,000 | 128,350,000 | 125,315,000 |
| Roumania | 9,254,000 | 12,217,000 | 6,794,000 | 7,629,000 | 1,988,000 |
| Bulgaria | 7,200,000 | 4,800,000 | 10,000,000 | 14,400,000 | 10,000,000 |
| Russia proper | 717,964,000 | 700,983,000 | 567,466,000 | 636,467,000 | 805,230,000 |
| Poland | 54,746,000 | 61,845,000 | 54,228,000 | 72,029,000 | 67,580,000 |
| North Caucasus | 10,952,000 | 4,584,000 | 3,758,000 | 5,572,000 | 7,638,000 |
| Total Russia in Europe | 783,662,000 | 767,412,000 | 625,452,000 | 714,068,000 | 880,448,000 |
| Total Europe | 1,385,169,000 | 1,419,657,000 | 1,213,588,000 | 1,380,482,000 | 1,520,193,000 |
| Siberia | 17,003,000 | 21,154,000 | 27,994,000 | 22,627,000 | 30,523,000 |
| Central Asia | 613,000 | 994,000 | 833,000 | 804,000 | 660,000 |
| Total Russia in Asia | 17,616,000 | 22,148,000 | 28,827,000 | 23,431,000 | 31,183,000 |
| Japan | 35,913,000 | 30,321,000 | 31,563,000 | 33,700,000 | 34,000,000 |
| Total | 1,468,212,000 | 1,499,250,000 | 1,305,350,000 | 1,466,514,000 | 1,612,161,000 |

*Hop crop of the countries named, 1895–1899.*

[In bales of 180 pounds.]

| Countries. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| California | 52,000 | 35,000 | 45,000 | 44,500 | 64,000 |
| Oregon | 99,500 | 56,000 | 75,000 | 71,250 | 85,000 |
| Washington | 28,800 | 12,000 | 32,000 | 36,200 | 33,000 |
| New York | 110,000 | 75,000 | 75,000 | 65,000 | 58,000 |
| Total United States | 290,300 | 178,000 | 227,000 | 216,950 | 240,000 |
| Australia | | | 18,383 | 18,383 | *a* 7,218 |
| Austria-Hungary | 95,000 | 136,000 | 100,000 | 95,000 | 190,633 |
| Belgium | | | 85,734 | 30,630 | *b* 70,311 |
| England | 343,000 | 281,000 | 255,784 | 218,000 | 411,554 |
| France | 42,000 | 43,000 | 88,184 | 42,867 | 25,545 |
| Germany | 368,000 | 353,000 | 584,498 | 440,920 | 407,199 |
| Russia | | | 64,000 | 61,240 | 41,057 |
| Total | 1,138,300 | 991,000 | 1,423,583 | 1,123,990 | 1,393,517 |

*a* New Zealand only. *b* Belgium and the Netherlands

*Flax crop of the countries named, 1895–1899.*

| Countries. | Seed. | | | Fiber. | | |
|---|---|---|---|---|---|---|
| | 1896. | 1897. | 1898. | 1896. | 1897. | 1898. |
| | *Bushels.* | *Bushels.* | *Bushels.* | *Pounds.* | *Pounds.* | *Pounds.* |
| United States *a* | 17,402,000 | 11,000,000 | 17,217,000 | | | |
| Manitoba | 267,500 | 255,500 | 305,500 | | | |
| Mexico | 108,000 | 222,500 | 311,000 | | | |
| Argentina *a* | 7,500,000 | 7,000,000 | 9,000,000 | | | |
| Total America | 25,277,500 | 18,478,000 | 26,833,500 | | | |
| Sweden | 70,000 | 73,500 | *d* 75,000 | 4,138,000 | 3,917,000 | *d* 4,223,000 |
| Netherlands | 312,000 | 275,000 | *d* 308,000 | 11,795,000 | 11,503,000 | *d* 12,934,000 |
| Belgium | 394,000 | 350,000 | *d* 400,000 | 31,417,000 | 30,123,000 | *d* 32,246,000 |
| France | 523,000 | 524,000 | 357,000 | 41,549,000 | 41,224,000 | 25,126,000 |
| Italy *b* | | | | 41,917,000 | 41,917,000 | 41,917,000 |
| Austria | 743,000 | 724,000 | 802,000 | 86,800,000 | 88,195,000 | 88,833,000 |
| Hungary | 245,000 | 220,000 | 250,000 | 11,972,000 | 10,629,000 | 14,939,000 |
| Croatia-Slavonia | 26,000 | 58,000 | 51,000 | 8,688,000 | 9,816,000 | 10,325,000 |
| Total Austria-Hungary | 1,014,000 | 1,002,000 | 1,103,000 | 107,460,000 | 108,640,000 | 114,097,000 |
| Roumania | 674,000 | 676,000 | 461,000 | | | |
| Servia *c* | | | | 1,237,000 | 1,237,000 | 1,237,000 |
| Russia | 39,625,000 | 27,296,500 | 28,537,500 | 1,474,692,000 | 1,240,284,000 | 1,530,776,000 |
| Total Europe | 42,612,000 | 30,197,000 | 31,241,500 | 1,714,205,000 | 1,478,845,000 | 1,762,556,000 |
| British India | 14,795,000 | 8,839,500 | 17,839,000 | | | |

RECAPITULATION.

| | | | | | | |
|---|---|---|---|---|---|---|
| America | 25,277,500 | 18,478,000 | 26,833,500 | | | |
| Europe | 42,612,000 | 30,197,000 | 31,241,500 | 1,714,205,000 | 1,478,845,000 | 1,762,556,000 |
| British India | 14,795,000 | 8,839,500 | 17,839,000 | | | |
| Total | 82,684,500 | 57,514,500 | 75,914,000 | 1,714,205,000 | 1,478,845,000 | 1,762,556,000 |

*a* Commercial estimate.
*b* Average, 1892 to 1895.
*c* Census 1893.
*d* Average for 3 preceding years.

*Sugar crop of the countries named, 1895–1896 to 1899–1900.*

[Tons of 2,240 pounds.]

| Countries. | 1895-1896. | 1896-1897. | 1897-1898. | 1898-1899. | 1899-1900. |
|---|---|---|---|---|---|
| CANE SUGAR. | | | | | |
| United States: | | | | | |
| Louisiana | 237,720 | 282,009 | 310,447 | 245,511 | 132,000 |
| Puerto Rico | 50,000 | 58,000 | 54,000 | 53,825 | 50,000 |
| Cuba, crop | 240,000 | 219,500 | 314,009 | 345,261 | 395,000 |
| British West Indies: | | | | | |
| Trinidad, exports | 58,000 | 53,000 | 53,000 | 53,436 | 45,000 |
| Barbadoes, exports | 47,800 | 52,178 | 47,835 | 40,876 | 44,000 |
| Jamaica | 30,000 | 30,000 | 30,000 | 27,000 | 27,000 |
| Antigua and St. Kitts | 24,000 | 29,000 | 25,000 | 22,000 | 18,000 |
| French West Indies: | | | | | |
| Martinique, exports | 35,000 | 35,000 | 35,000 | 34,000 | 35,000 |
| Guadeloupe | 45,000 | 45,000 | 45,000 | 40,000 | 30,000 |
| Danish West Indies: | | | | | |
| St. Croix | 8,000 | 13,058 | 13,000 | 12,000 | 12,000 |
| Haiti and San Domingo | 50,000 | 48,800 | 48,000 | 50,000 | 55,000 |
| Lesser Antilles (not named above) | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Mexico, exports | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Central America: | | | | | |
| Guatemala, crop | 7,000 | 8,000 | 9,000 | 11,000 | 12,000 |
| San Salvador, crop | 2,000 | 3,000 | 4,000 | 4,500 | 5,000 |
| Nicaragua, crop | 500 | 500 | 1,500 | 3,750 | 4,000 |
| Costa Rica, crop | 200 | 200 | 500 | 750 | 1,000 |
| South America: | | | | | |
| British Guiana (Demerara), exports | 105,000 | 99,789 | 106,760 | 81,535 | 80,000 |
| Dutch Guiana (Surinam), crop | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Peru, exports | 68,000 | 71,735 | 105,463 | 110,000 | 100,000 |
| Argentine Republic, crop | 130,000 | 165,000 | 110,000 | 72,000 | 90,000 |
| Brazil, crop | 225,000 | 175,903 | 200,478 | 151,495 | 175,000 |
| Total in America | 1,379,220 | 1,405,672 | 1,528,992 | 1,374,939 | 1,326,000 |
| Asia: *a* | | | | | |
| British India, exports | 80,000 | 28,000 | 20,000 | 10,000 | 10,000 |
| Siam, crop | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 |
| Java, exports | 695,025 | 498,434 | 531,201 | 689,281 | 722,000 |
| Philippine Islands, exports | 230,000 | 202,000 | 178,000 | 76,000 | 40,000 |
| Total in Asia | 922,025 | 735,434 | 736,201 | 782,281 | 779,000 |
| Australia and Polynesia: | | | | | |
| Queensland | 60,000 | 100,774 | 97,916 | 163,734 | 122,500 |
| New South Wales | 32,000 | 31,000 | 26,000 | 28,000 | 15,000 |
| Hawaiian Islands | 201,632 | 224,218 | 204,833 | 252,506 | 275,000 |
| Fiji Islands, exports | 30,000 | 30,000 | 30,000 | 34,000 | 30,000 |
| Total Australia and Polynesia | 323,632 | 385,992 | 358,749 | 478,240 | 442,500 |
| Africa: | | | | | |
| Egypt, crop | 92,000 | 100,000 | 80,178 | 90,822 | 94,000 |
| Mauritius | 140,000 | 152,677 | 121,693 | 186,487 | 155,000 |
| Reunion | 44,700 | 45,082 | 31,483 | 37,781 | 35,000 |
| Total in Africa | 276,700 | 297,759 | 233,354 | 315,090 | 284,000 |
| Europe: | | | | | |
| Spain | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Total cane-sugar production, (Willett & Gray) | 2,909,577 | 2,832,857 | 2,865,296 | 2,958,550 | 2,839,500 |
| BEET SUGAR. | | | | | |
| Europe beet-sugar production (Licht): | | | | | |
| Germany | 1,615,111 | 1,836,536 | 1,852,857 | 1,721,718 | 1,790,000 |
| Austria | 791,405 | 934,007 | 831,667 | 1,051,290 | 1,120,000 |
| France | 667,853 | 752,081 | 821,235 | 830,132 | 970,000 |
| Russia | 712,096 | 728,667 | 738,715 | 776,068 | 900,000 |
| Belgium | 235,795 | 288,009 | 265,397 | 244,017 | 300,000 |
| Holland | 106,829 | 174,206 | 125,658 | 149,763 | 180,000 |
| Other countries | 156,340 | 202,990 | 196,245 | 209,115 | 275,000 |
| Total in Europe | 4,285,429 | 4,916,496 | 4,831,774 | 4,982,101 | 5,535,000 |

*a* Japan, consumption 250,000 tons, mostly imported. China, consumption large, mostly imported.

*Sugar crop of the countries named, 1895-1896 to 1899-1900*—Continued.

| Countries. | 1895-1896. | 1896-1897. | 1897-1898. | 1898-1899. | 1899-1900. |
|---|---|---|---|---|---|
| BEET SUGAR—continued. | | | | | |
| United States beet-sugar production (Willett & Gray): | | | | | |
| California | 21,877 | 28,200 | 31,381 | 16,436 | 37,938 |
| Nebraska | 3,743 | 5,246 | 6,579 | 4,721 | 4,591 |
| Utah | 3,600 | 3,640 | 1,641 | 5,764 | 8,574 |
| New Mexico | | 450 | 455 | 550 | 446 |
| New York | | | 342 | 1,030 | 1,607 |
| Michigan | | | | 2,253 | 14,699 |
| Minnesota | | | | 891 | 2,053 |
| Oregon | | | | 826 | 982 |
| Illinois | | | | | 804 |
| Colorado | | | | | 804 |
| Washington | | | | | 446 |
| Total United States | 29,220 | 37,536 | 40,398 | 32,471 | 72,944 |
| Total cane and beet sugar | 7,224,226 | 7,786,889 | 7,737,468 | 7,973,122 | 8,447,444 |

*Rice crop of the countries named, 1895-1899.*

| Countries. | 1894-95. | 1895-96. | 1896-97. | 1897-98. | 1898-99. |
|---|---|---|---|---|---|
| | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* |
| North Carolina | 4,000,000 | 2,720,000 | 2,720,000 | 2,080,000 | 2,560,000 |
| South Carolina | 22,364,800 | 27,901,440 | 29,532,160 | 28,395,200 | 23,054,720 |
| Georgia | 6,656,000 | 10,464,000 | 8,727,040 | 10,181,760 | 3,584,000 |
| Louisiana | 76,800,000 | 127,600,000 | 55,907,200 | 75,664,800 | 107,792,000 |
| United States *a* | 109,820,800 | 168,685,440 | 96,886,400 | 116,321,760 | 136,990,720 |
| Mexico | 27,173,862 | 87,614,694 | 46,755,161 | *b* 43,261,948 | *b* 43,261,948 |
| North America | 136,994,662 | 256,300,134 | 143,641,561 | 159,583,708 | 180,252,668 |
| Spain | 387,450,000 | 383,293,440 | 385,000,000 | 385,000,000 | 385,000,000 |
| Italy | 1,042,112,000 | 1,088,576,000 | 683,072,000 | 1,167,744,000 | 1,122,368,000 |
| Europe | 1,429,562,000 | 1,471,869,440 | 1,068,072,000 | 1,552,744,000 | 1,507,368,000 |
| Bengal | 46,688,006,400 | 35,516,635,200 | 20,119,388,800 | 44,591,904,000 | 47,863,849,600 |
| Madras | 3,994,211,200 | 6,312,264,000 | 5,416,286,400 | 5,375,070,400 | 6,182,803,200 |
| Burma | 5,082,781,760 | 4,645,872,000 | 5,340,048,000 | 5,848,304,000 | 4,858,448,000 |
| India | 55,764,999,360 | 46,474,771,200 | 30,875,723,200 | 55,815,278,400 | 58,905,100,800 |
| Japan | 12,974,286,650 | 11,764,925,575 | 10,737,770,225 | 15,300,991,450 | 13,481,647,725 |
| Asia | 68,739,286,010 | 58,239,696,775 | 41,613,493,425 | 71,116,269,850 | 72,386,748,525 |

RECAPITULATION.

| | | | | | |
|---|---|---|---|---|---|
| North America | 136,994,662 | 256,300,134 | 143,641,561 | 159,583,708 | 180,252,668 |
| Europe | 1,429,562,000 | 1,471,869,440 | 1,068,072,000 | 1,552,744,000 | 1,507,368,000 |
| Asia | 68,739,286,010 | 58,239,696,775 | 41,613,493,425 | 71,116,269,850 | 72,386,748,525 |
| Total | 70,305,842,672 | 59,967,866,349 | 42,825,206,986 | 72,828,597,558 | 74,074,369,193 |

*a* Figures from Dan Talmage's Sons.

*b* Average 1893-1897.

*Average yield per acre of the principal farm crops, 1890–1899.*

[From Division of Statistics.]

CORN.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Maine | 36.2 | 37.5 | 35.5 | 30.3 | 39.9 | 42.0 | 37.0 | 37.0 | 40.0 | 36.0 |
| New Hampshire | 36.5 | 35.8 | 37.8 | 31.7 | 34.3 | 40.2 | 42.0 | 34.0 | 41.0 | 39.0 |
| Vermont | 33.5 | 37.2 | 38.0 | 32.4 | 40.8 | 45.6 | 41.0 | 35.0 | 43.0 | 36.0 |
| Massachusetts | 34.5 | 39.5 | 38.7 | 33.5 | 34.5 | 43.9 | 43.0 | 32.5 | 40.0 | 36.0 |
| Rhode Island | 32.7 | 34.5 | 33.4 | 24.4 | 31.4 | 30.9 | 34.0 | 31.0 | 34.0 | 31.0 |
| Connecticut | 35.7 | 36.0 | 34.5 | 28.2 | 31.0 | 37.9 | 38.0 | 31.5 | 37.0 | 39.0 |
| New York | 26.6 | 31.8 | 33.0 | 29.5 | 28.2 | 35.6 | 34.0 | 31.0 | 33.0 | 31.0 |
| New Jersey | 31.3 | 34.2 | 31.6 | 25.9 | 33.1 | 33.0 | 33.0 | 31.5 | 37.0 | 39.0 |
| Pennsylvania | 27.5 | 33.3 | 30.5 | 24.5 | 32.0 | 33.5 | 40.0 | 36.0 | 37.0 | 32.0 |
| Delaware | 18.5 | 22.0 | 18.7 | 24.6 | 22.0 | 21.0 | 22.0 | 29.0 | 25.0 | 22.0 |
| Maryland | 22.5 | 25.5 | 20.6 | 24.2 | 22.9 | 26.8 | 32.0 | 33.0 | 31.0 | 32.0 |
| Virginia | 17.5 | 19.7 | 15.3 | 18.9 | 19.1 | 18.6 | 21.5 | 18.0 | 22.0 | 20.0 |
| North Carolina | 13.3 | 14.1 | 10.2 | 12.3 | 13.4 | 14.5 | 12.0 | 13.0 | 14.0 | 13.0 |
| South Carolina | 10.2 | 11.6 | 10.5 | 7.7 | 11.2 | 11.1 | 9.0 | 9.0 | 10.0 | 9.0 |
| Georgia | 10.5 | 12.2 | 11.2 | 11.1 | 11.7 | 13.0 | 11.0 | 11.0 | 9.0 | 10.0 |
| Florida | 9.3 | 11.0 | 9.0 | 9.7 | 10.1 | 11.2 | 10.0 | 8.0 | 9.0 | 10.0 |
| Alabama | 10.2 | 12.7 | 12.2 | 11.5 | 13.7 | 15.9 | 12.5 | 12.0 | 15.0 | 12.0 |
| Mississippi | 12.5 | 15.2 | 13.7 | 13.1 | 17.2 | 15.8 | 13.5 | 14.5 | 18.0 | 16.0 |
| Louisiana | 16.0 | 17.3 | 14.8 | 14.2 | 16.2 | 18.8 | 13.0 | 17.0 | 18.0 | 18.0 |
| Texas | 15.5 | 19.5 | 21.4 | 17.6 | 19.0 | 26.4 | 9.5 | 18.5 | 25.0 | 18.0 |
| Arkansas | 16.7 | 21.2 | 17.5 | 16.2 | 19.2 | 21.5 | 13.5 | 16.0 | 20.0 | 20.0 |
| Tennessee | 18.8 | 22.7 | 20.3 | 21.3 | 21.9 | 25.0 | 23.0 | 21.0 | 26.0 | 20.0 |
| West Virginia | 20.0 | 27.3 | 22.5 | 21.7 | 18.5 | 24.2 | 30.0 | 24.5 | 29.0 | 26.0 |
| Kentucky | 22.6 | 30.0 | 23.3 | 23.5 | 23.0 | 31.2 | 28.0 | 23.0 | 31.0 | 21.0 |
| Ohio | 23.3 | 32.0 | 29.4 | 23.8 | 26.3 | 32.6 | 41.0 | 32.5 | 37.0 | 36.0 |
| Michigan | 27.2 | 29.5 | 25.0 | 23.7 | 23.2 | 33.8 | 38.0 | 31.5 | 34.0 | 25.0 |
| Indiana | 24.7 | 33.3 | 29.3 | 24.7 | 28.9 | 32.8 | 35.0 | 30.0 | 36.0 | 38.0 |
| Illinois | 26.2 | 33.5 | 26.2 | 25.7 | 28.8 | 37.4 | 40.5 | 32.5 | 30.0 | 36.0 |
| Wisconsin | 30.0 | 26.7 | 27.3 | 29.8 | 20.7 | 31.8 | 37.0 | 33.0 | 35.0 | 35.0 |
| Minnesota | 27.7 | 26.5 | 27.0 | 28.3 | 18.4 | 31.2 | 30.5 | 26.0 | 32.0 | 33.0 |
| Iowa | 26.5 | 36.7 | 28.3 | 33.9 | 15.0 | 35.1 | 39.0 | 29.0 | 35.0 | 31.0 |
| Missouri | 25.8 | 29.9 | 27.7 | 27.9 | 22.0 | 36.0 | 27.0 | 26.0 | 26.0 | 26.0 |
| Kansas | 15.6 | 26.7 | 24.5 | 21.3 | 11.2 | 24.3 | 28.0 | 18.0 | 16.0 | 27.0 |
| Nebraska | 18.0 | 35.2 | 28.2 | 25.2 | 6.0 | 16.1 | 37.5 | 30.0 | 21.0 | 28.0 |
| South Dakota | 13.6 | 22.5 | 22.3 | 23.7 | 4.2 | 11.1 | 26.0 | 24.0 | 28.0 | 26.0 |
| North Dakota | | 18.0 | 21.4 | 20.7 | 19.2 | 21.3 | 35.0 | 17.0 | 19.0 | 23.0 |
| Montana | ------ | ------ | 19.4 | 27.5 | 32.7 | 25.0 | 26.0 | 18.0 | 28.0 | 23.0 |
| Wyoming | ------ | ------ | 18.5 | 18.5 | 30.0 | 27.5 | 25.0 | 12.0 | 16.0 | 22.0 |
| Colorado | 18.2 | 21.5 | 22.3 | 16.5 | 19.7 | 20.7 | 16.0 | 19.0 | 18.0 | 17.0 |
| New Mexico | 20.0 | 18.3 | 20.0 | 25.3 | 19.1 | 27.2 | 16.0 | 27.0 | 21.0 | 20.0 |
| Utah | 21.0 | 19.0 | 18.0 | 21.5 | 24.4 | 20.3 | 25.0 | 22.0 | 21.0 | 20.0 |
| Washington | ------ | ------ | 18.0 | 21.3 | 20.8 | 17.1 | 14.0 | 18.0 | 12.0 | 23.0 |
| Oregon | 21.6 | 27.0 | 21.5 | 24.7 | 25.4 | 26.4 | 22.0 | 25.0 | 24.0 | 22.0 |
| California | 27.5 | 34.5 | 30.3 | 31.7 | 19.3 | 34.5 | 37.0 | 31.5 | 26.0 | 27.0 |
| Oklahoma | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 19.0 |
| General average | 20.70 | 27.03 | 23.06 | 22.48 | 19.38 | 26.21 | 28.19 | 23.76 | 24.76 | 25.31 |

WHEAT.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Maine | 13.5 | 16.3 | 16.7 | 16.0 | 21.1 | 19.2 | 22.0 | 16.5 | 19.5 | 22.5 |
| New Hampshire | 15.3 | 16.5 | 16.2 | 15.0 | 20.0 | 19.3 | 21.0 | 16.0 | 19.0 | 17.2 |
| Vermont | 17.2 | 17.5 | 17.3 | 16.8 | 22.7 | 29.0 | 24.5 | 17.0 | 22.5 | 22.0 |
| Connecticut | 16.1 | 17.0 | 16.7 | 18.3 | ------ | ------ | ------ | 20.0 | 20.0 | 18.3 |
| New York | 14.5 | 16.6 | 16.2 | 14.5 | 14.8 | 18.1 | 16.0 | 21.4 | 21.2 | 18.5 |
| New Jersey | 12.1 | 15.3 | 14.3 | 14.5 | 15.3 | 12.4 | 15.3 | 18.5 | 17.4 | 14.5 |
| Pennsylvania | 12.0 | 15.6 | 14.6 | 14.0 | 15.0 | 16.6 | 14.0 | 19.7 | 17.5 | 13.6 |
| Delaware | 9.7 | 12.8 | 13.0 | 14.7 | 13.0 | 11.6 | 18.0 | 21.5 | 13.3 | 12.8 |
| Maryland | 11.6 | 15.0 | 13.2 | 13.5 | 15.3 | 17.0 | 17.0 | 19.2 | 15.3 | 14.1 |
| Virginia | 7.0 | 9.0 | 9.5 | 11.2 | 9.5 | 9.3 | 9.3 | 12.0 | 14.1 | 8.4 |
| North Carolina | 4.4 | 6.8 | 7.1 | 8.2 | 5.0 | 6.9 | 7.3 | 8.0 | 9.2 | 6.7 |
| South Carolina | 4.2 | 5.5 | 6.5 | 6.3 | 5.6 | 6.4 | 6.8 | 8.7 | 10.6 | 6.5 |
| Georgia | 4.1 | 7.5 | 6.8 | 7.2 | 6.9 | 6.2 | 8.0 | 9.4 | 10.0 | 6.8 |
| Alabama | 4.5 | 8.0 | 6.7 | 8.2 | 8.3 | 7.5 | 8.0 | 10.0 | 12.0 | 7.6 |
| Mississippi | 4.7 | 7.8 | 6.8 | 7.5 | 9.8 | 8.0 | 8.5 | 10.0 | 13.9 | 7.7 |
| Texas | 7.0 | 12.0 | 12.3 | 10.5 | 15.1 | 5.7 | 11.7 | 15.8 | 14.8 | 11.1 |
| Arkansas | 7.1 | 9.6 | 8.2 | 8.0 | 8.8 | 9.4 | 8.0 | 10.5 | 11.0 | 8.6 |
| Tennessee | 6.7 | 9.7 | 9.5 | 9.2 | 8.1 | 8.8 | 8.5 | 11.2 | 13.2 | 8.7 |
| West Virginia | 7.7 | 10.3 | 10.7 | 11.5 | 12.1 | 10.6 | 10.3 | 13.4 | 13.8 | 9.3 |
| Kentucky | 9.7 | 12.7 | 11.8 | 11.3 | 12.5 | 10.9 | 8.7 | 13.6 | 15.4 | 9.1 |
| Ohio | 12.5 | 17.1 | 13.6 | 14.5 | 19.0 | 13.3 | 9.0 | 16.9 | 16.9 | 14.2 |
| Michigan | 13.5 | 18.8 | 14.7 | 13.2 | 15.8 | 13.2 | 12.8 | 15.6 | 20.8 | 8.4 |
| Indiana | 11.2 | 18.1 | 14.7 | 14.1 | 18.4 | 9.2 | 9.0 | 13.0 | 15.6 | 9.8 |
| Illinois | 9.8 | 18.0 | 16.2 | 11.5 | 18.2 | 11.0 | 14.7 | 7.9 | 11.0 | 10.0 |
| Wisconsin | 12.2 | 13.5 | 11.5 | 13.3 | 16.5 | 15.5 | 13.3 | 12.5 | 18.0 | 15.5 |

*Average yield per acre of the principal farm crops, 1890-1899*—Continued.

WHEAT—Continued.

| States and Territories. | 1890. | 1831. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1899. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Minnesota | 12.2 | 17.6 | 11.6 | 9.6 | 13.5 | 23.0 | 14.2 | 13.0 | 15.8 | 13.4 |
| Iowa | 11.3 | 15.3 | 11.5 | 11.5 | 14.8 | 19.5 | 16.0 | 13.0 | 16.7 | 13.0 |
| Missouri | 11.0 | 13.6 | 12.5 | 9.5 | 15.3 | 12.0 | 11.7 | 9.0 | 9.8 | 9.9 |
| Kansas | 13.7 | 15.5 | 17.4 | 8.4 | 10.4 | 7.7 | 10.6 | 15.5 | 14.2 | 9.8 |
| Nebraska | 10.8 | 15.0 | 12.5 | 8.7 | 7.0 | 12.0 | 14.0 | 14.5 | 16.4 | 10.3 |
| South Dakota | 9.6 | 15.2 | 12.5 | 8.5 | 6.6 | 12.0 | 11.2 | 8.0 | 12.4 | 10.7 |
| North Dakota | | 17.8 | 12.2 | 9.6 | 11.8 | 21.0 | 11.8 | 10.3 | 14.4 | 12.8 |
| Montana | 17.0 | 20.0 | 21.5 | 21.5 | 24.8 | 23.9 | 26.5 | 32.5 | 29.5 | 25.7 |
| Wyoming | ------ | 20.0 | 17.5 | 18.7 | 19.6 | 26.0 | 24.5 | 25.0 | 23.7 | 18.8 |
| Colorado | 18.5 | 20.2 | 19.1 | 13.2 | 17.9 | 23.5 | 17.5 | 24.0 | 26.3 | 23.7 |
| New Mexico | 12.2 | 11.5 | 13.8 | 16.8 | 18.0 | 20.4 | 21.0 | 24.0 | 23.8 | 13.8 |
| Arizona | 12.0 | 14.5 | 15.6 | 17.5 | 17.0 | 20.5 | 23.0 | 18.0 | 31.7 | 15.3 |
| Utah | 17.5 | 17.5 | 17.3 | 13.8 | 22.0 | 22.4 | 26.5 | 21.0 | 28.0 | 20.7 |
| Nevada | 13.5 | 18.3 | 19.2 | 14.7 | 20.0 | 21.7 | 30.0 | 24.3 | 29.0 | 18.0 |
| Idaho | 16.5 | 20.0 | 22.0 | 19.3 | 20.6 | 17.8 | 24.5 | 22.0 | 31.0 | 24.2 |
| Washington | 18.5 | 17.5 | 17.2 | 20.3 | 16.6 | 15.5 | 18.0 | 23.5 | 24.2 | 22.7 |
| Oregon | 14.5 | 19.0 | 15.7 | 17.5 | 17.7 | 20.0 | 17.0 | 17.0 | 20.5 | 19.2 |
| California | 12.0 | 13.0 | 13.0 | 13.3 | 11.3 | 13.0 | 14.6 | 10.0 | 9.1 | 14.1 |
| Oklahoma | ------ | ------ | ------ | ------ | 11.3 | 11.4 | 13.0 | 19.0 | 14.9 | 13.3 |
| General average | 11.06 | 15.33 | 13.38 | 11.44 | 13.19 | 13.72 | 12.35 | 13.43 | 15.33 | 12.27 |

OATS.

| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | 28.3 | 34.6 | 32.2 | 36.3 | 33.5 | 40.1 | 40.0 | 31.0 | 36.0 | 35.0 |
| New Hampshire | 27.5 | 35.0 | 34.0 | 34.2 | 31.1 | 36.9 | 38.0 | 35.0 | 33.0 | 35.0 |
| Vermont | 26.2 | 37.5 | 35.5 | 36.4 | 32.9 | 43.8 | 40.5 | 33.0 | 38.0 | 37.0 |
| Massachusetts | 25.7 | 33.0 | 30.4 | 34.3 | 31.9 | 36.0 | 36.0 | 32.0 | 32.0 | 33.0 |
| Rhode Island | 23.4 | 33.5 | 29.4 | 28.2 | 30.0 | 32.4 | 30.0 | 32.0 | 27.0 | 26.0 |
| Connecticut | 20.0 | 30.0 | 25.3 | 25.0 | 25.8 | 31.9 | 29.0 | 29.0 | 28.2 | 28.0 |
| New York | 17.8 | 31.5 | 28.0 | 24.0 | 22.1 | 31.7 | 33.0 | 31.0 | 27.5 | 31.0 |
| New Jersey | 17.3 | 28.0 | 25.7 | 23.9 | 28.4 | 35.5 | 34.0 | 25.0 | 19.6 | 24.0 |
| Pennsylvania | 17.2 | 27.2 | 25.2 | 26.8 | 22.3 | 31.7 | 31.0 | 28.2 | 23.3 | 33.0 |
| Delaware | 13.0 | 20.3 | 19.3 | 25.4 | 19.0 | 19.1 | 29.0 | 22.0 | 22.0 | 20.0 |
| Maryland | 12.0 | 19.0 | 19.0 | 21.2 | 21.4 | 26.2 | 24.0 | 24.0 | 19.5 | 23.0 |
| Virginia | 9.8 | 10.7 | 11.2 | 17.5 | 12.0 | 17.7 | 18.5 | 12.0 | 16.1 | 14.0 |
| North Carolina | 9.2 | 9.5 | 9.7 | 14.1 | 10.9 | 15.1 | 12.0 | 13.0 | 14.3 | 12.0 |
| South Carolina | 10.6 | 10.6 | 10.5 | 11.8 | 12.0 | 15.2 | 11.0 | 15.5 | 17.2 | 12.0 |
| Georgia | 9.7 | 11.7 | 10.7 | 13.3 | 13.4 | 14.5 | 12.0 | 14.0 | 16.6 | 9.0 |
| Florida | 10.7 | 11.4 | 9.8 | 11.8 | 11.8 | 10.2 | 12.0 | 9.0 | 15.4 | 9.0 |
| Alabama | 12.0 | 12.8 | 10.2 | 14.2 | 13.2 | 14.9 | 14.0 | 13.0 | 16.8 | 10.0 |
| Mississippi | 13.2 | 11.5 | 10.6 | 15.5 | 13.0 | 15.7 | 13.0 | 14.0 | 18.5 | 10.0 |
| Louisiana | 13.2 | 12.3 | 12.2 | 16.0 | 22.3 | 15.0 | 10.0 | 18.0 | 18.1 | 18.0 |
| Texas | 17.3 | 24.5 | 24.5 | 25.1 | 32.7 | 20.7 | 20.0 | 25.0 | 29.7 | 25.0 |
| Arkansas | 13.5 | 16.5 | 15.7 | 19.3 | 18.5 | 25.4 | 16.0 | 17.0 | 22.8 | 19.0 |
| Tennessee | 9.5 | 9.7 | 13.5 | 18.4 | 14.6 | 22.5 | 16.5 | 10.0 | 18.7 | 14.0 |
| West Virginia | 10.6 | 17.3 | 17.5 | 23.5 | 18.5 | 23.4 | 24.0 | 20.0 | 19.5 | 23.0 |
| Kentucky | 8.5 | 18.5 | 18.3 | 22.2 | 21.0 | 26.2 | 21.0 | 18.0 | 22.4 | 18.0 |
| Ohio | 18.0 | 31.3 | 26.3 | 28.6 | 30.3 | 31.7 | 31.0 | 32.0 | 30.9 | 36.0 |
| Michigan | 26.6 | 32.5 | 28.7 | 26.0 | 26.1 | 23.9 | 30.0 | 26.0 | 32.8 | 34.0 |
| Indiana | 17.5 | 23.5 | 26.5 | 27.5 | 32.3 | 22.9 | 29.0 | 30.2 | 29.2 | 32.0 |
| Illinois | 21.0 | 36.2 | 26.3 | 27.2 | 36.1 | 24.4 | 28.0 | 32.0 | 29.0 | 38.0 |
| Wisconsin | 26.0 | 33.3 | 30.2 | 27.6 | 32.9 | 33.8 | 33.4 | 34.0 | 36.1 | 36.0 |
| Minnesota | 25.6 | 36.5 | 27.3 | 24.8 | 28.1 | 39.9 | 33.0 | 26.0 | 36.3 | 32.0 |
| Iowa | 25.8 | 36.7 | 25.4 | 24.8 | 25.6 | 46.2 | 27.5 | 30.0 | 34.0 | 33.0 |
| Missouri | 17.4 | 23.8 | 20.0 | 23.4 | 23.3 | 27.7 | 18.0 | 22.0 | 17.0 | 25.0 |
| Kansas | 24.0 | 30.0 | 28.5 | 18.5 | 17.9 | 17.9 | 13.0 | 24.0 | 18.0 | 29.0 |
| Nebraska | 21.3 | 35.5 | 26.7 | 15.0 | 12.6 | 23.8 | 19.0 | 31.0 | 32.1 | 30.0 |
| South Dakota | 21.0 | 32.3 | 26.3 | 21.5 | 7.6 | 25.3 | 27.5 | 22.0 | 26.8 | 26.0 |
| North Dakota | | 33.5 | 26.5 | 21.9 | 25.9 | 32.1 | 22.0 | 23.0 | 30.7 | 30.0 |
| Montana | 31.0 | 38.5 | 28.8 | 34.0 | 40.1 | 35.8 | 47.0 | 42.0 | 40.6 | 38.0 |
| Wyoming | ------ | ------ | 28.6 | 24.0 | 30.4 | 41.0 | 32.0 | 35.0 | 31.2 | 30.0 |
| Colorado | 24.8 | 32.6 | 28.7 | 26.7 | 13.5 | 34.3 | 28.0 | 34.0 | 35.8 | 27.0 |
| New Mexico | 24.0 | 22.0 | 20.3 | 29.2 | 35.0 | 39.9 | 27.0 | 35.5 | 38.8 | 24.0 |
| Utah | 27.5 | 32.5 | 26.5 | 27.9 | 33.0 | 33.8 | 38.0 | 35.0 | 39.7 | 34.0 |
| Idaho | 30.0 | 35.0 | 29.0 | 33.1 | 38.5 | 35.2 | 42.0 | 36.3 | 43.6 | 34.0 |
| Washington | 33.5 | 38.0 | 34.5 | 39.7 | 36.5 | 40.3 | 36.0 | 48.0 | 41.9 | 37.0 |
| Oregon | 30.0 | 31.5 | 26.5 | 28.5 | 26.7 | 28.8 | 21.0 | 32.0 | 27.0 | 30.0 |
| California | 27.5 | 28.5 | 29.3 | 25.5 | 35.6 | 28.1 | 31.0 | 18.0 | 33.0 | 31.0 |
| General average | 19.81 | 28.86 | 24.43 | 23.42 | 24.50 | 29.57 | 25.66 | 27.16 | 28.35 | 30.23 |

*Average yield per acre of the principal farm crops, 1890–1899*—Continued.

BARLEY.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Maine | 20.0 | 26.5 | 22.3 | 26.1 | 26.1 | 32.4 | 30.6 | 25.0 | 27.0 | 29.0 |
| New Hampshire | 20.0 | 26.3 | 23.5 | 25.3 | 24.4 | 25.6 | 29.3 | 22.5 | 23.5 | 25.0 |
| Vermont | 22.5 | 27.3 | 26.0 | 27.5 | 27.9 | 33.2 | 33.0 | 28.5 | 30.0 | 31.0 |
| Massachusetts | 22.0 | 26.7 | 22.5 | 25.3 | 21.7 | 22.5 | 30.0 | 34.5 | 24.5 | 30.0 |
| Rhode Island | 21.7 | 28.0 | 21.5 | 25.2 | 30.0 | 23.5 | 29.0 | 28.0 | 28.0 | 29.0 |
| New York | 16.7 | 23.3 | 22.2 | 20.3 | 17.5 | 22.9 | 23.2 | 25.0 | 25.2 | 24.0 |
| Pennsylvania | ...... | 22.5 | 21.7 | 19.0 | 16.6 | 20.2 | 17.2 | 24.5 | 19.4 | 21.0 |
| Texas | 15.0 | 15.2 | 16.5 | 14.5 | 15.3 | 21.6 | 12.0 | 25.0 | 20.0 | 18.0 |
| Tennessee | ...... | 12.7 | 19.5 | 15.1 | 13.8 | 23.1 | 14.0 | 18.0 | 18.0 | 11.0 |
| Kentucky | 19.0 | 24.5 | 22.3 | 17.0 | 28.7 | 33.3 | 14.8 | 20.0 | 16.0 | 21.0 |
| Ohio | 19.5 | 25.7 | 23.5 | 22.7 | 28.5 | 28.2 | 20.2 | 28.5 | 28.7 | 28.0 |
| Michigan | 22.3 | 24.5 | 23.4 | 16.4 | 20.6 | 18.1 | 22.3 | 21.5 | 25.2 | 24.0 |
| Indiana | 16.5 | 23.5 | 28.0 | 19.9 | 20.7 | 15.0 | 20.3 | 19.0 | 23.4 | 25.0 |
| Illinois | 20.3 | 26.0 | 17.9 | 23.2 | 23.5 | 20.0 | 23.7 | 25.0 | 27.3 | 29.0 |
| Wisconsin | 22.7 | 26.5 | 25.5 | 24.0 | 28.6 | 29.3 | 27.4 | 28.0 | 29.1 | 30.0 |
| Minnesota | 22.5 | 27.3 | 24.9 | 22.1 | 28.5 | 36.0 | 27.2 | 25.5 | 28.4 | 25.0 |
| Iowa | 22.6 | 27.3 | 21.1 | 22.6 | 15.5 | 28.0 | 26.3 | 24.0 | 26.0 | 26.0 |
| Missouri | 20.0 | ...... | 29.1 | 20.0 | 14.0 | 15.3 | 17.5 | 19.0 | 20.0 | 18.0 |
| Kansas | 18.0 | 26.5 | 25.0 | 8.1 | 8.8 | 14.4 | 4.6 | 17.5 | 28.0 | 17.0 |
| Nebraska | 17.3 | 27.2 | 22.2 | 12.0 | 5.7 | 28.4 | 19.9 | 22.0 | 27.1 | 26.0 |
| South Dakota | 19.5 | 28.5 | 23.3 | 15.4 | 14.7 | 19.5 | 28.5 | 20.0 | 23.0 | 23.0 |
| North Dakota | | 30.0 | 24.3 | 15.2 | 20.1 | 30.4 | 16.1 | 22.5 | 26.4 | 24.0 |
| Montana | 24.0 | 30.0 | 32.5 | 30.1 | 22.5 | 25.0 | 25.0 | 38.0 | 36.0 | 35.0 |
| Colorado | 24.5 | 26.5 | 24.0 | 28.3 | 27.8 | 31.3 | 20.0 | 28.0 | 30.5 | 28.0 |
| New Mexico | 20.0 | 22.0 | 19.6 | 21.6 | 27.0 | 28.0 | 19.0 | 32.5 | 33.8 | 32.0 |
| Utah | 23.2 | 26.7 | 20.3 | 37.6 | 33.0 | 30.0 | 27.1 | 31.0 | 37.0 | 33.0 |
| Idaho | ...... | 29.0 | 26.0 | 30.0 | 32.6 | 24.5 | 15.3 | 35.0 | 35.0 | 35.0 |
| Washington | 25.0 | 31.5 | 25.3 | 40.1 | 33.7 | 37.3 | 26.0 | 45.0 | 39.8 | 35.0 |
| Oregon | 25.0 | 24.0 | 23.3 | 26.1 | 38.6 | 22.1 | 21.8 | 32.5 | 29.1 | 28.0 |
| California | 22.3 | 23.7 | 24.0 | 22.5 | 15.2 | 20.3 | 21.6 | 23.0 | 10.5 | 26.0 |
| General average | 21.00 | 25.80 | 23.70 | 21.70 | 19.37 | 26.39 | 23.62 | 24.52 | 21.60 | 25.50 |

RYE.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Maine | 11.8 | 16.0 | 13.5 | 12.0 | 16.5 | 19.2 | 18.0 | 13.5 | 18.0 | 15.0 |
| New Hampshire | 12.5 | 16.2 | 14.0 | 15.1 | 15.4 | 16.0 | 19.6 | 18.0 | 17.5 | 15.0 |
| Vermont | 12.9 | 16.1 | 14.3 | 14.0 | 13.1 | 16.0 | 18.6 | 16.0 | 19.1 | 17.0 |
| Massachusetts | 13.5 | 15.3 | 15.2 | 16.2 | 19.2 | 19.9 | 22.0 | 19.5 | 16.7 | 16.0 |
| Connecticut | 12.2 | 14.3 | 14.3 | 15.9 | 12.9 | 16.9 | 15.4 | 19.0 | 18.0 | 18.0 |
| New York | 12.3 | 15.0 | 12.7 | 14.9 | 15.4 | 18.1 | 14.3 | 18.5 | 17.5 | 16.0 |
| New Jersey | 11.3 | 14.3 | 13.5 | 13.4 | 14.8 | 13.6 | 13.8 | 17.0 | 15.5 | 15.0 |
| Pennsylvania | 12.2 | 14.8 | 12.6 | 14.7 | 13.9 | 15.1 | 16.0 | 19.0 | 16.1 | 15.0 |
| Maryland | 10.3 | 12.2 | 11.3 | 13.1 | 13.5 | 12.9 | 9.2 | 17.0 | 14.5 | 14.0 |
| Virginia | 6.6 | 8.2 | 8.8 | 9.3 | 8.8 | 11.0 | 10.0 | 11.0 | 11.2 | 9.0 |
| North Carolina | 5.7 | 7.0 | 6.5 | 7.7 | 9.0 | 7.7 | 7.5 | 8.8 | 9.1 | 7.0 |
| South Carolina | 5.4 | 6.0 | 6.0 | 5.4 | 4.7 | 9.3 | 4.8 | 6.6 | 8.5 | 5.0 |
| Georgia | 4.9 | 7.6 | 6.0 | 6.4 | 6.5 | 7.2 | 7.1 | 7.4 | 8.0 | 6.0 |
| Alabama | 7.2 | 7.5 | 6.5 | 9.8 | 13.3 | 10.2 | 8.0 | 9.6 | 11.1 | 8.0 |
| Texas | 5.5 | 11.2 | 11.2 | 9.3 | 11.3 | 5.5 | 7.0 | 12.0 | 12.0 | 10.0 |
| Arkansas | 6.5 | 9.3 | 8.2 | 7.5 | 9.0 | 10.0 | 10.0 | 11.0 | 11.4 | 11.0 |
| Tennessee | 6.3 | 8.7 | 8.7 | 9.5 | 7.6 | 7.2 | 9.0 | 10.0 | 10.5 | 9.0 |
| West Virginia | 9.5 | 10.5 | 9.5 | 8.2 | 8.0 | 16.1 | 10.6 | 11.5 | 11.2 | 10.0 |
| Kentucky | 9.5 | 10.3 | 11.3 | 13.2 | 12.2 | 13.2 | 11.0 | 13.0 | 13.0 | 10.0 |
| Ohio | 11.7 | 15.5 | 12.6 | 15.2 | 18.3 | 14.8 | 9.6 | 18.0 | 17.4 | 16.0 |
| Michigan | 13.4 | 15.0 | 13.7 | 12.8 | 13.2 | 13.6 | 9.2 | 15.0 | 15.3 | 14.0 |
| Indiana | 13.7 | 17.2 | 12.5 | 14.4 | 19.3 | 12.2 | 10.6 | 13.0 | 15.5 | 13.0 |
| Illinois | 12.7 | 17.5 | 12.3 | 13.9 | 18.6 | 15.2 | 15.3 | 15.5 | 14.8 | 15.0 |
| Wisconsin | 12.5 | 14.6 | 13.7 | 14.5 | 16.0 | 16.1 | 14.5 | 16.0 | 15.3 | 15.0 |
| Minnesota | 14.0 | 17.2 | 17.1 | 15.3 | 17.5 | 21.1 | 15.6 | 17.2 | 20.5 | 18.0 |
| Iowa | 13.7 | 17.0 | 13.2 | 14.6 | 16.9 | 20.6 | 17.5 | 16.0 | 19.0 | 18.0 |
| Missouri | 12.7 | 13.5 | 12.5 | 12.8 | 15.4 | 12.2 | 12.2 | 12.0 | 13.1 | 13.0 |
| Kansas | 13.0 | 14.3 | 15.0 | 7.0 | 5.8 | 5.9 | 7.0 | 14.0 | 15.6 | 11.0 |
| Nebraska | 13.2 | 15.7 | 14.5 | 10.1 | 6.1 | 9.3 | 16.9 | 17.0 | 18.8 | 16.0 |
| South Dakota | 11.7 | 15.3 | 12.5 | 10.6 | 4.5 | 8.4 | 11.6 | 16.5 | 16.6 | 15.0 |
| North Dakota | | 17.5 | 11.8 | 12.3 | 15.0 | 21.3 | 12.0 | 14.5 | 15.0 | 15.0 |
| Colorado | 14.5 | 20.6 | 14.6 | 21.0 | 15.6 | 14.5 | 23.5 | 15.0 | 18.0 | 14.0 |
| Utah | 13.5 | 16.8 | 13.2 | 11.9 | 19.0 | 19.8 | 20.0 | 12.0 | 19.5 | 17.0 |
| Washington | 14.2 | 14.3 | 17.0 | 15.1 | 14.4 | 26.7 | 15.0 | 19.5 | 18.0 | 16.0 |
| Oregon | 14.3 | 13.8 | 12.0 | 10.5 | 14.1 | 11.2 | 12.7 | 15.0 | 14.4 | 11.0 |
| California | 14.0 | 16.5 | 11.5 | 17.5 | 13.2 | 11.6 | 14.3 | 12.2 | 9.0 | 15.0 |
| General average | 11.80 | 14.40 | 12.70 | 13.03 | 13.74 | 14.40 | 13.31 | 16.06 | 15.61 | 14.44 |

*Average yield per acre of the principal farm crops, 1890-1899*—Continued.

BUCKWHEAT.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Maine | 20.0 | 22.0 | 19.0 | 29.0 | 37.8 | 38.6 | 42.3 | 35.0 | 26.5 | 22.0 |
| New Hampshire | 18.0 | 21.5 | 17.5 | 23.2 | 20.0 | 29.9 | 27.2 | 27.0 | 20.0 | 20.0 |
| Vermont | 20.0 | 22.5 | 20.0 | 29.2 | 22.4 | 34.5 | 31.4 | 24.0 | 21.4 | 23.0 |
| Massachusetts | 17.5 | 16.5 | 11.5 | 27.5 | 18.9 | 15.0 | 18.3 | 19.0 | 20.0 | 20.0 |
| Connecticut | 14.7 | 16.0 | 12.0 | 15.8 | 16.4 | 15.4 | 14.2 | 17.0 | 19.0 | 19.0 |
| New York | 15.5 | 17.5 | 14.7 | 14.4 | 15.5 | 21.4 | 18.8 | 22.0 | 16.8 | 13.0 |
| New Jersey | 14.0 | 14.2 | 12.5 | 14.4 | 14.4 | 18.7 | 20.7 | 16.0 | 21.0 | 21.0 |
| Pennsylvania | 13.5 | 13.6 | 14.5 | 14.1 | 18.0 | 19.9 | 17.3 | 21.0 | 17.2 | 20.0 |
| Delaware | ...... | ...... | ...... | 20.0 | 20.0 | 10.0 | 20.0 | 19.0 | 16.5 | 18.0 |
| Maryland | 12.0 | 12.5 | 12.5 | 11.8 | 20.0 | 10.9 | 22.7 | 19.0 | 12.2 | 13.0 |
| Virginia | 9.5 | 12.5 | 8.3 | 13.3 | 14.7 | 10.1 | 18.0 | 14.0 | 17.3 | 14.0 |
| North Carolina | 11.0 | 11.5 | 7.2 | 11.5 | 18.7 | 12.0 | 20.0 | 11.0 | 19.5 | 17.0 |
| Tennessee | 10.0 | ...... | 7.5 | 12.6 | 12.8 | 10.0 | 24.0 | 18.0 | 18.0 | 12.0 |
| West Virginia | 12.0 | 13.5 | 16.3 | 11.5 | 22.6 | 18.8 | 19.5 | 19.0 | 20.5 | 17.0 |
| Ohio | 12.0 | 15.5 | 12.6 | 12.0 | 14.9 | 14.6 | 18.8 | 18.0 | 20.0 | 16.0 |
| Michigan | 16.5 | 14.2 | 13.0 | 13.9 | 12.0 | 17.2 | 15.3 | 17.0 | 14.2 | 11.0 |
| Indiana | 15.0 | 13.2 | 11.5 | 6.9 | 14.8 | 14.3 | 24.0 | 14.0 | 18.4 | 16.0 |
| Illinois | 14.5 | 14.0 | 11.3 | 11.6 | 11.7 | 13.3 | 13.8 | 13.0 | 14.0 | 15.0 |
| Wisconsin | 14.3 | 9.5 | 13.5 | 15.8 | 8.5 | 17.9 | 13.5 | 18.0 | 15.5 | 15.0 |
| Minnesota | 12.8 | 12.5 | 13.8 | 15.2 | 9.2 | 15.3 | 10.6 | 17.0 | 15.0 | 17.0 |
| Iowa | 14.2 | 13.5 | 10.7 | 13.2 | 13.6 | 13.5 | 16.2 | 17.0 | 16.0 | 16.0 |
| Missouri | 13.2 | 12.5 | 11.3 | 12.7 | 9.2 | 10.2 | 21.8 | 15.0 | 15.8 | 14.0 |
| Nebraska | 12.0 | 12.0 | 8.2 | 14.7 | 3.7 | 6.7 | 21.3 | 14.0 | 12.8 | 16.0 |
| Oregon | 16.0 | ...... | 11.2 | 20.0 | 38.0 | 15.5 | 21.0 | 18.0 | 14.0 | 17.0 |
| General average | 14.50 | 15.30 | 14.10 | 14.86 | 16.05 | 20.10 | 18.66 | 20.89 | 17.28 | 16.56 |

POTATOES.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* | *Bush.* |
| Maine | 95 | 125 | 82 | 120 | 147 | 163 | 165 | 59 | 130 | 139 |
| New Hampshire | 90 | 110 | 80 | 119 | 120 | 124 | 108 | 51 | 90 | 127 |
| Vermont | 95 | 120 | 54 | 111 | 124 | 154 | 128 | 70 | 105 | 132 |
| Massachusetts | 87 | 120 | 83 | 119 | 105 | 133 | 108 | 62 | 97 | 134 |
| Rhode Island | 90 | 120 | 95 | 108 | 133 | 138 | 105 | 110 | 123 | 142 |
| Connecticut | 80 | 92 | 82 | 87 | 79 | 128 | 108 | 54 | 100 | 130 |
| New York | 62 | 87 | 63 | 70 | 77 | 122 | 89 | 62 | 73 | 88 |
| New Jersey | 76 | 98 | 71 | 73 | 60 | 94 | 94 | 68 | 75 | 83 |
| Pennsylvania | 68 | 84 | 60 | 76 | 64 | 111 | 109 | 63 | 54 | 85 |
| Delaware | 70 | 76 | 42 | 50 | 50 | 58 | 78 | 60 | 49 | 52 |
| Maryland | 70 | 78 | 60 | 49 | 52 | 87 | 90 | 74 | 58 | 64 |
| Virginia | 68 | 76 | 58 | 74 | 59 | 73 | 93 | 61 | 68 | 66 |
| North Carolina | 73 | 75 | 55 | 97 | 62 | 79 | 79 | 66 | 67 | 57 |
| South Carolina | 63 | 69 | 70 | 83 | 59 | 90 | 52 | 65 | 65 | 56 |
| Georgia | 72 | 74 | 70 | 74 | 52 | 58 | 55 | 52 | 54 | 46 |
| Florida | 75 | 74 | 65 | 87 | 90 | 55 | 75 | 75 | 64 | 69 |
| Alabama | 67 | 67 | 65 | 83 | 43 | 70 | 64 | 55 | 74 | 58 |
| Mississippi | 61 | 60 | 67 | 81 | 72 | 58 | 70 | 59 | 74 | 61 |
| Louisiana | 63 | 73 | 65 | 67 | 45 | 89 | 55 | 64 | 78 | 60 |
| Texas | 67 | 69 | 61 | 53 | 80 | 89 | 52 | 60 | 78 | 64 |
| Arkansas | 60 | 75 | 68 | 88 | 82 | 70 | 59 | 55 | 74 | 63 |
| Tennessee | 62 | 70 | 67 | 68 | 55 | 64 | 62 | 40 | 52 | 44 |
| West Virginia | 58 | 88 | 60 | 80 | 52 | 69 | 93 | 56 | 62 | 72 |
| Kentucky | 33 | 78 | 58 | 68 | 54 | 86 | 85 | 47 | 64 | 51 |
| Ohio | 46 | 98 | 60 | 58 | 63 | 63 | 89 | 42 | 61 | 71 |
| Michigan | 58 | 96 | 62 | 75 | 62 | 101 | 88 | 72 | 79 | 66 |
| Indiana | 37 | 93 | 56 | 51 | 59 | 66 | 85 | 31 | 71 | 76 |
| Illinois | 30 | 92 | 52 | 53 | 50 | 77 | 97 | 38 | 70 | 96 |
| Wisconsin | 60 | 98 | 65 | 77 | 45 | 107 | 78 | 99 | 98 | 103 |
| Minnesota | 63 | 100 | 70 | 66 | 39 | 158 | 84 | 106 | 85 | 96 |
| Iowa | 48 | 99 | 51 | 58 | 43 | 106 | 94 | 60 | 80 | 100 |
| Missouri | 39 | 96 | 51 | 78 | 69 | 109 | 78 | 42 | 66 | 83 |
| Kansas | 28 | 88 | 47 | 44 | 41 | 72 | 69 | 48 | 70 | 95 |
| Nebraska | 27 | 97 | 48 | 44 | 22 | 67 | 90 | 69 | 65 | 94 |
| South Dakota | 45 | 91 | 64 | 54 | 23 | 66 | 96 | 94 | 72 | 78 |
| North Dakota | | 105 | 75 | 69 | 84 | 128 | 102 | 99 | 87 | 103 |
| Montana | ...... | 120 | 100 | 138 | 111 | 53 | 170 | 156 | 104 | 141 |
| Wyoming | ...... | 100 | 100 | 134 | 150 | 100 | 167 | 150 | 120 | 125 |
| Colorado | 73 | 115 | 99 | 94 | 85 | 95 | 88 | 97 | 77 | 84 |
| New Mexico | 80 | 85 | 35 | 70 | 75 | 80 | 72 | 90 | 58 | 49 |
| Utah | 85 | 105 | 59 | 88 | 135 | 172 | 155 | 148 | 135 | 120 |
| Nevada | 95 | 98 | 100 | 132 | 161 | 150 | 190 | 135 | 155 | 102 |
| Idaho | ...... | 115 | 98 | 153 | 178 | 105 | 162 | 140 | 120 | 124 |
| Washington | 115 | 125 | 100 | 120 | 125 | 149 | 125 | 162 | 108 | 144 |
| Oregon | 100 | 110 | 70 | 127 | 112 | 64 | 87 | 160 | 86 | 115 |
| California | 95 | 95 | 75 | 96 | 52 | 75 | 80 | 105 | 95 | 119 |
| General average | 57.50 | 93.90 | 62.00 | 70.28 | 62.38 | 100.59 | 91.14 | 64.71 | 75.19 | 88.63 |

*Average yield per acre of the principal farm crops, 1890–1899*—Continued.

HAY.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Maine | 1.00 | 0.95 | 0.90 | 0.92 | 0.95 | 1.02 | 1.00 | 1.10 | 1.20 | 0.90 |
| New Hampshire | 1.05 | .92 | .90 | 1.06 | .95 | .95 | .96 | 1.15 | 1.25 | .89 |
| Vermont | 1.08 | 1.60 | .95 | 1.11 | 1.20 | 1.07 | 1.25 | 1.30 | 1.45 | 1.14 |
| Massachusetts | 1.00 | 1.10 | 1.10 | 1.15 | 1.26 | 1.11 | 1.28 | 1.40 | 1.42 | 1.13 |
| Rhode Island | 1.12 | .85 | .90 | .83 | .75 | .91 | 1.10 | 1.15 | 1.18 | .89 |
| Connecticut | 1.20 | .90 | 1.00 | .99 | .87 | .85 | 1.07 | 1.20 | 1.31 | .94 |
| New York | 1.25 | 1.10 | 1.10 | 1.24 | 1.17 | .73 | .81 | 1.35 | 1.40 | 1.04 |
| New Jersey | 1.30 | 1.05 | 1.07 | .99 | 1.16 | 1.21 | 1.15 | 1.75 | 1.42 | .83 |
| Pennsylvania | 1.25 | 1.15 | 1.10 | 1.03 | 1.18 | 1.01 | 1.06 | 1.40 | 1.45 | 1.20 |
| Delaware | 1.20 | 1.10 | 1.00 | .75 | 1.30 | 1.23 | 1.10 | 1.35 | 1.38 | 1.04 |
| Maryland | 1.25 | 1.12 | .98 | 1.04 | 1.03 | 1.25 | .87 | 1.35 | 1.20 | 1.13 |
| Virginia | 1.27 | 1.13 | .95 | 1.11 | .72 | 1.13 | 1.08 | 1.08 | 1.32 | 1.10 |
| North Carolina | 1.35 | 1.10 | 1.20 | 1.70 | 1.45 | 1.63 | 1.26 | 1.25 | 1.70 | 1.50 |
| South Carolina | 1.37 | 1.15 | 1.20 | 1.57 | 1.53 | 1.00 | 1.33 | 1.00 | 1.69 | 1.22 |
| Georgia | 1.35 | 1.17 | 1.35 | 1.32 | 1.16 | 1.60 | 1.38 | 1.35 | 1.75 | 1.45 |
| Florida | 1.28 | | | 2.00 | 1.23 | 1.53 | 1.40 | 1.00 | 1.60 | 1.46 |
| Alabama | 1.25 | 1.30 | 1.30 | 1.52 | 2.68 | 1.56 | 1.40 | 1.45 | 1.90 | 1.66 |
| Mississippi | 1.30 | 1.30 | 1.35 | 1.65 | 1.84 | 1.95 | 1.35 | 1.48 | 1.90 | 1.44 |
| Louisiana | 1.30 | 1.30 | 1.40 | 1.62 | 1.96 | 2.02 | 1.90 | 1.90 | 2.10 | 1.95 |
| Texas | 1.00 | 1.31 | 1.05 | 1.04 | 1.33 | 1.48 | 1.00 | 1.40 | 1.50 | 1.43 |
| Arkansas | 1.10 | 1.30 | 1.15 | 1.17 | 1.32 | 1.20 | 1.18 | 1.30 | 1.54 | 1.48 |
| Tennessee | 1.15 | 1.20 | 1.10 | 1.39 | 1.18 | 1.39 | 1.40 | 1.45 | 1.50 | 1.31 |
| West Virginia | 1.15 | 1.18 | 1.00 | 1.10 | 1.02 | .71 | 1.22 | 1.35 | 1.54 | 1.29 |
| Kentucky | 1.25 | 1.18 | 1.15 | 1.33 | 1.26 | 1.35 | 1.20 | 1.17 | 1.45 | 1.29 |
| Ohio | 1.30 | 1.20 | 1.15 | 1.33 | 1.27 | .58 | 1.26 | 1.44 | 1.39 | 1.30 |
| Michigan | 1.25 | 1.15 | 1.20 | 1.46 | 1.20 | .58 | 1.16 | 1.49 | 1.36 | 1.22 |
| Indiana | 1.30 | 1.20 | 1.20 | 1.36 | 1.27 | .61 | 1.30 | 1.43 | 1.45 | 1.34 |
| Illinois | 1.30 | 1.25 | 1.25 | 1.21 | 1.14 | .66 | 1.38 | 1.29 | 1.56 | 1.29 |
| Wisconsin | 1.25 | 1.12 | 1.20 | 1.52 | 1.31 | .88 | 1.25 | 1.35 | 1.50 | 1.47 |
| Minnesota | 1.35 | 1.15 | 1.25 | 1.62 | 1.02 | 1.30 | 1.69 | 1.57 | 1.80 | 1.70 |
| Iowa | 1.20 | 1.20 | 1.25 | 1.58 | .73 | 1.08 | 1.74 | 1.50 | 1.75 | 1.34 |
| Missouri | 1.20 | 1.15 | 1.15 | 1.24 | .85 | 1.17 | 1.43 | 1.15 | 1.60 | 1.37 |
| Kansas | .80 | 1.30 | 1.10 | 1.31 | .77 | 1.24 | 1.42 | 1.30 | 1.46 | 1.57 |
| Nebraska | .85 | 1.20 | 1.20 | 1.25 | .59 | .99 | 1.66 | 1.60 | 1.60 | 1.66 |
| South Dakota | .86 | 1.21 | 1.25 | 1.42 | .94 | .79 | 1.28 | 1.25 | 1.38 | 1.43 |
| North Dakota | | 1.15 | 1.30 | 1.29 | 1.19 | 1.42 | 1.65 | 1.60 | 1.50 | 1.58 |
| Montana | | 1.15 | 1.10 | 1.26 | 1.20 | .94 | 1.38 | 1.50 | 1.45 | 1.42 |
| Wyoming | | .93 | 1.15 | 1.35 | 1.60 | 1.08 | 1.55 | 1.65 | 1.96 | 1.47 |
| Colorado | 1.37 | 1.88 | 2.00 | 1.19 | 2.27 | 2.42 | 2.20 | 2.25 | 2.20 | 2.10 |
| New Mexico | 1.13 | 1.10 | 1.20 | 2.08 | 1.88 | 2.61 | 3.00 | 3.50 | 3.75 | 1.70 |
| Arizona | | | 1.30 | 1.75 | 1.82 | 1.85 | 3.20 | 3.00 | 3.50 | 2.63 |
| Utah | 1.38 | 1.40 | 1.40 | 1.72 | 2.52 | 2.56 | 2.70 | 2.95 | 3.25 | 2.50 |
| Nevada | 1.20 | 1.20 | 1.75 | 2.68 | 4.04 | 3.01 | 2.55 | 2.50 | 2.60 | 1.87 |
| Idaho | | 1.20 | 1.50 | 2.45 | 2.53 | 2.57 | 2.60 | 2.30 | 3.75 | 2.50 |
| Washington | 1.40 | 1.45 | 1.40 | 1.58 | 2.05 | 1.85 | 1.95 | 2.25 | 1.75 | 2.02 |
| Oregon | 1.50 | 1.30 | 1.45 | 1.88 | 2.00 | 1.78 | 1.98 | 1.90 | 1.90 | 1.97 |
| California | 1.40 | 1.40 | 1.50 | 1.69 | 1.93 | 1.66 | 1.65 | 1.60 | 1.60 | 1.63 |
| General average | 1.20 | 1.18 | 1.18 | 1.33 | 1.14 | 1.06 | 1.37 | 1.43 | 1.55 | 1.35 |

COTTON.

| States and Territories. | 1890–91 | 1891–92 | 1892–93 | 1893–94 | 1894–95 | 1895–96 | 1896–97 | 1897–98 | 1898–99 |
|---|---|---|---|---|---|---|---|---|---|
| | *Bales.* | *Bales.* | *Bales.* | *Bales.* | *Bales.* | *Bales.* | *Bales.* | *Bales.* | *Bales.* |
| Virginia | | | | | 0.21 | 0.18 | 0.24 | 0.25 | 0.27 |
| North Carolina | | | | 0.34 | .35 | .38 | .42 | .50 | .48 |
| South Carolina | | | | .34 | .38 | .42 | .46 | .50 | .44 |
| Georgia | | | | .33 | .33 | .35 | .37 | .38 | .39 |
| Florida | | | | .33 | .24 | .20 | .18 | .21 | .23 |
| Alabama | | | | .35 | .32 | .28 | .31 | .41 | .39 |
| Mississippi | | | | .37 | .41 | .41 | .42 | .55 | .43 |
| Louisiana | | | | .50 | .55 | .45 | .46 | .63 | .56 |
| Texas | | | | .48 | .45 | .33 | .31 | .39 | .48 |
| Arkansas | | | | .36 | .48 | .44 | .39 | .58 | .49 |
| Tennessee | | | | .34 | .33 | .24 | .26 | .28 | .36 |
| Missouri | | | | | .38 | .25 | .31 | .32 | .40 |
| Oklahoma | | | | | .45 | .54 | .45 | .51 | .50 |
| Indian Territory | | | | | .45 | .32 | .62 | .65 | .66 |
| General average | .416 | .436 | .371 | .387 | .418 | .355 | .367 | .448 | .448 |

*Average value per acre of principal farm crops, 1890–1899*

CORN.

[From Division of Statistics.]

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $26.79 | $30.00 | $23.79 | $18.79 | $28.73 | $22.68 | $17.39 | $17.39 | $19.20 | $18.00 |
| New Hampshire | 26.28 | 27.57 | 24.57 | 18.07 | 26.07 | 20.50 | 18.90 | 15.30 | 18.86 | 19.11 |
| Vermont | 24.12 | 28.27 | 24.32 | 19.76 | 28.15 | 21.89 | 15.58 | 15.05 | 18.92 | 16.92 |
| Massachussetts | 24.15 | 30.81 | 23.99 | 20.77 | 21.05 | 22.83 | 19.78 | 15.28 | 19.60 | 18.36 |
| Rhode Island | 23.54 | 27.26 | 21.04 | 16.84 | 23.55 | 17.30 | 16.66 | 16.74 | 21.76 | 16.43 |
| Connecticut | 24.99 | 27.36 | 21.39 | 18.05 | 21.08 | 19.33 | 15.96 | 15.43 | 19.24 | 19.50 |
| New York | 17.29 | 20.99 | 19.80 | 16.23 | 17.20 | 16.02 | 12.92 | 12.40 | 14.19 | 13.95 |
| New Jersey | 19.41 | 22.23 | 18.33 | 13.47 | 17.87 | 13.86 | 11.88 | 11.97 | 14.80 | 15.60 |
| Pennsylvania | 16.50 | 18.98 | 17.38 | 12.00 | 17.60 | 13.07 | 13.20 | 22.24 | 14.80 | 13.12 |
| Delaware | 9.25 | 12.10 | 8.23 | 9.84 | 9.90 | 7.14 | 5.50 | 8.70 | 7.75 | 7.48 |
| Maryland | 11.25 | 13.52 | 9.27 | 10.64 | 11.45 | 9.92 | 10.24 | 9.90 | 10.85 | 11.52 |
| Virginia | 9.62 | 9.85 | 8.11 | 8.69 | 8.98 | 6.88 | 6.88 | 6.84 | 7.70 | 7.60 |
| North Carolina | 7.32 | 8.18 | 5.51 | 6.15 | 6.30 | 5.51 | 4.44 | 5.59 | 6.02 | 6.11 |
| South Carolina | 7.14 | 8.12 | 5.99 | 4.62 | 7.28 | 5.11 | 4.14 | 4.41 | 4.60 | 4.50 |
| Georgia | 7.24 | 8.42 | 6.27 | 6.22 | 6.79 | 5.33 | 4.73 | 5.28 | 4.32 | 5.00 |
| Florida | 6.97 | 8.80 | 5.40 | 6.60 | 7.17 | 5.26 | 5.30 | 4.40 | 4.50 | 5.30 |
| Alabama | 6.94 | 8.00 | 6.34 | 6.79 | 7.26 | 5.88 | 5.63 | 5.52 | 6.15 | 5.64 |
| Mississippi | 8.75 | 8.82 | 6.99 | 7.20 | 8.43 | 5.85 | 5.94 | 6.53 | 7.02 | 7.36 |
| Louisiana | 11.20 | 10.38 | 7.40 | 8.09 | 10.04 | 7.24 | 5.85 | 7.65 | 7.38 | 7.92 |
| Texas | 11.16 | 10.73 | 9.63 | 9.50 | 10.64 | 8.18 | 3.90 | 7.58 | 8.50 | 6.48 |
| Arkansas | 10.86 | 9.75 | 8.23 | 7.29 | 9.02 | 6.88 | 4.99 | 6.40 | 5.80 | 7.60 |
| Tennessee | 9.78 | 9.76 | 8.73 | 8.31 | 8.54 | 6.75 | 6.44 | 7.56 | 7.54 | 7.80 |
| West Virginia | 12.00 | 14.20 | 12.60 | 11.94 | 10.55 | 9.68 | 10.20 | 9.80 | 10.73 | 11.70 |
| Kentucky | 11.07 | 12.00 | 9.32 | 10.11 | 10.12 | 8.42 | 7.00 | 8.05 | 8.37 | 7.77 |
| Ohio | 11.88 | 13.12 | 12.35 | 9.52 | 11.31 | 8.80 | 8.61 | 8.12 | 9.99 | 10.80 |
| Michigan | 14.96 | 14.16 | 11.50 | 10.66 | 11.60 | 10.82 | 9.12 | 8.50 | 11.56 | 9.00 |
| Indiana | 11.61 | 12.65 | 11.72 | 8.89 | 10.69 | 7.54 | 6.65 | 6.30 | 9.00 | 10.26 |
| Illinois | 11.27 | 12.40 | 9.69 | 7.97 | 11.23 | 8.23 | 7.29 | 6.83 | 7.50 | 9.36 |
| Wisconsin | 13.50 | 11.75 | 10.37 | 10.43 | 9.32 | 9.54 | 8.14 | 8.25 | 9.80 | 10.50 |
| Minnesota | 11.63 | 10.33 | 9.99 | 9.62 | 7.91 | 6.24 | 5.79 | 6.24 | 7.68 | 7.92 |
| Iowa | 10.87 | 11.01 | 9.06 | 9.15 | 6.75 | 6.32 | 5.46 | 4.93 | 8.05 | 7.13 |
| Missouri | 11.35 | 11.36 | 9.97 | 8.37 | 8.80 | 7.20 | 5.40 | 6.24 | 7.02 | 7.80 |
| Kansas | 7.96 | 9.08 | 7.60 | 6.60 | 4.82 | 4.62 | 5.04 | 3.96 | 4.16 | 6.75 |
| Nebraska | 8.64 | 9.15 | 7.90 | 6.80 | 3.00 | 2.90 | 4.88 | 5.10 | 4.62 | 6.44 |
| South Dakota | } 6.80 | 7.88 | 7.36 | 5.93 | 1.93 | 2.55 | 4.68 | 5.04 | 6.44 | 6.76 |
| North Dakota | | 7.20 | 8.56 | 7.87 | 8.45 | 5.11 | 8.75 | 5.44 | 6.84 | 7.59 |
| Montana | ...... | ...... | 13.30 | 19.25 | 26.81 | 18.75 | 15.60 | 11.70 | 18.48 | 11.96 |
| Wyoming | ...... | ...... | 11.28 | 11.66 | 19.50 | 15.67 | 19.50 | 6.00 | 8.80 | 9.46 |
| Colorado | 11.47 | 11.40 | 8.92 | 8.42 | 12.02 | 8.49 | 5.76 | 7.22 | 7.20 | 7.31 |
| New Mexico | 14.60 | 13.18 | 14.40 | 17.96 | 14.33 | 15.23 | 8.80 | 15.66 | 11.76 | 11.60 |
| Utah | 14.28 | 11.40 | 10.44 | 12.47 | 14.15 | 9.95 | 12.75 | 12.10 | 12.60 | 11.80 |
| Washington | ...... | ...... | 10.80 | 13.21 | 14.35 | 6.84 | 7.98 | 9.90 | 5.04 | 12.65 |
| Oregon | 14.26 | 19.17 | 12.04 | 11.61 | 14.22 | 14.52 | 12.32 | 13.25 | 14.40 | 14.08 |
| California | 17.87 | 24.50 | 16.67 | 15.85 | 11.00 | 18.29 | 19.61 | 17.64 | 16.12 | 16.20 |
| Oklahoma | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 3.80 |
| General average | 10.48 | 10.98 | 9.09 | 8.21 | 8.86 | 6.64 | 6.06 | 6.26 | 7.10 | 7.66 |

WHEAT.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $15.53 | $17.93 | $17.03 | $16.32 | $16.67 | $15.74 | $18.48 | $17.49 | $17.36 | $20.47 |
| New Hampshire | 17.60 | 18.98 | 16.30 | 12.75 | 16.00 | 14.67 | 21.00 | 17.60 | 17.48 | 16.34 |
| Vermont | 19.09 | 19.95 | 16.51 | 14.28 | 15.21 | 20.01 | 22.79 | 17.68 | 20.25 | 18.70 |
| Connecticut | 17.60 | 17.85 | 14.53 | ...... | ...... | ...... | ...... | 20.00 | 17.60 | 17.39 |
| New York | 14.50 | 16.60 | 13.77 | 11.02 | 9.18 | 12.31 | 14.08 | 19.26 | 15.26 | 14.80 |
| New Jersey | 12.10 | 15.91 | 11.87 | 10.15 | 9.33 | 8.80 | 13.62 | 17.20 | 12.70 | 10.88 |
| Pennsylvania | 11.88 | 15.60 | 11.83 | 9.10 | 8.40 | 10.79 | 11.62 | 17.93 | 11.90 | 8.98 |
| Delaware | 9.31 | 12.80 | 9.75 | 8.82 | 7.15 | 7.42 | 15.66 | 20.21 | 9.18 | 8.70 |
| Maryland | 10.67 | 15.00 | 9.77 | 10.26 | 8.26 | 10.88 | 14.96 | 17.86 | 10.71 | 9.59 |
| Virginia | 6.72 | 9.00 | 7.22 | 7.06 | 5.32 | 6.05 | 7.44 | 11.04 | 9.31 | 5.80 |
| North Carolina | 4.40 | 6.94 | 6.32 | 5.90 | 3.25 | 4.97 | 6.06 | 7.52 | 7.18 | 5.49 |
| South Carolina | 4.41 | 6.05 | 6.04 | 6.17 | 4.87 | 5.63 | 6.05 | 10.27 | 9.96 | 6.44 |
| Georgia | 4.51 | 8.25 | 6.12 | 6.48 | 5.24 | 5.08 | 7.12 | 9.68 | 9.80 | 6.66 |
| Alabama | 4.91 | 8.80 | 6.23 | 7.22 | 6.47 | 6.00 | 6.80 | 10.10 | 10.80 | 6.76 |
| Mississippi | 5.17 | 7.80 | 6.12 | 6.55 | 7.35 | 4.88 | 6.97 | 9.90 | 11.54 | 6.01 |
| Texas | 6.65 | 10.44 | 9.23 | 6.09 | 8.15 | 3.76 | 8.78 | 14.06 | 10.06 | 7.55 |
| Arkansas | 6.96 | 8.64 | 6.56 | 5.20 | 4.84 | 5.55 | 5.68 | 8.82 | 6.38 | 5.50 |
| Tennessee | 6.50 | 9.02 | 6.46 | 5.24 | 4.13 | 5.46 | 6.29 | 10.64 | 8.84 | 6.79 |
| West Virginia | 7.31 | 9.89 | 8.03 | 8.28 | 7.26 | 7.31 | 8.03 | 11.93 | 9.80 | 6.60 |
| Kentucky | 8.92 | 11.43 | 7.91 | 6.44 | 6.25 | 6.65 | 6.61 | 12.10 | 9.55 | 6.01 |
| Ohio | 11.38 | 15.73 | 9.25 | 8.27 | 9.31 | 7.98 | 7.02 | 14.87 | 11.15 | 9.09 |
| Michigan | 12.15 | 17.11 | 9.85 | 7.52 | 8.22 | 7.92 | 10.75 | 13.57 | 13.31 | 5.46 |
| Indiana | 9.86 | 15.57 | 9.41 | 7.47 | 8.46 | 5.24 | 7.20 | 11.57 | 9.83 | 6.27 |
| Illinois | 8.53 | 15.30 | 10.21 | 5.87 | 8.19 | 5.83 | 10.88 | 7.03 | 6.60 | 6.30 |
| Wisconsin | 10.13 | 11.34 | 7.13 | 7.18 | 8.42 | 7.91 | 9.31 | 10.50 | 10.62 | 9.46 |
| Minnesota | 9.88 | 13.73 | 7.08 | 4.90 | 6.62 | 10.12 | 9.66 | 10.01 | 8.53 | 7.37 |
| Iowa | 9.04 | 12.39 | 6.90 | 5.64 | 7.40 | 8.97 | 9.92 | 9.75 | 8.68 | 7.15 |

*Average value per acre of principal farm crops, 1890-1899*—Continued.

WHEAT—Continued.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Missouri | $9.13 | $10.88 | $7.25 | $4.56 | $6.58 | $6.12 | $8.19 | $7.65 | $5.78 | $6.14 |
| Kansas | 10.55 | 11.31 | 9.05 | 3.53 | 4.58 | 3.47 | 6.68 | 11.47 | 7.10 | 5.10 |
| Nebraska | 8.21 | 10.95 | 6.25 | 3.48 | 3.43 | 4.80 | 8.12 | 10.00 | 7.71 | 5.05 |
| South Dakota | 6.72 | 10.94 | 6.38 | 3.74 | 3.04 | 4.56 | 6.94 | 5.52 | 6.20 | 5.35 |
| North Dakota | | 12.46 | 6.34 | 4.13 | 5.07 | 7.98 | 7.55 | 7.62 | 7.34 | 6.53 |
| Montana | 13.60 | 16.80 | 14.84 | 12.90 | 13.39 | 17.45 | 17.49 | 22.10 | 17.11 | 15.68 |
| Wyoming | ...... | 16.40 | 11.55 | 12.15 | 12.35 | 16.64 | 15.19 | 17.50 | 16.35 | 12.60 |
| Colorado | 14.99 | 14.75 | 11.08 | 6.86 | 11.64 | 13.16 | 10.67 | 16.80 | 14.73 | 13.51 |
| New Mexico | 11.59 | 9.43 | 11.04 | 12.60 | 15.84 | 14.89 | 13.86 | 18.00 | 14.76 | 8.42 |
| Arizona | 10.80 | 10.88 | 12.17 | 11.38 | 17.00 | 13.33 | 18.40 | 13.32 | 29.16 | 9.79 |
| Utah | 13.65 | 13.13 | 10.73 | 8.28 | 11.66 | 9.86 | 18.02 | 14.28 | 15.12 | 10.97 |
| Nevada | 11.61 | 15.92 | 14.40 | 10.73 | 15.00 | 10.63 | 20.70 | 21.87 | 27.55 | 13.68 |
| Idaho | 12.87 | 16.80 | 13.20 | 11.58 | 9.48 | 8.37 | 15.93 | 15.40 | 15.81 | 12.10 |
| Washington | 14.06 | 13.12 | 9.98 | 9.74 | 6.47 | 6.35 | 13.32 | 15.98 | 13.07 | 11.58 |
| Oregon | 10.88 | 16.72 | 10.05 | 9.63 | 7.61 | 9.40 | 12.24 | 12.24 | 12.71 | 10.18 |
| California | 9.12 | 12.35 | 8.84 | 7.05 | 6.44 | 7.80 | 12.12 | 8.30 | 6.55 | 8.74 |
| Oklahoma | ...... | ...... | ...... | ...... | 5.76 | 5.47 | 8.84 | 14.44 | 7.75 | 7.05 |
| General average | 9.28 | 12.86 | 8.35 | 6.16 | 6.48 | 6.99 | 8.97 | 10.86 | 8.92 | 7.17 |

OATS.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $16.13 | $15.57 | $14.49 | $16.34 | $14.74 | $13.63 | $12.40 | $9.92 | $12.24 | $13.30 |
| New Hampshire | 15.40 | 16.10 | 14.96 | 14.71 | 15.24 | 12.92 | 13.30 | 13.30 | 12.54 | 13.65 |
| Vermont | 13.10 | 15.38 | 15.26 | 15.29 | 16.78 | 14.37 | 12.56 | 10.56 | 13.30 | 13.69 |
| Massachusetts | 14.13 | 15.51 | 14.59 | 14.41 | 13.72 | 12.24 | 12.60 | 10.56 | 11.84 | 12.54 |
| Rhode Island | 12.64 | 15.74 | 14.46 | 12.13 | 14.10 | 12.64 | 9.30 | 10.88 | 9.99 | 9.62 |
| Connecticut | 10.60 | 13.50 | 11.38 | 10.00 | 11.09 | 9.89 | 8.99 | 9.86 | 10.15 | 10.36 |
| New York | 8.90 | 11.97 | 10.92 | 7.20 | 8.62 | 8.88 | 8.58 | 8.37 | 8.53 | 10.23 |
| New Jersey | 8.65 | 11.20 | 10.54 | 8.37 | 10.79 | 10.29 | 9.52 | 7.50 | 6.08 | 7.92 |
| Pennsylvania | 8.26 | 10.06 | 10.08 | 9.38 | 8.47 | 8.56 | 7.43 | 7.61 | 6.99 | 9.57 |
| Delaware | 5.85 | 7.92 | 7.33 | 9.65 | 6.65 | 5.54 | 6.09 | 5.06 | 6.60 | 5.00 |
| Maryland | 5.28 | 7.22 | 7.22 | 7.42 | 8.35 | 7.07 | 5.52 | 6.24 | 5.65 | 6.90 |
| Virginia | 4.41 | 4.39 | 4.37 | 6.13 | 4.44 | 5.31 | 4.81 | 3.48 | 4.67 | 4.62 |
| North Carolina | 4.69 | 4.85 | 4.37 | 6.20 | 4.80 | 5.74 | 4.20 | 4.81 | 5.29 | 4.92 |
| South Carolina | 6.36 | 6.47 | 5.46 | 6.25 | 6.36 | 7.45 | 5.28 | 6.98 | 7.74 | 5.64 |
| Georgia | 5.82 | 7.02 | 5.56 | 6.92 | 6.83 | 6.67 | 4.92 | 5.88 | 7.97 | 4.32 |
| Florida | 6.53 | 7.07 | 5.39 | 6.49 | 7.20 | 6.63 | 6.36 | 4.77 | 8.32 | 4.50 |
| Alabama | 7.44 | 7.68 | 5.20 | 7.24 | 6.73 | 6.26 | 5.74 | 5.59 | 6.89 | 4.30 |
| Mississippi | 7.92 | 6.67 | 5.30 | 7.28 | 6.11 | 6.12 | 5.72 | 6.16 | 7.77 | 5.00 |
| Louisiana | 8.05 | 6.40 | 6.10 | 7.04 | 10.48 | 5.40 | 3.40 | 6.84 | 6.88 | 7.20 |
| Texas | 9.52 | 11.52 | 9.31 | 10.54 | 12.75 | 5.38 | 6.80 | 6.75 | 8.32 | 7.50 |
| Arkansas | 7.16 | 6.93 | 6.28 | 7.53 | 7.40 | 8.13 | 4.96 | 5.61 | 6.61 | 6.46 |
| Tennessee | 4.28 | 3.88 | 5.13 | 5.70 | 5.11 | 6.08 | 4.29 | 2.80 | 5.24 | 4.48 |
| West Virginia | 4.77 | 6.92 | 7.18 | 8.93 | 7.21 | 7.49 | 6.72 | 6.00 | 5.85 | 8.05 |
| Kentucky | 3.82 | 6.84 | 6.77 | 7.55 | 7.56 | 6.81 | 5.04 | 4.86 | 6.05 | 5.76 |
| Ohio | 7.56 | 10.33 | 9.20 | 8.58 | 9.39 | 6.97 | 5.27 | 6.40 | 7.42 | 9.00 |
| Michigan | 11.70 | 10.40 | 10.05 | 8.32 | 8.87 | 5.50 | 5.70 | 5.98 | 8.86 | 9.52 |
| Indiana | 7.17 | 7.52 | 9.01 | 7.70 | 9.69 | 4.58 | 4.64 | 5.74 | 6.72 | 7.36 |
| Illinois | 8.61 | 10.14 | 8.15 | 7.34 | 10.47 | 4.15 | 4.20 | 5.76 | 6.67 | 8.36 |
| Wisconsin | 10.40 | 9.32 | 8.76 | 7.45 | 9.87 | 6.08 | 5.95 | 6.46 | 8.66 | 8.28 |
| Minnesota | 9.47 | 9.85 | 7.64 | 6.45 | 8.43 | 5.59 | 4.95 | 4.94 | 7.62 | 7.04 |
| Iowa | 9.80 | 9.54 | 6.60 | 5.70 | 7.17 | 6.47 | 3.30 | 4.80 | 8.16 | 6.27 |
| Missouri | 6.79 | 6.90 | 6.00 | 5.85 | 6.76 | 4.99 | 3.06 | 4.18 | 3.91 | 6.00 |
| Kansas | 9.12 | 8.10 | 7.41 | 5.00 | 5.55 | 3.04 | 2.08 | 4.32 | 3.96 | 6.38 |
| Nebraska | 8.31 | 8.16 | 6.14 | 3.30 | 4.54 | 3.33 | 2.09 | 4.65 | 6.42 | 6.60 |
| South Dakota | 6.72 | 8.08 | 6.05 | 5.37 | 2.65 | 4.35 | 3.58 | 3.96 | 5.63 | 5.98 |
| North Dakota | | 8.71 | 7.42 | 6.13 | 7.51 | 5.14 | 3.96 | 5.98 | 7.98 | 8.10 |
| Montana | 18.29 | 18.48 | 11.52 | 12.58 | 12.43 | 15.75 | 14.57 | 13.86 | 14.21 | 14.82 |
| Wyoming | ...... | ...... | 10.87 | 9.60 | 14.59 | 15.99 | 16.96 | 12.25 | 12.48 | 12.00 |
| Colorado | 12.40 | 12.39 | 9.76 | 9.88 | 6.21 | 9.60 | 8.40 | 10.88 | 14.68 | 11.34 |
| New Mexico | 13.68 | 12.10 | 11.37 | 14.89 | 17.50 | 17.96 | 10.80 | 14.56 | 15.91 | 10.56 |
| Utah | 15.13 | 13.65 | 10.60 | 9.21 | 11.22 | 10.14 | 14.82 | 11.55 | 15.09 | 13.60 |
| Idaho | 17.40 | 17.50 | 10.73 | 13.57 | 12.32 | 10.21 | 12.60 | 11.62 | 15.70 | 12.92 |
| Washington | 15.74 | 15.58 | 12.07 | 13.90 | 11.32 | 11.28 | 14.40 | 16.80 | 16.76 | 14.06 |
| Oregon | 15.00 | 12.92 | 9.81 | 10.55 | 7.48 | 7.78 | 6.93 | 11.20 | 10.80 | 12.30 |
| California | 15.40 | 17.10 | 11.72 | 9.69 | 15.66 | 10.96 | 13.64 | 8.82 | 16.50 | 14.57 |
| General average | 8.40 | 9.08 | 7.73 | 6.88 | 7.95 | 5.87 | 4.81 | 5.75 | 7.23 | 7.52 |

*Average value per acre of principal farm crops, 1890-1899*—Continued.

BARLEY.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $15.20 | $19.08 | $15.16 | $17.49 | $17.23 | $16.85 | $13.16 | $13.75 | $15.12 | $17.11 |
| New Hampshire | 16.20 | 19.46 | 17.39 | 17.71 | 15.37 | 14.34 | 15.53 | 13.50 | 13.63 | 16.25 |
| Vermont | 15.75 | 19.66 | 17.16 | 16.50 | 16.74 | 15.60 | 13.53 | 13.11 | 14.10 | 16.12 |
| Massachusetts | 16.94 | 20.03 | 16.87 | 22.77 | 13.67 | 14.63 | 17.40 | 22.77 | 16.17 | 20.40 |
| Rhode Island | 16.49 | 21.84 | 17.63 | 21.92 | 21.60 | 17.63 | 17.40 | 15.12 | 17.08 | 20.30 |
| New York | 13.03 | 15.15 | 16.65 | 12.18 | 9.80 | 18.55 | 9.05 | 10.50 | 12.10 | 12.00 |
| Pennsylvania | 14.70 | 14.40 | 12.37 | 9.50 | 7.97 | 8.28 | 6.88 | 9.55 | 8.54 | 10.29 |
| Texas | 9.72 | 11.86 | 10.73 | 8.99 | 8.41 | 11.66 | 6.00 | 10.75 | 10.00 | 11.88 |
| Tennessee | 13.61 | 6.86 | 12.87 | 8.31 | 7.73 | 11.55 | 6.30 | 10.62 | 10.08 | 7.04 |
| Kentucky | 12.42 | 13.23 | 8.47 | 8.67 | 13.49 | 12.65 | 5.92 | 8.00 | 6.40 | 9.03 |
| Ohio | 13.65 | 15.42 | 13.39 | 10.67 | 13.68 | 11.56 | 7.68 | 11.69 | 12.63 | 12.60 |
| Michigan | 14.05 | 14.70 | 14.04 | 8.04 | 10.30 | 7.78 | 9.37 | 8.60 | 11.09 | 11.52 |
| Indiana | 10.72 | 13.87 | 14.56 | 8.95 | 9.32 | 6.00 | 6.70 | 8.36 | 10.30 | 11.25 |
| Illinois | 12.18 | 14.30 | 8.77 | 9.28 | 11.28 | 9.00 | 7.35 | 9.50 | 10.65 | 13.63 |
| Wisconsin | 13.17 | 14.57 | 12.75 | 10.32 | 12.87 | 9.96 | 7.40 | 8.96 | 11.64 | 12.00 |
| Minnesota | 12.37 | 11.74 | 12.31 | 7.96 | 9.63 | 8.64 | 5.44 | 6.12 | 9.37 | 7.75 |
| Iowa | 11.75 | 11.47 | 8.44 | 7.46 | 6.51 | 6.44 | 5.52 | 5.76 | 8.84 | 8.06 |
| Missouri | 11.40 | 14.71 | 12.22 | 8.00 | 7.14 | 7.34 | 4.38 | 7.60 | 7.20 | 7.56 |
| Kansas | 10.26 | 10.60 | 8.75 | 3.81 | 4.31 | 3.31 | 1.01 | 4.38 | 7.56 | 4.59 |
| Nebraska | 9.86 | 10.06 | 7.33 | 3.72 | 2.45 | 6.82 | 3.78 | 5.28 | 6.78 | 7.80 |
| South Dakota | 10.14 | 11.68 | 8.16 | 5.08 | 4.72 | 3.71 | 5.42 | 4.40 | 6.21 | 6.67 |
| North Dakota | | 12.60 | 8.02 | 4.71 | 7.24 | 6.08 | 3.38 | 6.07 | 7.66 | 7.92 |
| Montana | 17.76 | 19.50 | 21.45 | 15.05 | 9.00 | 14.75 | 13.75 | 19.00 | 20.52 | 17.85 |
| Colorado | 18.62 | 14.84 | 12.96 | 14.15 | 16.04 | 18.78 | 9.20 | 14.28 | 14.03 | 15.40 |
| New Mexico | 12.96 | 15.40 | 12.74 | 12.53 | 18.90 | 19.04 | 12.35 | 17.88 | 18.59 | 19.52 |
| Utah | 17.40 | 16.02 | 10.56 | 16.92 | 15.18 | 11.70 | 11.38 | 13.95 | 17.39 | 17.16 |
| Idaho | 15.75 | 19.72 | 8.58 | 15.90 | 15.32 | 10.29 | 3.37 | 14.70 | 16.80 | 16.10 |
| Washington | 17.00 | 18.90 | 11.39 | 15.64 | 10.78 | 14.17 | 10.40 | 19.35 | 17.91 | 15.40 |
| Oregon | 17.50 | 11.52 | 10.72 | 10.44 | 12.74 | 8.84 | 9.81 | 14.63 | 14.26 | 14.00 |
| California | 16.72 | 14.46 | 11.28 | 9.45 | 6.84 | 8.12 | 10.37 | 12.42 | 6.82 | 13.00 |
| General average | 13.44 | 13.56 | 11.18 | 8.92 | 8.56 | 8.88 | 7.62 | 9.25 | 8.93 | 10.28 |

RYE.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $10.03 | $15.52 | $11.34 | $12.96 | $13.37 | $16.32 | $12.06 | $11.07 | $15.12 | $12.60 |
| New Hampshire | 10.50 | 15.39 | 11.62 | 11.78 | 11.40 | 12.16 | 14.11 | 15.12 | 13.12 | 12.15 |
| Vermont | 10.32 | 14.49 | 10.44 | 10.22 | 9.56 | 9.12 | 12.09 | 9.60 | 11.08 | 10.54 |
| Massachusetts | 10.94 | 14.69 | 10.94 | 12.15 | 14.02 | 13.33 | 15.40 | 11.90 | 10.52 | 12.64 |
| Connecticut | 9.76 | 13.44 | 10.44 | 10.49 | 8.39 | 10.65 | 8.78 | 11.21 | 10.80 | 11.52 |
| New York | 8.98 | 13.20 | 8.26 | 9.39 | 8.32 | 8.69 | 6.29 | 8.88 | 8.75 | 8.96 |
| New Jersey | 8.48 | 11.73 | 8.37 | 9.38 | 8.14 | 6.94 | 6.49 | 8.50 | 7.75 | 8.25 |
| Pennsylvania | 8.54 | 11.84 | 7.81 | 8.38 | 7.78 | 7.55 | 7.52 | 8.17 | 7.57 | 7.65 |
| Maryland | 7.21 | 10.74 | 7.01 | 6.68 | 6.35 | 6.32 | 4.42 | 7.82 | 7.83 | 7.98 |
| Virginia | 4.42 | 6.72 | 5.54 | 5.21 | 4.75 | 5.72 | 4.80 | 5.50 | 5.15 | 4.77 |
| North Carolina | 4.62 | 5.95 | 5.52 | 5.39 | 6.30 | 4.93 | 5.32 | 5.28 | 5.82 | 5.25 |
| South Carolina | 4.59 | 6.42 | 5.88 | 5.94 | 4.51 | 10.70 | 4.18 | 5.68 | 8.67 | 5.45 |
| Georgia | 4.41 | 8.74 | 6.00 | 6.91 | 6.31 | 6.12 | 7.17 | 6.81 | 7.84 | 6.72 |
| Alabama | 6.48 | 8.40 | 6.50 | 11.27 | 12.64 | 8.57 | 7.04 | 11.33 | 11.65 | 8.32 |
| Texas | 4.40 | 8.96 | 7.84 | 6.32 | 8.48 | 4.13 | 4.69 | 8.64 | 8.52 | 8.20 |
| Arkansas | 4.09 | 8.18 | 6.72 | 4.35 | 6.84 | 7.20 | 7.00 | 9.46 | 7.41 | 8.14 |
| Tennessee | 4.73 | 7.40 | 5.65 | 5.60 | 4.48 | 4.46 | 5.40 | 5.80 | 5.56 | 6.03 |
| West Virginia | 6.56 | 7.98 | 6.37 | 5.33 | 4.56 | 9.82 | 5.94 | 5.87 | 5.82 | 6.20 |
| Kentucky | 6.65 | 8.55 | 7.01 | 7.66 | 7.20 | 7.39 | 5.94 | 6.89 | 7.15 | 7.00 |
| Ohio | 7.37 | 13.18 | 7.06 | 7.14 | 8.23 | 6.66 | 3.74 | 7.92 | 7.83 | 8.80 |
| Michigan | 8.04 | 11.70 | 7.26 | 5.63 | 6.07 | 5.44 | 2.94 | 6.30 | 6.58 | 7.28 |
| Indiana | 8.22 | 13.42 | 6.50 | 6.48 | 8.11 | 5.12 | 3.82 | 5.46 | 6.67 | 6.24 |
| Illinois | 7.49 | 13.48 | 6.15 | 5.70 | 8.00 | 6.08 | 5.20 | 6.82 | 6.51 | 7.05 |
| Wisconsin | 7.00 | 11.39 | 6.58 | 6.24 | 6.88 | 5.64 | 4.82 | 6.56 | 6.58 | 7.20 |
| Minnesota | 7.42 | 11.70 | 7.52 | 6.27 | 7.53 | 5.91 | 4.68 | 6.36 | 7.79 | 7.56 |
| Iowa | 6.85 | 11.39 | 6.47 | 5.99 | 7.77 | 6.39 | 5.08 | 5.76 | 7.60 | 7.20 |
| Missouri | 7.37 | 9.86 | 6.25 | 5.76 | 7.24 | 4.76 | 5.73 | 5.28 | 6.16 | 6.50 |
| Kansas | 7.15 | 9.15 | 6.00 | 2.66 | 2.67 | 2.24 | 2.45 | 5.60 | 5.77 | 4.62 |
| Nebraska | 6.86 | 9.42 | 5.65 | 3.54 | 2.93 | 2.79 | 3.72 | 5.44 | 6.39 | 6.08 |
| South Dakota | 5.50 | 9.18 | 4.62 | 3.92 | 2.07 | 2.10 | 3.13 | 5.78 | 5.64 | 5.55 |
| North Dakota | | 11.38 | 5.19 | 3.94 | 5.55 | 5.75 | 2.64 | 5.22 | 5.40 | 5.55 |
| Colorado | 9.43 | 12.77 | 7.59 | 10.50 | 10.30 | 6.96 | 14.57 | 7.80 | 9.00 | 6.72 |
| Utah | 8.51 | 10.75 | 7.26 | 5.59 | 10.83 | 6.93 | 8.00 | 7.20 | 8.97 | 8.16 |
| Washington | 9.66 | 11.73 | 9.35 | 10.42 | 8.06 | 20.03 | 7.50 | 12.09 | 10.44 | 9.60 |
| Oregon | 9.72 | 11.04 | 7.20 | 7.66 | 8.04 | 6.05 | 7.62 | 8.85 | 10.37 | 7.70 |
| California | 9.80 | 14.85 | 7.70 | 10.50 | 7.92 | 6.73 | 8.70 | 7.93 | 6.30 | 11.70 |
| General average | 7.58 | 11.30 | 6.98 | 6.68 | 6.89 | 6.33 | 5.44 | 7.18 | 7.23 | 7.36 |

*Average value per acre of principal farm crops, 1890–1899*—Continued.

BUCKWHEAT.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $11.00 | $13.42 | $10.83 | $15.66 | $21.92 | $17.76 | $16.07 | $15.40 | $10.34 | $9.68 |
| New Hampshire | 11.16 | 14.40 | 12.25 | 8.58 | 12.20 | 14.05 | 17.20 | 14.85 | 9.40 | 10.00 |
| Vermont | 11.00 | 12.37 | 9.60 | 15.48 | 12.77 | 12.77 | 12.56 | 11.04 | 9.84 | 11.96 |
| Massachusetts | 11.38 | 11.55 | 8.97 | 20.63 | 12.85 | 8.85 | 9.70 | 12.54 | 12.20 | 14.00 |
| Connecticut | 8.82 | 12.32 | 9.00 | 11.38 | 10.99 | 8.62 | 7.24 | 9.69 | 10.64 | 11.97 |
| New York | 8.99 | 9.80 | 7.35 | 8.64 | 8.37 | 9.42 | 6.96 | 8.80 | 7.56 | 7.67 |
| New Jersey | 8.40 | 9.51 | 7.12 | 9.50 | 9.36 | 9.35 | 8.07 | 7.84 | 11.34 | 11.76 |
| Pennsylvania | 7.43 | 7.75 | 7.69 | 8.32 | 9.54 | 8.76 | 6.57 | 8.82 | 7.57 | 10.80 |
| Delaware | 8.41 | 11.47 | 8.46 | 11.00 | 10.00 | 5.00 | 6.00 | 6.84 | 6.60 | 8.82 |
| Maryland | 7.08 | 8.75 | 8.12 | 6.84 | 11.20 | 6.10 | 11.12 | 9.69 | 6.47 | 7.28 |
| Virginia | 6.18 | 8.12 | 5.06 | 7.31 | 7.94 | 5.45 | 8.46 | 7.00 | 7.79 | 7.56 |
| North Carolina | 6.93 | 6.44 | 3.96 | 5.63 | 8.79 | 5.28 | 12.00 | 5.39 | 9.36 | 8.33 |
| Tennessee | 5.77 | 8.86 | 4.65 | 6.80 | 7.30 | 5.40 | 14.88 | 10.26 | 9.36 | 6.84 |
| West Virginia | 8.16 | 8.10 | 10.60 | 7.82 | 14.01 | 10.72 | 9.75 | 9.31 | 10.05 | 9.52 |
| Ohio | 7.80 | 10.08 | 7.43 | 7.20 | 9.83 | 8.03 | 8.08 | 9.00 | 10.20 | 9.28 |
| Michigan | 9.08 | 7.10 | 6.37 | 7.37 | 6.60 | 7.40 | 5.81 | 6.46 | 5.96 | 6.05 |
| Indiana | 9.75 | 8.32 | 6.67 | 3.86 | 8.29 | 8.29 | 12.24 | 6.86 | 9.38 | 9.44 |
| Illinois | 8.99 | 8.96 | 6.78 | 6.61 | 9.01 | 5.85 | 6.21 | 7.41 | 7.28 | 8.70 |
| Wisconsin | 7.58 | 5.03 | 6.08 | 9.01 | 4.76 | 8.23 | 5.13 | 6.84 | 6.20 | 9.45 |
| Minnesota | 6.66 | 7.00 | 6.21 | 8.06 | 5.43 | 7.80 | 4.35 | 7.65 | 7.35 | 8.84 |
| Iowa | 8.95 | 8.10 | 6.42 | 8.05 | 10.20 | 6.75 | 7.45 | 8.33 | 7.69 | 9.28 |
| Missouri | 8.58 | 9.37 | 7.35 | 7.37 | 5.52 | 5.92 | 15.20 | 9.00 | 9.48 | 8.54 |
| Nebraska | 8.40 | 6.96 | 4.10 | 7.64 | 2.52 | 4.36 | 10.65 | 7.14 | 7.81 | 9.92 |
| Oregon | 11.20 | 12.39 | 8.40 | 10.00 | 20.90 | 7.75 | 14.28 | 9.90 | 8.12 | 12.58 |
| General average | 8.45 | 8.56 | 7.31 | 8.67 | 8.92 | 9.09 | 7.32 | 8.80 | 7.77 | 9.23 |

POTATOES.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $67.45 | $51.25 | $63.14 | $64.80 | $64.68 | $55.42 | $62.70 | $52.51 | $59.80 | $58.38 |
| New Hampshire | 64.55 | 49.50 | 68.00 | 74.97 | 56.40 | 42.88 | 50.76 | 45.90 | 44.10 | 58.42 |
| Vermont | 59.85 | 45.60 | 36.72 | 53.28 | 54.56 | 40.04 | 37.12 | 49.00 | 44.10 | 47.52 |
| Massachusetts | 73.08 | 64.80 | 68.89 | 90.44 | 68.25 | 63.84 | 61.56 | 55.80 | 61.11 | 76.38 |
| Rhode Island | 76.50 | 72.00 | 80.75 | 85.32 | 95.76 | 62.10 | 58.70 | 106.70 | 78.72 | 71.00 |
| Connecticut | 68.00 | 50.60 | 62.32 | 65.25 | 53.72 | 52.48 | 48.76 | 48.60 | 55.00 | 59.80 |
| New York | 48.36 | 32.19 | 40.95 | 38.50 | 36.96 | 28.06 | 27.59 | 41.54 | 30.66 | 35.20 |
| New Jersey | 62.32 | 48.02 | 53.25 | 54.75 | 37.20 | 31.96 | 33.84 | 53.04 | 45.75 | 42.33 |
| Pennsylvania | 52.36 | 36.12 | 43.20 | 45.60 | 36.48 | 31.08 | 29.43 | 41.58 | 31.32 | 36.55 |
| Delaware | 52.50 | 34.20 | 26.46 | 32.50 | 25.00 | 22.04 | 27.30 | 39.00 | 33.81 | 26.52 |
| Maryland | 49.70 | 37.44 | 40.80 | 33.32 | 27.56 | 26.10 | 27.00 | 50.32 | 30.74 | 32.64 |
| Virginia | 45.56 | 35.72 | 34.80 | 47.88 | 33.04 | 27.74 | 31.62 | 42.70 | 37.40 | 36.96 |
| North Carolina | 47.45 | 51.00 | 33.55 | 58.20 | 37.20 | 43.45 | 33.97 | 42.24 | 41.54 | 37.62 |
| South Carolina | 56.70 | 56.58 | 59.50 | 63.91 | 45.43 | 65.70 | 34.32 | 68.25 | 65.00 | 58.24 |
| Georgia | 68.40 | 59.20 | 56.00 | 68.08 | 42.12 | 41.18 | 41.25 | 52.00 | 40.50 | 38.18 |
| Florida | 72.75 | 66.60 | 48.75 | 101.79 | 67.50 | 55.00 | 63.00 | 90.00 | 76.80 | 85.56 |
| Alabama | 62.31 | 52.26 | 49.40 | 73.04 | 37.84 | 56.70 | 48.00 | 51.70 | 61.42 | 48.72 |
| Mississippi | 59.78 | 48.60 | 50.92 | 68.04 | 59.04 | 37.12 | 43.40 | 48.38 | 53.28 | 62.22 |
| Louisiana | 57.96 | 59.86 | 50.05 | 55.61 | 37.35 | 64.08 | 41.80 | 54.40 | 58.50 | 43.60 |
| Texas | 60.30 | 65.55 | 51.85 | 54.59 | 79.20 | 69.42 | 40.56 | 57.00 | 67.08 | 58.24 |
| Arkansas | 52.80 | 48.01 | 47.60 | 56.32 | 43.46 | 35.70 | 31.27 | 46.20 | 40.70 | 44.73 |
| Tennessee | 52.70 | 38.50 | 32.16 | 33.32 | 26.95 | 25.60 | 24.80 | 29.20 | 29.64 | 28.60 |
| West Virginia | 47.56 | 36.96 | 34.80 | 47.20 | 29.64 | 28.98 | 28.83 | 36.40 | 33.48 | 37.44 |
| Kentucky | 27.72 | 35.10 | 30.16 | 38.08 | 30.24 | 33.54 | 28.05 | 31.49 | 29.44 | 31.11 |
| Ohio | 39.10 | 34.30 | 38.40 | 38.86 | 32.76 | 20.16 | 23.14 | 26.04 | 25.01 | 30.53 |
| Michigan | 37.12 | 23.04 | 32.86 | 33.75 | 26.66 | 16.16 | 16.72 | 30.96 | 21.33 | 21.12 |
| Indiana | 34.04 | 34.41 | 40.32 | 37.23 | 31.86 | 20.46 | 21.25 | 19.22 | 29.11 | 32.68 |
| Illinois | 28.50 | 36.80 | 41.60 | 39.22 | 32.00 | 23.10 | 25.22 | 23.56 | 32.20 | 39.36 |
| Wisconsin | 37.80 | 25.48 | 35.10 | 37.73 | 23.85 | 18.19 | 14.82 | 37.62 | 23.52 | 26.78 |
| Minnesota | 40.80 | 24.00 | 33.60 | 30.36 | 19.89 | 22.12 | 17.64 | 32.86 | 21.25 | 24.00 |
| Iowa | 33.60 | 21.78 | 38.25 | 37.70 | 29.67 | 20.14 | 20.68 | 28.20 | 24.00 | 23.60 |
| Missouri | 31.20 | 33.50 | 39.27 | 44.46 | 35.88 | 27.25 | 24.18 | 26.46 | 29.04 | 33.20 |
| Kansas | 27.44 | 30.80 | 41.36 | 34.76 | 27.88 | 30.24 | 18.63 | 26.40 | 35.70 | 42.75 |
| Nebraska | 26.73 | 27.16 | 36.00 | 34.76 | 16.94 | 20.10 | 22.50 | 31.74 | 24.05 | 23.50 |
| South Dakota | 30.60 | 25.48 | 35.20 | 31.86 | 17.02 | 17.16 | 19.20 | 30.08 | 20.16 | 21.06 |
| North Dakota | | 21.00 | 30.00 | 33.81 | 38.64 | 21.76 | 21.42 | 32.67 | 29.58 | 27.81 |
| Montana | 58.40 | 49.20 | 60.00 | 95.22 | 53.28 | 25.44 | 54.40 | 62.40 | 57.20 | 74.73 |
| Wyoming | 58.40 | 43.60 | 70.00 | 87.10 | 90.00 | 56.00 | 71.81 | 82.50 | 78.00 | 76.25 |
| Colorado | 54.75 | 32.20 | 60.39 | 50.76 | 46.75 | 31.35 | 41.36 | 54.32 | 41.58 | 46.20 |
| New Mexico | 76.00 | 53.55 | 28.00 | 46.90 | 60.00 | 50.40 | 48.96 | 70.20 | 45.24 | 33.32 |
| Utah | 63.75 | 26.25 | 42.48 | 29.04 | 40.50 | 58.48 | 49.60 | 44.40 | 41.85 | 66.00 |
| Nevada | 66.50 | 49.00 | 58.00 | 52.80 | 56.35 | 57.00 | 72.20 | 98.55 | 139.50 | 91.80 |
| Idaho | 63.75 | 46.00 | 52.92 | 85.68 | 94.34 | 42.00 | 48.60 | 44.80 | 64.80 | 75.64 |
| Washington | 69.00 | 47.50 | 50.00 | 46.80 | 35.00 | 41.72 | 50.00 | 45.36 | 42.14 | 72.00 |
| Oregon | 65.00 | 44.00 | 39.20 | 59.69 | 40.32 | 24.96 | 33.93 | 64.00 | 40.42 | 56.35 |
| California | 64.60 | 51.31 | 44.25 | 48.00 | 25.48 | 36.00 | 42.40 | 51.45 | 52.25 | 74.97 |
| General average | 42.32 | 33.53 | 40.65 | 41.71 | 33.43 | 26.73 | 26.08 | 35.37 | 31.11 | 34.60 |

*Average value per acre of principal farm crops, 1890–1899*—Continued.

HAY.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $9.25 | $8.84 | $11.52 | $11.16 | $9.12 | $9.87 | $10.25 | $10.73 | $9.12 | $9.09 |
| New Hampshire | 10.24 | 10.12 | 11.88 | 16.54 | 9.97 | 11.88 | 12.38 | 13.23 | 11.56 | 10.46 |
| Vermont | 9.40 | 14.40 | 9.50 | 11.80 | 11.93 | 13.11 | 12.85 | 12.03 | 9.21 | 10.55 |
| Massachusetts | 13.50 | 17.60 | 18.26 | 19.93 | 19.53 | 19.42 | 20.99 | 19.46 | 17.18 | 17.52 |
| Rhode Island | 15.68 | 13.81 | 15.66 | 16.27 | 12.25 | 15.70 | 18.26 | 16.67 | 14.93 | 15.35 |
| Connecticut | 16.20 | 14.17 | 16.50 | 17.32 | 13.54 | 13.68 | 15.74 | 15.60 | 14.61 | 13.63 |
| New York | 9.69 | 12.10 | 12.10 | 14.05 | 11.30 | 10.00 | 9.75 | 11.14 | 8.05 | 10.87 |
| New Jersey | 13.39 | 15.12 | 15.25 | 17.26 | 16.34 | 15.29 | 16.50 | 18.81 | 13.63 | 12.74 |
| Pennsylvania | 9.38 | 11.50 | 13.53 | 14.83 | 13.35 | 12.42 | 12.88 | 12.81 | 11.46 | 13.80 |
| Delaware | 12.00 | 13.20 | 12.33 | 12.75 | 19.50 | 14.96 | 14.30 | 13.50 | 11.66 | 12.12 |
| Maryland | 12.30 | 12.49 | 11.52 | 14.82 | 11.46 | 14.44 | 10.31 | 14.17 | 11.16 | 13.73 |
| Virginia | 13.59 | 12.43 | 10.92 | 14.53 | 8.56 | 12.92 | 11.03 | 11.07 | 11.22 | 11.27 |
| North Carolina | 16.08 | 12.10 | 12.66 | 18.89 | 15.85 | 16.53 | 13.55 | 12.19 | 15.81 | 15.15 |
| South Carolina | 17.81 | 14.01 | 13.56 | 15.18 | 16.45 | 7.62 | 15.06 | 11.50 | 15.20 | 12.56 |
| Georgia | 19.24 | 15.79 | 15.93 | 15.92 | 14.36 | 17.44 | 15.25 | 17.55 | 20.56 | 19.07 |
| Florida | 19.84 | 17.70 | 16.38 | 39.50 | 19.99 | 20.24 | 18.20 | 14.25 | 22.56 | 22.41 |
| Alabama | 16.87 | 16.09 | 14.04 | 17.08 | 25.49 | 15.93 | 13.72 | 13.86 | 17.57 | 18.92 |
| Mississippi | 14.82 | 14.59 | 13.38 | 15.86 | 17.79 | 18.91 | 12.77 | 14.06 | 15.96 | 13.32 |
| Louisiana | 13.26 | 15.05 | 13.72 | 14.58 | 28.85 | 19.47 | 16.63 | 16.62 | 19.74 | 18.92 |
| Texas | 9.50 | 11.46 | 8.99 | 9.98 | 10.13 | 9.52 | 7.20 | 10.15 | 8.77 | 10.15 |
| Arkansas | 11.35 | 13.74 | 10.05 | 10.96 | 11.66 | 11.12 | 8.90 | 11.25 | 10.39 | 12.80 |
| Tennessee | 11.50 | 13.56 | 11.44 | 14.96 | 13.30 | 15.05 | 13.54 | 15.59 | 14.25 | 14.74 |
| West Virginia | 9.77 | 10.82 | 10.50 | 14.02 | 10.87 | 9.04 | 11.94 | 11.95 | 12.94 | 12.19 |
| Kentucky | 11.25 | 11.98 | 10.92 | 13.51 | 13.19 | 14.77 | 11.35 | 11.70 | 13.19 | 13.42 |
| Ohio | 9.75 | 9.84 | 10.55 | 13.37 | 10.74 | 7.40 | 9.99 | 9.00 | 7.99 | 11.63 |
| Michigan | 10.00 | 12.65 | 10.08 | 13.37 | 10.85 | 7.59 | 9.84 | 11.55 | 9.72 | 10.37 |
| Indiana | 10.40 | 9.24 | 9.36 | 12.46 | 9.63 | 7.34 | 9.33 | 8.44 | 8.12 | 10.45 |
| Illinois | 9.88 | 9.65 | 9.41 | 10.72 | 9.50 | 6.77 | 8.82 | 7.93 | 9.20 | 10.00 |
| Wisconsin | 8.31 | 10.98 | 9.18 | 10.94 | 10.42 | 8.47 | 8.25 | 8.44 | 8.62 | 10.07 |
| Minnesota | 6.75 | 6.61 | 5.75 | 7.40 | 5.41 | 6.66 | 6.41 | 7.06 | 6.66 | 7.40 |
| Iowa | 8.10 | 6.60 | 6.56 | 9.73 | 5.39 | 6.97 | 6.94 | 6.37 | 7.09 | 7.10 |
| Missouri | 8.64 | 7.13 | 7.76 | 8.73 | 6.65 | 7.96 | 6.94 | 7.07 | 9.28 | 8.56 |
| Kansas | 4.14 | 4.71 | 4.84 | 6.14 | 4.04 | 4.04 | 3.83 | 4.42 | 4.74 | 5.49 |
| Nebraska | 4.25 | 3.80 | 5.12 | 6.09 | 4.20 | 3.52 | 4.05 | 4.80 | 5.28 | 6.14 |
| South Dakota | 3.87 | 5.08 | 4.25 | 5.21 | 4.02 | 2.60 | 3.99 | 3.69 | 4.14 | 4.43 |
| North Dakota | | 4.60 | 5.33 | 4.80 | 4.61 | 4.94 | 5.59 | 5.20 | 4.87 | 5.21 |
| Montana | 12.60 | 9.77 | 9.85 | 9.94 | 8.60 | 10.72 | 9.47 | 11.63 | 9.86 | 10.93 |
| Wyoming | 9.29 | 8.37 | 7.36 | 10.80 | 16.10 | 7.02 | 11.07 | 9.90 | 11.40 | 9.70 |
| Colorado | 12.33 | 15.04 | 13.00 | 8.31 | 17.12 | 14.21 | 13.68 | 12.38 | 11.88 | 15.43 |
| New Mexico | 10.17 | 10.45 | 13.50 | 17.68 | 21.62 | 20.88 | 17.10 | 24.50 | 27.56 | 18.02 |
| Arizona | 9.00 | 9.90 | 13.65 | 14.44 | 21.84 | 16.65 | 28.00 | 15.00 | 42.00 | 27.22 |
| Utah | 11.04 | 7.70 | 8.83 | 8.89 | 14.01 | 13.49 | 13.50 | 14.01 | 14.62 | 17.75 |
| Nevada | 11.70 | 6.00 | 12.25 | 26.60 | 29.29 | 20.32 | 12.29 | 12.50 | 18.20 | 14.31 |
| Idaho | 13.20 | 8.00 | 11.10 | 13.48 | 10.98 | 16.06 | 12.25 | 12.08 | 18.37 | 15.75 |
| Washington | 16.80 | 15.22 | 12.60 | 14.49 | 15.13 | 12.49 | 13.83 | 20.25 | 13.30 | 17.98 |
| Oregon | 15.00 | 10.40 | 12.93 | 15.23 | 11.72 | 10.89 | 13.07 | 14.73 | 13.78 | 13.49 |
| California | 14.70 | 15.40 | 13.14 | 13.30 | 18.34 | 11.72 | 10.48 | 14.40 | 22.80 | 13.04 |
| General average | 9.34 | 9.68 | 9.64 | 11.51 | 9.70 | 8.89 | 8.97 | 9.46 | 9.30 | 9.97 |

COTTON.

| States and Territories. | 1890–91. | 1891–92. | 1892–93. | 1893–94. | 1894–95. | 1895–96. | 1896–97. | 1897–98. | 1898–99. |
|---|---|---|---|---|---|---|---|---|---|
| Virginia | | | | | $5.94 | $7.31 | $8.07 | $7.39 | $7.31 |
| North Carolina | | | | $12.20 | 10.00 | 15.52 | 14.45 | 14.66 | 12.93 |
| South Carolina | | | | 12.24 | 10.44 | 17.26 | 15.97 | 13.85 | 11.06 |
| Georgia | | | | 11.97 | 9.10 | 14.25 | 12.71 | 10.82 | 10.22 |
| Florida | | | | 12.17 | 6.67 | 8.28 | 7.92 | 8.67 | 9.84 |
| Alabama | | | | 12.24 | 8.97 | 11.47 | 10.65 | 11.81 | 10.31 |
| Mississippi | | | | 12.92 | 11.07 | 16.69 | 14.47 | 15.89 | 11.60 |
| Louisiana | | | | 17.50 | 15.41 | 18.42 | 15.40 | 18.37 | 15.11 |
| Texas | | | | 16.59 | 12.58 | 13.40 | 11.00 | 12.05 | 13.82 |
| Arkansas | | | | 12.36 | 11.17 | 17.98 | 12.71 | 16.85 | 13.40 |
| Tennessee | | | | 11.13 | 7.61 | 9.92 | 8.62 | 7.98 | 9.77 |
| Missouri | | | | | | 10.13 | 9.96 | 9.33 | 11.00 |
| Oklahoma | | | | | | 22.14 | 15.92 | 15.55 | 14.40 |
| Indian Territory | | | | | | 13.22 | 21.16 | 19.94 | 18.96 |
| General average | | | | 13.41 | 10.94 | 14.53 | 12.54 | 13.14 | 12.23 |

*Prices of principal agricultural products on the farm, December 1, 1890–1899.*

[From Division of Statistics.]

CORN (PER BUSHEL).

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| Maine | 74 | 80 | 67 | 62 | 72 | 54 | 47 | 47 | 48 | 50 |
| New Hampshire | 72 | 77 | 65 | 57 | 76 | 51 | 45 | 45 | 46 | 49 |
| Vermont | 72 | 76 | 64 | 61 | 69 | 48 | 38 | 43 | 44 | 47 |
| Massachusetts | 70 | 78 | 62 | 62 | 61 | 52 | 46 | 47 | 49 | 51 |
| Rhode Island | 72 | 79 | 63 | 69 | 75 | 56 | 49 | 54 | 64 | 53 |
| Connecticut | 70 | 76 | 62 | 64 | 68 | 51 | 42 | 49 | 52 | 50 |
| New York | 65 | 66 | 60 | 55 | 61 | 45 | 38 | 40 | 43 | 45 |
| New Jersey | 62 | 65 | 58 | 52 | 54 | 42 | 36 | 38 | 40 | 40 |
| Pennsylvania | 60 | 57 | 57 | 49 | 55 | 39 | 33 | 34 | 40 | 41 |
| Delaware | 50 | 55 | 44 | 40 | 45 | 34 | 25 | 30 | 31 | 34 |
| Maryland | 50 | 53 | 45 | 44 | 50 | 37 | 32 | 30 | 35 | 36 |
| Virginia | 55 | 50 | 53 | 46 | 47 | 37 | 32 | 38 | 35 | 38 |
| North Carolina | 55 | 58 | 54 | 50 | 47 | 38 | 37 | 43 | 43 | 47 |
| South Carolina | 70 | 70 | 57 | 60 | 65 | 46 | 46 | 49 | 46 | 50 |
| Georgia | 69 | 69 | 56 | 56 | 58 | 41 | 43 | 48 | 48 | 50 |
| Florida | 75 | 80 | 60 | 68 | 71 | 47 | 53 | 55 | 50 | 53 |
| Alabama | 68 | 63 | 52 | 59 | 53 | 37 | 45 | 46 | 41 | 47 |
| Mississippi | 70 | 58 | 51 | 55 | 49 | 37 | 44 | 45 | 39 | 46 |
| Louisiana | 70 | 60 | 50 | 57 | 62 | 40 | 45 | 45 | 41 | 44 |
| Texas | 72 | 55 | 45 | 54 | 56 | 31 | 41 | 41 | 34 | 36 |
| Arkansas | 65 | 46 | 47 | 45 | 47 | 32 | 37 | 40 | 29 | 38 |
| Tennessee | 52 | 43 | 43 | 39 | 39 | 27 | 28 | 36 | 29 | 39 |
| West Virgini: | 60 | 52 | 56 | 55 | 57 | 40 | 34 | 40 | 37 | 45 |
| Kentucky | 49 | 40 | 40 | 43 | 44 | 27 | 25 | 35 | 27 | 37 |
| Ohio | 51 | 41 | 42 | 40 | 43 | 27 | 21 | 25 | 27 | 30 |
| Michigan | 55 | 48 | 46 | 45 | 50 | 32 | 24 | 27 | 34 | 36 |
| Indiana | 47 | 38 | 40 | 36 | 37 | 23 | 19 | 21 | 25 | 27 |
| Illinois | 43 | 37 | 37 | 31 | 39 | 22 | 18 | 21 | 25 | 26 |
| Wisconsin | 45 | 44 | 38 | 35 | 45 | 30 | 22 | 25 | 28 | 30 |
| Minnesota | 42 | 39 | 37 | 34 | 43 | 20 | 19 | 24 | 24 | 24 |
| Iowa | 41 | 30 | 32 | 27 | 45 | 18 | 14 | 17 | 23 | 23 |
| Missouri | 44 | 38 | 36 | 30 | 40 | 20 | 20 | 24 | 27 | 30 |
| Kansas | 51 | 34 | 31 | 31 | 43 | 19 | 18 | 22 | 26 | 25 |
| Nebraska | 48 | 26 | 28 | 27 | 50 | 18 | 13 | 17 | 22 | 23 |
| South Dakota | 50 | 35 | 33 | 25 | 46 | 23 | 18 | 21 | 23 | 26 |
| North Dakota | | 40 | 40 | 38 | 44 | 24 | 25 | 32 | 36 | 33 |
| Montana | 70 | ------ | 70 | 70 | 82 | 75 | 60 | 65 | 66 | 52 |
| Wyoming | 65 | ------ | 61 | 63 | 65 | 57 | 78 | 50 | 55 | 43 |
| Colorado | 63 | 53 | 40 | 51 | 61 | 41 | 36 | 38 | 40 | 43 |
| New Mexico | 73 | 72 | 72 | 71 | 75 | 56 | 55 | 58 | 56 | 58 |
| Utah | 68 | 60 | 58 | 58 | 58 | 49 | 51 | 55 | 60 | 59 |
| Washington | 50 | ------ | 60 | 62 | 69 | 40 | 57 | 55 | 42 | 55 |
| Oregon | 66 | 71 | 56 | 47 | 56 | 55 | 56 | 53 | 60 | 64 |
| California | 65 | 71 | 55 | 50 | 57 | 53 | 53 | 56 | 62 | 60 |
| Oklahoma | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 20 |
| General average | 50.63 | 40.60 | 39.43 | 36.53 | 45.74 | 25.33 | 21.50 | 26.33 | 28.69 | 30.28 |

WHEAT (PER BUSHEL).

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $1.15 | $1.10 | $1.02 | $1.02 | $0.79 | $0.82 | $0.84 | $1.06 | $0.89 | $0.91 |
| New Hampshire | 1.15 | 1.15 | 1.00 | .85 | .80 | .76 | 1.00 | 1.10 | .92 | .95 |
| Vermont | 1.11 | 1.14 | .96 | .85 | .67 | .69 | .93 | 1.04 | .90 | .85 |
| Connecticut | 1.10 | 1.06 | .87 | ------ | ------ | .68 | ------ | 1.00 | .88 | .95 |
| New York | 1.00 | 1.00 | .85 | .76 | .62 | .68 | .88 | .90 | .72 | .80 |
| New Jersey | 1.00 | 1.04 | .83 | .70 | .61 | .71 | .89 | .93 | .73 | .75 |
| Pennsylvania | .99 | 1.00 | .81 | .65 | .56 | .65 | .83 | .91 | .68 | .66 |
| Delaware | .96 | 1.00 | .75 | .60 | .55 | .64 | .87 | .94 | .69 | .68 |
| Maryland | .92 | 1.00 | .74 | .76 | .54 | .64 | .88 | .93 | .70 | .68 |
| Virginia | .96 | 1.00 | .76 | .63 | .56 | .65 | .80 | .92 | .66 | .69 |
| North Carolina | 1.00 | 1.02 | .89 | .72 | .65 | .72 | .83 | .94 | .78 | .82 |
| South Carolina | 1.05 | 1.10 | .93 | .98 | .87 | .88 | .89 | 1.18 | .94 | .99 |
| Georgia | 1.10 | 1.10 | .90 | .90 | .76 | .82 | .89 | 1.03 | .98 | .98 |
| Alabama | 1.09 | 1.10 | .93 | .88 | .78 | .80 | .85 | 1.01 | .90 | .89 |
| Mississippi | 1.10 | 1.00 | .90 | .85 | .75 | .61 | .82 | .99 | .83 | .78 |
| Texas | .95 | .87 | .75 | .58 | .54 | .66 | .75 | .89 | .68 | .68 |
| Arkansas | .98 | .90 | .80 | .65 | .55 | .59 | .71 | .84 | .58 | .64 |
| Tennessee | .97 | .93 | .68 | .57 | .51 | .62 | .74 | .95 | .67 | .78 |
| West Virginia | .95 | .96 | .75 | .72 | .60 | .69 | .78 | .89 | .71 | .71 |
| Kentucky | .92 | .90 | .67 | .57 | .50 | .61 | .76 | .89 | .62 | .66 |
| Ohio | .91 | .92 | .68 | .57 | .49 | .60 | .78 | .88 | .66 | .64 |
| Michigan | .90 | .91 | .67 | .57 | .52 | .60 | .84 | .87 | .64 | .65 |
| Indiana | .88 | .86 | .64 | .53 | .46 | .57 | .80 | .89 | .63 | .64 |
| Illinois | .87 | .85 | .63 | .51 | .45 | .53 | .74 | .89 | .60 | .63 |
| Wisconsin | .83 | .84 | .62 | .54 | .51 | .51 | .70 | .84 | .59 | .61 |

*Prices of principal agricultural products on the farm, December 1, 1890–1899*—C't'd.

WHEAT (PER BUSHEL)—Continued.

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Minnesota | $0.81 | $0.78 | $0.61 | $0.51 | $0.49 | $0.44 | $0.68 | $0.77 | $0.54 | $0.55 |
| Iowa | .80 | .81 | .60 | .49 | .50 | .46 | .62 | .75 | .52 | .55 |
| Missouri | .83 | .80 | .58 | .48 | .43 | .51 | .70 | .85 | .59 | .62 |
| Kansas | .77 | .73 | .52 | .42 | .44 | .45 | .63 | .74 | .50 | .52 |
| Nebraska | .76 | .73 | .50 | .40 | .49 | .40 | .58 | .69 | .47 | .49 |
| South Dakota | .70 | .72 | .51 | .44 | .46 | .38 | .62 | .69 | .50 | .50 |
| North Dakota | | .70 | .52 | .43 | .43 | .38 | .64 | .74 | .51 | .51 |
| Montana | .80 | .84 | .69 | .60 | .54 | .73 | .66 | .68 | .58 | .61 |
| Wyoming | .82 | .82 | .66 | .65 | .63 | .64 | .62 | .70 | .69 | .67 |
| Colorado | .81 | .73 | .58 | .52 | .65 | .56 | .61 | .70 | .56 | .57 |
| New Mexico | .95 | .82 | .80 | .75 | .88 | .73 | .66 | .75 | .62 | .61 |
| Arizona | .90 | .75 | .78 | .65 | 1.00 | .65 | .80 | .74 | .92 | .64 |
| Utah | .78 | .75 | .62 | .60 | .53 | .44 | .68 | .68 | .54 | .53 |
| Nevada | .86 | .87 | .75 | .73 | .75 | .49 | .69 | .90 | .95 | .76 |
| Idaho | .78 | .84 | .60 | .60 | .46 | .47 | .65 | .70 | .51 | .50 |
| Washington | .76 | .75 | .58 | .48 | .39 | .41 | .74 | .68 | .54 | .51 |
| Oregon | .75 | .88 | .64 | .55 | .43 | .47 | .72 | .72 | .62 | .53 |
| California | .76 | .95 | .68 | .53 | .57 | .60 | .83 | .83 | .72 | .62 |
| Oklahoma | ------ | ------ | ------ | ------ | .51 | .48 | .68 | .76 | .52 | .53 |
| General average | .838 | .839 | .624 | .538 | .491 | .509 | .726 | .808 | .582 | .584 |

OATS (PER BUSHEL).

| | Cents. | Cents. | Cents. | Cents. | Cents. | Cents. | Cents. | Cents. | Cents. | Cents. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | 57 | 45 | 45 | 45 | 44 | 34 | 31 | 32 | 34 | 38 |
| New Hampshire | 56 | 46 | 44 | 43 | 49 | 35 | 35 | 38 | 38 | 39 |
| Vermont | 50 | 41 | 43 | 42 | 51 | 33 | 31 | 32 | 35 | 37 |
| Massachusetts | 55 | 47 | 48 | 42 | 43 | 34 | 35 | 33 | 37 | 38 |
| Rhode Island | 54 | 47 | 49 | 43 | 47 | 39 | 31 | 34 | 37 | 37 |
| Connecticut | 53 | 45 | 45 | 40 | 43 | 31 | 31 | 34 | 36 | 37 |
| New York | 50 | 38 | 39 | 30 | 39 | 28 | 26 | 27 | 31 | 33 |
| New Jersey | 50 | 40 | 41 | 35 | 38 | 29 | 28 | 30 | 31 | 33 |
| Pennsylvania | 48 | 37 | 40 | 35 | 38 | 27 | 24 | 27 | 30 | 29 |
| Delaware | 45 | 39 | 38 | 38 | 35 | 29 | 21 | 23 | 30 | 25 |
| Maryland | 44 | 38 | 38 | 35 | 39 | 27 | 23 | 26 | 29 | 30 |
| Virginia | 45 | 41 | 39 | 35 | 37 | 30 | 26 | 29 | 29 | 33 |
| North Carolina | 51 | 51 | 45 | 44 | 44 | 38 | 35 | 37 | 37 | 41 |
| South Carolina | 60 | 61 | 52 | 53 | 53 | 49 | 48 | 45 | 45 | 47 |
| Georgia | 60 | 60 | 52 | 52 | 51 | 46 | 41 | 42 | 48 | 48 |
| Florida | 61 | 62 | 55 | 55 | 61 | 65 | 53 | 53 | 54 | 50 |
| Alabama | 62 | 60 | 51 | 51 | 51 | 42 | 41 | 43 | 41 | 43 |
| Mississippi | 60 | 58 | 50 | 47 | 47 | 39 | 44 | 44 | 42 | 50 |
| Louisiana | 61 | 52 | 50 | 44 | 47 | 36 | 34 | 38 | 38 | 40 |
| Texas | 55 | 47 | 38 | 42 | 39 | 26 | 34 | 27 | 28 | 30 |
| Arkansas | 53 | 42 | 40 | 39 | 40 | 32 | 31 | 33 | 29 | 34 |
| Tennessee | 45 | 40 | 38 | 31 | 35 | 27 | 26 | 28 | 28 | 32 |
| West Virginia | 45 | 40 | 41 | 38 | 39 | 32 | 28 | 30 | 30 | 35 |
| Kentucky | 45 | 37 | 37 | 34 | 36 | 26 | 24 | 27 | 27 | 32 |
| Ohio | 42 | 33 | 35 | 30 | 31 | 22 | 17 | 20 | 24 | 25 |
| Michigan | 44 | 32 | 35 | 32 | 34 | 23 | 19 | 23 | 27 | 28 |
| Indiana | 41 | 32 | 34 | 28 | 30 | 20 | 16 | 19 | 23 | 23 |
| Illinois | 41 | 28 | 31 | 27 | 29 | 17 | 15 | 18 | 23 | 22 |
| Wisconsin | 40 | 28 | 29 | 27 | 30 | 18 | 17 | 19 | 24 | 23 |
| Minnesota | 37 | 27 | 28 | 26 | 30 | 14 | 15 | 19 | 21 | 22 |
| Iowa | 38 | 26 | 26 | 23 | 28 | 14 | 12 | 16 | 24 | 19 |
| Missouri | 39 | 29 | 30 | 25 | 29 | 18 | 17 | 19 | 23 | 24 |
| Kansas | 38 | 27 | 26 | 27 | 31 | 17 | 16 | 18 | 22 | 22 |
| Nebraska | 39 | 23 | 23 | 22 | 36 | 14 | 11 | 15 | 20 | 22 |
| South Dakota | 32 | 25 | 23 | 25 | 35 | 17 | 13 | 18 | 21 | 23 |
| North Dakota | | 26 | 28 | 28 | 29 | 16 | 18 | 26 | 26 | 27 |
| Montana | 59 | 48 | 40 | 37 | 31 | 44 | 31 | 33 | 35 | 39 |
| Wyoming | 56 | ------ | 38 | 40 | 48 | 39 | 53 | 35 | 40 | 40 |
| Colorado | 50 | 38 | 34 | 37 | 46 | 28 | 30 | 32 | 41 | 42 |
| New Mexico | 57 | 55 | 56 | 51 | 50 | 45 | 40 | 41 | 41 | 44 |
| Utah | 55 | 42 | 40 | 33 | 34 | 30 | 39 | 33 | 38 | 40 |
| Idaho | 58 | 50 | 37 | 41 | 32 | 29 | 30 | 32 | 36 | 38 |
| Washington | 47 | 41 | 35 | 35 | 31 | 28 | 40 | 35 | 40 | 38 |
| Oregon | 50 | 41 | 37 | 37 | 28 | 27 | 33 | 35 | 40 | 41 |
| California | 56 | 60 | 40 | 38 | 44 | 39 | 44 | 49 | 50 | 47 |
| General average | 42.41 | 31.46 | 31.66 | 29.36 | 32.45 | 19.85 | 18.73 | 21.18 | 25.50 | 24.89 |

*Prices of principal agricultural products on the farm, December 1, 1890–1899*—C't'd.

BARLEY (PER BUSHEL).

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| Maine | 76 | 72 | 68 | 67 | 66 | 52 | 43 | 55 | 56 | 59 |
| New Hampshire | 81 | 74 | 74 | 70 | 63 | 56 | 53 | 60 | 58 | 65 |
| Vermont | 70 | 72 | 66 | 60 | 60 | 47 | 41 | 46 | 47 | 52 |
| Massachusetts | 77 | 75 | 75 | 90 | 63 | 65 | 58 | 66 | 66 | 68 |
| Rhode Island | 76 | 78 | 82 | 87 | 72 | 75 | 60 | 54 | 61 | 70 |
| New York | 78 | 65 | 75 | 60 | 56 | 81 | 39 | 42 | 48 | 50 |
| Pennsylvania | 70 | 64 | 57 | 50 | 48 | 41 | 40 | 39 | 44 | 49 |
| Texas | ...... | 78 | 65 | 62 | 55 | 54 | 50 | 43 | 50 | 66 |
| Tennessee | ...... | ...... | 66 | 55 | 56 | 50 | 45 | 59 | 56 | 64 |
| Kentucky | ...... | ...... | 38 | 51 | 47 | 38 | 40 | 40 | 40 | 43 |
| Ohio | 70 | 60 | 57 | 47 | 48 | 41 | 38 | 41 | 44 | 45 |
| Michigan | 63 | 60 | 60 | 49 | 50 | 43 | 42 | 40 | 44 | 48 |
| Indiana | 65 | 59 | 52 | 45 | 45 | 40 | 33 | 44 | 44 | 45 |
| Illinois | 60 | 55 | 49 | 40 | 48 | 45 | 31 | 38 | 39 | 47 |
| Wisconsin | 58 | 55 | 50 | 43 | 45 | 34 | 27 | 32 | 40 | 40 |
| Minnesota | 55 | 43 | 42 | 36 | 41 | 24 | 20 | 24 | 33 | 31 |
| Iowa | 52 | 42 | 40 | 33 | 42 | 23 | 21 | 24 | 34 | 31 |
| Missouri | 57 | 57 | 42 | 40 | 51 | 48 | 25 | 40 | 36 | 42 |
| Kansas | 57 | 40 | 35 | 47 | 49 | 23 | 22 | 25 | 27 | 27 |
| Nebraska | 57 | 37 | 33 | 31 | 43 | 24 | 19 | 24 | 25 | 30 |
| South Dakota | 52 | 41 | 35 | 33 | 35 | 19 | 19 | 22 | 27 | 29 |
| North Dakota | | 42 | 33 | 31 | 36 | 20 | 21 | 27 | 29 | 33 |
| Montana | 74 | 65 | 66 | 50 | 40 | 59 | 55 | 50 | 57 | 51 |
| Colorado | 76 | 56 | 54 | 50 | 58 | 60 | 46 | 51 | 46 | 55 |
| New Mexico | ...... | 70 | 65 | 58 | 70 | 68 | 65 | 55 | 55 | 61 |
| Utah | 75 | 60 | 52 | 45 | 46 | 39 | 42 | 45 | 47 | 52 |
| Idaho | 75 | 68 | 33 | 53 | 47 | 42 | 22 | 42 | 48 | 46 |
| Washington | 68 | 60 | 45 | 39 | 32 | 38 | 40 | 43 | 45 | 44 |
| Oregon | 70 | 48 | 46 | 40 | 33 | 40 | 45 | 45 | 49 | 50 |
| California | 75 | 61 | 47 | 42 | 45 | 40 | 48 | 54 | 65 | 50 |
| General average | 64.80 | 54.00 | 47.20 | 41.12 | 44.19 | 33.66 | 32.27 | 37.70 | 41.34 | 40.37 |

RYE (PER BUSHEL).

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| Maine | 85 | 97 | 84 | 108 | 81 | 85 | 67 | 82 | 84 | 84 |
| New Hampshire | 84 | 95 | 83 | 78 | 74 | 76 | 72 | 84 | 75 | 81 |
| Vermont | 80 | 90 | 73 | 73 | 73 | 57 | 65 | 60 | 58 | 62 |
| Massachusetts | 81 | 96 | 72 | 75 | 73 | 67 | 70 | 61 | 63 | 79 |
| Connecticut | 80 | 94 | 73 | 66 | 65 | 63 | 57 | 59 | 60 | 64 |
| New York | 73 | 88 | 65 | 63 | 54 | 48 | 44 | 48 | 50 | 56 |
| New Jersey | 75 | 82 | 62 | 70 | 55 | 51 | 47 | 50 | 50 | 55 |
| Pennsylvania | 70 | 80 | 62 | 57 | 56 | 50 | 47 | 43 | 47 | 51 |
| Maryland | 70 | 88 | 62 | 51 | 47 | 49 | 48 | 46 | 54 | 57 |
| Virginia | 67 | 82 | 63 | 56 | 54 | 52 | 48 | 50 | 46 | 53 |
| North Carolina | 81 | 85 | 85 | 70 | 70 | 64 | 71 | 60 | 64 | 75 |
| South Carolina | 85 | 107 | 98 | 110 | 96 | 115 | 87 | 86 | 102 | 109 |
| Georgia | 90 | 115 | 100 | 108 | 97 | 85 | 101 | 92 | 98 | 112 |
| Alabama | 90 | 112 | 100 | 115 | 95 | 84 | 88 | 118 | 105 | 104 |
| Texas | 80 | 80 | 70 | 68 | 75 | 75 | 67 | 72 | 71 | 82 |
| Arkansas | ...... | 88 | 82 | 58 | 76 | 72 | 70 | 86 | 65 | 74 |
| Tennessee | 75 | 85 | 65 | 59 | 59 | 62 | 60 | 58 | 53 | 67 |
| West Virginia | 69 | 76 | 67 | 65 | 57 | 61 | 56 | 51 | 52 | 62 |
| Kentucky | 70 | 83 | 62 | 58 | 59 | 56 | 54 | 53 | 55 | 70 |
| Ohio | 63 | 85 | 56 | 47 | 45 | 45 | 39 | 44 | 45 | 55 |
| Michigan | 60 | 78 | 53 | 44 | 46 | 40 | 32 | 42 | 43 | 52 |
| Indiana | 60 | 78 | 52 | 45 | 42 | 42 | 36 | 42 | 43 | 48 |
| Illinois | 59 | 77 | 50 | 41 | 43 | 40 | 34 | 44 | 44 | 47 |
| Wisconsin | 56 | 78 | 48 | 43 | 43 | 35 | 33 | 41 | 43 | 48 |
| Minnesota | 53 | 68 | 44 | 41 | 43 | 28 | 30 | 37 | 38 | 42 |
| Iowa | 50 | 67 | 49 | 41 | 46 | 31 | 29 | 36 | 40 | 40 |
| Missouri | 58 | 73 | 50 | 45 | 47 | 39 | 47 | 44 | 47 | 50 |
| Kansas | 55 | 64 | 40 | 38 | 46 | 38 | 35 | 40 | 37 | 42 |
| Nebraska | 52 | 60 | 39 | 35 | 48 | 30 | 22 | 32 | 34 | 38 |
| South Dakota | 47 | 60 | 37 | 37 | 46 | 25 | 27 | 35 | 34 | 37 |
| North Dakota | | 65 | 44 | 32 | 37 | 27 | 22 | 36 | 36 | 37 |
| Colorado | 65 | 62 | 52 | 50 | 66 | 48 | 62 | 52 | 50 | 48 |
| Utah | 63 | 64 | 55 | 47 | 57 | 35 | 40 | 60 | 46 | 48 |
| Washington | 68 | 82 | 55 | 69 | 56 | 75 | 50 | 62 | 58 | 60 |
| Oregon | 68 | 80 | 60 | 73 | 57 | 54 | 60 | 59 | 72 | 70 |
| California | 70 | 90 | 67 | 60 | 60 | 58 | 60 | 65 | 70 | 78 |
| General average | 62.89 | 77.44 | 54.18 | 51.26 | 50.12 | 43.97 | 40.87 | 44.73 | 46.28 | 50.97 |

*Prices of principal agricultural products on the farm, December 1, 1890–1899*—C't'd.

BUCKWHEAT (PER BUSHEL).

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| Maine | 55 | 61 | 57 | 54 | 58 | 46 | 38 | 44 | 39 | 44 |
| New Hampshire | 62 | 67 | 70 | 37 | 61 | 47 | 63 | 55 | 47 | 50 |
| Vermont | 55 | 55 | 48 | 53 | 57 | 37 | 40 | 46 | 46 | 52 |
| Massachusetts | 65 | 70 | 78 | 75 | 68 | 59 | 53 | 66 | 61 | 70 |
| Connecticut | 60 | 77 | 75 | 72 | 67 | 56 | 51 | 57 | 56 | 63 |
| New York | 58 | 56 | 50 | 60 | 54 | 44 | 37 | 40 | 45 | 59 |
| New Jersey | 60 | 67 | 57 | 66 | 65 | 50 | 39 | 49 | 54 | 56 |
| Pennsylvania | 55 | 57 | 53 | 59 | 53 | 44 | 38 | 42 | 44 | 54 |
| Delaware | 58 | 75 | 60 | 55 | 50 | 50 | 30 | 36 | 40 | 49 |
| Maryland | 59 | 70 | 65 | 58 | 56 | 56 | 49 | 51 | 53 | 56 |
| Virginia | 65 | 65 | 61 | 55 | 54 | 54 | 47 | 50 | 45 | 54 |
| North Carolina | 63 | 56 | 55 | 49 | 47 | 44 | 60 | 49 | 48 | 49 |
| Tennessee | ------ | ------ | 62 | 54 | 57 | 54 | 62 | 57 | 52 | 57 |
| West Virginia | 68 | 60 | 65 | 68 | 62 | 57 | 50 | 49 | 49 | 56 |
| Ohio | 65 | 65 | 59 | 60 | 66 | 55 | 43 | 50 | 51 | 58 |
| Michigan | 55 | 50 | 49 | 53 | 55 | 43 | 38 | 38 | 42 | 55 |
| Indiana | 65 | 63 | 58 | 56 | 56 | 58 | 51 | 49 | 51 | 59 |
| Illinois | 62 | 64 | 60 | 57 | 77 | 44 | 45 | 57 | 52 | 58 |
| Wisconsin | 53 | 53 | 45 | 57 | 56 | 46 | 38 | 38 | 40 | 63 |
| Minnesota | 52 | 56 | 45 | 53 | 59 | 51 | 41 | 45 | 49 | 52 |
| Iowa | 63 | 60 | 60 | 61 | 75 | 50 | 46 | 49 | 48 | 58 |
| Missouri | 65 | 75 | 65 | 58 | 60 | 58 | 70 | 60 | 60 | 61 |
| Nebraska | 70 | 58 | 50 | 52 | 68 | 65 | 50 | 51 | 61 | 62 |
| Oregon | 70 | 81 | 75 | 50 | 55 | 50 | 68 | 55 | 58 | 74 |
| General average | 57.37 | 56.98 | 51.85 | 58.36 | 55.57 | 45.21 | 39.19 | 42.14 | 44.97 | 55.74 |

POTATOES (PER BUSHEL).

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| Maine | 71 | 41 | 77 | 54 | 44 | 34 | 38 | 89 | 46 | 42 |
| New Hampshire | 72 | 45 | 85 | 63 | 47 | 32 | 47 | 90 | 49 | 46 |
| Vermont | 63 | 38 | 68 | 48 | 44 | 26 | 29 | 70 | 42 | 36 |
| Massachusetts | 84 | 54 | 83 | 76 | 65 | 48 | 57 | 90 | 63 | 57 |
| Rhode Island | 85 | 60 | 85 | 79 | 72 | 45 | 54 | 97 | 64 | 50 |
| Connecticut | 85 | 55 | 76 | 75 | 68 | 41 | 46 | 90 | 55 | 46 |
| New York | 78 | 37 | 65 | 55 | 48 | 23 | 31 | 67 | 42 | 40 |
| New Jersey | 82 | 49 | 75 | 75 | 62 | 34 | 36 | 78 | 61 | 51 |
| Pennsylvania | 77 | 43 | 72 | 60 | 57 | 28 | 27 | 66 | 58 | 43 |
| Delaware | 75 | 45 | 63 | 65 | 50 | 38 | 35 | 65 | 69 | 51 |
| Maryland | 71 | 48 | 68 | 68 | 53 | 30 | 30 | 68 | 53 | 51 |
| Virginia | 67 | 47 | 60 | 57 | 56 | 38 | 34 | 70 | 55 | 56 |
| North Carolina | 65 | 68 | 61 | 60 | 60 | 55 | 43 | 64 | 62 | 66 |
| South Carolina | 90 | 82 | 85 | 77 | 77 | 73 | 66 | 105 | 100 | 104 |
| Georgia | 95 | 80 | 80 | 92 | 81 | 71 | 75 | 100 | 75 | 83 |
| Florida | 97 | 90 | 75 | 117 | 75 | 100 | 84 | 120 | 120 | 124 |
| Alabama | 93 | 78 | 76 | 88 | 88 | 81 | 75 | 94 | 83 | 87 |
| Mississippi | 98 | 81 | 76 | 84 | 82 | 64 | 62 | 82 | 72 | 102 |
| Louisiana | 92 | 82 | 77 | 83 | 83 | 72 | 76 | 85 | 75 | 81 |
| Texas | 90 | 95 | 85 | 103 | 99 | 78 | 78 | 95 | 86 | 91 |
| Arkansas | 88 | 64 | 70 | 64 | 53 | 51 | 53 | 84 | 55 | 71 |
| Tennessee | 85 | 55 | 48 | 49 | 49 | 40 | 40 | 73 | 57 | 65 |
| West Virginia | 82 | 42 | 58 | 59 | 57 | 42 | 31 | 65 | 54 | 52 |
| Kentucky | 84 | 45 | 52 | 56 | 56 | 39 | 33 | 67 | 46 | 61 |
| Ohio | 85 | 35 | 64 | 67 | 52 | 32 | 26 | 62 | 41 | 43 |
| Michigan | 64 | 24 | 53 | 45 | 43 | 16 | 19 | 43 | 27 | 32 |
| Indiana | 92 | 37 | 72 | 73 | 54 | 31 | 25 | 62 | 41 | 43 |
| Illinois | 95 | 40 | 80 | 74 | 64 | 30 | 26 | 62 | 46 | 41 |
| Wisconsin | 63 | 26 | 54 | 49 | 53 | 17 | 19 | 38 | 24 | 26 |
| Minnesota | 60 | 24 | 48 | 46 | 51 | 14 | 21 | 31 | 25 | 25 |
| Iowa | 70 | 22 | 75 | 65 | 69 | 19 | 22 | 47 | 30 | 23 |
| Missouri | 80 | 35 | 77 | 57 | 52 | 25 | 31 | 63 | 44 | 40 |
| Kansas | 98 | 35 | 88 | 79 | 68 | 42 | 27 | 55 | 51 | 45 |
| Nebraska | 99 | 28 | 75 | 79 | 77 | 30 | 25 | 46 | 37 | 25 |
| South Dakota | 68 | 28 | 55 | 59 | 74 | 26 | 20 | 32 | 28 | 27 |
| North Dakota | | 20 | 40 | 49 | 46 | 17 | 21 | 33 | 34 | 27 |
| Montana | 80 | 41 | 60 | 69 | 48 | 48 | 32 | 40 | 55 | 53 |
| Wyoming | 80 | 43 | 70 | 65 | 60 | 56 | 43 | 55 | 65 | 61 |
| Colorado | 75 | 28 | 61 | 54 | 55 | 33 | 47 | 56 | 54 | 55 |
| New Mexico | 95 | 63 | 80 | 67 | 80 | 63 | 68 | 78 | 78 | 68 |
| Utah | 75 | 25 | 72 | 33 | 30 | 34 | 32 | 30 | 31 | 55 |
| Nevada | 70 | 50 | 58 | 40 | 35 | 38 | 38 | 73 | 90 | 90 |
| Idaho | ------ | 40 | 54 | 56 | 53 | 40 | 30 | 32 | 54 | 61 |
| Washington | 60 | 38 | 50 | 39 | 28 | 28 | 40 | 28 | 39 | 50 |
| Oregon | 65 | 40 | 56 | 47 | 36 | 39 | 39 | 40 | 47 | 49 |
| California | 68 | 54 | 59 | 50 | 49 | 48 | 53 | 49 | 55 | 63 |
| General average | 75.77 | 35.78 | 66.11 | 59.37 | 53.59 | 26.57 | 28.62 | 54.66 | 41.38 | 39.04 |

*Prices of principal agricultural products on the farm, December 1, 1890–1899*—C't'd.

HAY (PER TON).

| States and Territories. | 1890. | 1891. | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|---|---|---|---|---|
| Maine | $9.25 | $9.30 | $12.80 | $12.13 | $9.60 | $9.68 | $10.25 | $9.75 | $7.60 | $10.10 |
| New Hampshire | 9.75 | 11.00 | 13.20 | 15.60 | 10.50 | 12.50 | 12.90 | 11.50 | 9.25 | 11.75 |
| Vermont | 8.70 | 9.00 | 10.00 | 10.63 | 9.94 | 12.25 | 10.28 | 9.25 | 6.35 | 9.25 |
| Massachusetts | 13.50 | 16.00 | 16.60 | 17.33 | 15.50 | 17.50 | 16.40 | 13.90 | 12.10 | 15.50 |
| Rhode Island | 14.00 | 16.25 | 17.40 | 19.60 | 16.33 | 17.25 | 16.60 | 14.50 | 12.65 | 17.25 |
| Connecticut | 13.50 | 15.75 | 16.50 | 17.50 | 15.56 | 16.10 | 14.71 | 13.00 | 11.15 | 14.50 |
| New York | 7.75 | 11.00 | 11.00 | 11.33 | 9.66 | 13.70 | 12.04 | 8.25 | 5.75 | 10.45 |
| New Jersey | 10.30 | 14.40 | 14.25 | 17.43 | 14.09 | 12.64 | 14.35 | 10.75 | 9.60 | 15.35 |
| Pennsylvania | 7.50 | 10.00 | 12.30 | 14.40 | 11.31 | 12.30 | 12.15 | 9.15 | 7.90 | 11.50 |
| Delaware | 10.00 | 12.00 | 12.33 | 17.00 | 15.00 | 12.16 | 13.00 | 10.00 | 8.45 | 11.65 |
| Maryland | 9.84 | 11.15 | 11.75 | 14.25 | 11.13 | 11.55 | 11.85 | 10.50 | 9.80 | 12.15 |
| Virginia | 10.70 | 11.00 | 11.50 | 13.09 | 11.89 | 11.43 | 10.21 | 10.25 | 8.50 | 10.25 |
| North Carolina | 11.91 | 11.00 | 10.55 | 11.11 | 10.93 | 10.14 | 10.75 | 9.75 | 9.30 | 10.10 |
| South Carolina | 13.00 | 12.18 | 11.30 | 9.67 | 10.75 | 7.62 | 11.32 | 11.50 | 9.50 | 10.30 |
| Georgia | 14.25 | 13.50 | 11.80 | 12.06 | 12.38 | 10.90 | 11.05 | 13.00 | 11.75 | 13.15 |
| Florida | 15.50 | 15.00 | 14.00 | 19.75 | 16.25 | 13.23 | 13.00 | 14.25 | 14.10 | 15.35 |
| Alabama | 13.50 | 12.38 | 10.80 | 11.24 | 9.51 | 10.21 | 9.80 | 10.25 | 9.25 | 11.40 |
| Mississippi | 11.40 | 11.22 | 9.91 | 9.61 | 9.67 | 9.70 | 9.46 | 9.50 | 8.40 | 9.25 |
| Louisiana | 10.20 | 11.58 | 9.80 | 9.00 | 10.64 | 9.64 | 8.75 | 8.75 | 9.40 | 9.70 |
| Texas | 9.50 | 8.75 | 8.56 | 9.60 | 7.62 | 6.43 | 7.20 | 7.25 | 5.85 | 7.10 |
| Arkansas | 10.30 | 10.57 | 8.74 | 9.37 | 8.83 | 9.27 | 7.54 | 8.65 | 6.75 | 8.65 |
| Tennessee | 10.00 | 11.30 | 10.40 | 10.76 | 11.27 | 10.83 | 9.67 | 10.75 | 9.50 | 11.25 |
| West Virginia | 8.50 | 9.17 | 10.50 | 12.25 | 10.66 | 12.73 | 9.79 | 8.85 | 8.40 | 9.45 |
| Kentucky | 9.00 | 10.15 | 9.50 | 10.16 | 10.47 | 10.94 | 9.46 | 10.00 | 9.10 | 10.40 |
| Ohio | 7.50 | 8.20 | 9.17 | 10.05 | 8.46 | 12.76 | 7.93 | 6.25 | 5.75 | 8.95 |
| Michigan | 8.00 | 11.00 | 8.40 | 9.16 | 9.04 | 13.09 | 8.48 | 7.75 | 7.15 | 8.50 |
| Indiana | 8.00 | 7.70 | 7.80 | 9.16 | 7.58 | 12.08 | 7.18 | 5.90 | 5.60 | 7.80 |
| Illinois | 7.60 | 7.72 | 7.53 | 8.86 | 8.33 | 10.25 | 6.39 | 6.15 | 5.90 | 7.75 |
| Wisconsin | 6.65 | 9.80 | 7.65 | 7.20 | 7.96 | 9.63 | 6.60 | 6.25 | 5.75 | 6.85 |
| Minnesota | 5.00 | 5.75 | 4.60 | 4.57 | 5.30 | 5.12 | 3.79 | 4.50 | 3.70 | 4.35 |
| Iowa | 6.75 | 5.50 | 5.25 | 6.16 | 7.39 | 6.45 | 3.99 | 4.25 | 4.05 | 5.30 |
| Missouri | 7.20 | 6.20 | 6.75 | 7.04 | 7.82 | 6.80 | 4.85 | 6.15 | 5.80 | 6.25 |
| Kansas | 5.18 | 3.62 | 4.40 | 4.69 | 5.25 | 3.26 | 2.70 | 3.40 | 3.25 | 3.50 |
| Nebraska | 5.00 | 3.17 | 4.27 | 4.87 | 7.12 | 3.56 | 2.44 | 3.00 | 3.30 | 3.70 |
| South Dakota | 4.50 | 4.20 | 3.40 | 3.67 | 4.28 | 3.29 | 3.12 | 2.95 | 3.00 | 3.10 |
| North Dakota | | 4.00 | 4.10 | 3.72 | 3.87 | 3.48 | 3.39 | 3.25 | 3.25 | 3.30 |
| Montana | 10.50 | 8.50 | 8.95 | 7.89 | 7.17 | 1.40 | 6.86 | 7.75 | 6.80 | 7.70 |
| Wyoming | ...... | 9.00 | 6.40 | 8.00 | 10.00 | 6.50 | 7.14 | 6.00 | 5.90 | 6.60 |
| Colorado | 9.00 | 8.00 | 6.50 | 6.98 | 7.54 | 5.87 | 6.22 | 5.50 | 5.40 | 7.35 |
| New Mexico | 9.00 | 9.50 | 11.25 | 8.50 | 11.50 | 8.00 | 5.70 | 7.00 | 7.35 | 10.60 |
| Arizona | 7.50 | ...... | 10.50 | 8.25 | 12.00 | 9.00 | 8.75 | 5.00 | 12.00 | 10.35 |
| Utah | 8.00 | 5.50 | 6.31 | 5.17 | 5.56 | 5.27 | 5.00 | 4.75 | 4.50 | 7.10 |
| Nevada | 9.75 | 5.00 | 7.00 | 10.00 | 7.25 | 6.75 | 4.82 | 5.00 | 7.00 | 7.65 |
| Idaho | 11.00 | 6.67 | 7.40 | 5.50 | 4.34 | 6.25 | 4.71 | 5.25 | 4.90 | 6.30 |
| Washington | 12.00 | 10.50 | 9.00 | 9.17 | 7.38 | 6.75 | 7.09 | 9.00 | 7.60 | 8.90 |
| Oregon | 10.00 | 8.00 | 8.92 | 8.10 | 5.86 | 6.12 | 6.60 | 7.75 | 7.25 | 6.85 |
| California | 10.50 | 11.00 | 8.76 | 7.87 | 9.50 | 7.06 | 6.35 | 9.00 | 14.25 | 8.00 |
| General average | 7.74 | 8.39 | 8.49 | 8.68 | 8.54 | 8.35 | 6.55 | 6.62 | 6.00 | 7.27 |

COTTON (PER POUND).

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| Virginia | 8.7 | 7.0 | 8.6 | 7.1 | 5.0 | 7.8 | 7.1 | 6.9 | 5.9 | 7.0 |
| North Carolina | 8.7 | 7.4 | 8.6 | 7.2 | 4.8 | 8.2 | 6.7 | 7.0 | 5.9 | 7.2 |
| South Carolina | 8.7 | 7.4 | 8.6 | 7.1 | 5.0 | 8.8 | 6.8 | 6.9 | 5.6 | 7.0 |
| Georgia | 8.6 | 7.4 | 8.5 | 7.3 | 4.5 | 7.0 | 7.0 | 6.7 | 5.6 | 7.2 |
| Florida | 8.6 | 7.3 | 8.2 | 7.3 | 4.8 | 11.5 | 8.7 | 6.8 | 5.6 | 8.4 |
| Alabama | 8.6 | 7.3 | 8.5 | 7.0 | 4.8 | 7.8 | 6.5 | 6.7 | 5.7 | 7.0 |
| Mississippi | 8.8 | 7.3 | 8.5 | 7.0 | 4.1 | 7.5 | 6.7 | 6.7 | 5.7 | 7.0 |
| Louisiana | 8.8 | 7.3 | 8.4 | 7.0 | 4.3 | 7.8 | 6.7 | 6.7 | 5.7 | 6.9 |
| Texas | 8.4 | 7.0 | 8.0 | 6.9 | 4.5 | 7.3 | 6.5 | 6.6 | 5.8 | 6.8 |
| Arkansas | 8.5 | 7.3 | 8.5 | 6.8 | 4.8 | 7.6 | 6.4 | 6.5 | 5.8 | 6.9 |
| Tennessee | 8.4 | 7.3 | 8.5 | 6.5 | 4.5 | 7.3 | 6.2 | 6.6 | 5.7 | 7.5 |
| Missouri | 8.6 | ...... | 7.8 | ...... | 4.6 | 7.4 | 6.2 | 6.4 | 5.8 | 7.0 |
| Oklahoma | ...... | ...... | ...... | ...... | 4.6 | 7.5 | 6.2 | 6.7 | 5.8 | 6.8 |
| Indian Territory | ...... | ...... | ...... | ...... | ...... | 7.3 | ...... | 6.4 | 5.8 | 6.9 |
| General average | 8.6 | 7.3 | 8.4 | 7.0 | 4.6 | 7.6 | 6.6 | 6.6 | 5.7 | ...... |

*Average yields of wheat, oats, rye, and barley in certain countries.*

[From official returns. Bushels per acre.]

WHEAT.

| Year. | United States. | Russia. | Germany. | Austria. | Hungary. | France. | United Kingdom. |
|---|---|---|---|---|---|---|---|
| | (a) | (b) | (b) | (b) | (a) | (a) | (a) |
| 1894 | 13.2 | 10.8 | 25.1 | 17.4 | 17.8 | 20.1 | 31.7 |
| 1895 | 13.7 | 9.8 | 24.4 | 15.3 | 20.1 | 19.7 | 27.2 |
| 1896 | 12.4 | 9.0 | 26.4 | 15.9 | 19.2 | 20.0 | 34.7 |
| 1897 | 13.4 | 7.3 | 25.3 | 13.2 | 12.1 | 15.1 | 30.0 |
| 1898 | 15.3 | 9.8 | 27.2 | 18.0 | 17.1 | 21.1 | 35.8 |
| Average | 13.6 | 9.3 | 25.7 | 16.0 | 17.3 | 19.2 | 31.9 |

OATS.

| Year. | United States. | Russia. | Germany. | Austria. | Hungary. | France. | United Kingdom. |
|---|---|---|---|---|---|---|---|
| | (a) | (c) | (c) | (c) | (a) | (a) | (a) |
| 1894 | 24.5 | 21.7 | 46.8 | 25.9 | 28.3 | 27.2 | 43.7 |
| 1895 | 29.6 | 19.9 | 43.2 | 26.2 | 28.3 | 27.5 | 39.9 |
| 1896 | 25.7 | 19.2 | 41.8 | 23.1 | 29.4 | 27.0 | 39.2 |
| 1897 | 27.2 | 15.7 | 39.9 | 21.5 | 23.1 | 23.1 | 40.1 |
| 1898 | 28.4 | 16.5 | 47.1 | 27.3 | 30.2 | 29.0 | 43.6 |
| Average | 27.1 | 18.6 | 43.8 | 24.8 | 27.9 | 26.8 | 41.3 |

RYE.

| Year. | United States. | Russia. | Germany. | Austria. | Hungary. | France. | United Kingdom. |
|---|---|---|---|---|---|---|---|
| | (a) | (d) | (d) | (d) | (a) | (a) | (d f) |
| 1894 | 13.7 | 12.7 | 22.0 | 17.2 | 19.3 | 19.5 | 25.4 |
| 1895 | 13.4 | 11.6 | 20.9 | 14.5 | 16.8 | 18.8 | 26.8 |
| 1896 | 13.3 | 10.9 | 22.7 | 16.3 | 18.3 | 18.7 | 25.4 |
| 1897 | 16.1 | 9.3 | 21.8 | 13.9 | 13.9 | 13.4 | 21.6 |
| 1898 | 15.6 | 10.5 | 24.2 | 17.7 | 17.1 | 18.3 | 25.8 |
| Average | 14.4 | 11.0 | 22.3 | 15.9 | 17.1 | 17.7 | 25.0 |

BARLEY.

| Year. | United States. | Russia. | Germany. | Austria. | Hungary. | France. | United Kingdom. |
|---|---|---|---|---|---|---|---|
| | (a) | (e) | (e) | (e) | (a) | (a) | (a) |
| 1894 | 19.4 | 15.3 | 33.0 | 22.3 | 21.2 | 22.0 | 35.9 |
| 1895 | 26.4 | 13.7 | 31.2 | 20.9 | 20.6 | 21.9 | 33.1 |
| 1896 | 23.6 | 12.8 | 30.7 | 19.3 | 22.8 | 21.8 | 35.2 |
| 1897 | 24.5 | 11.8 | 29.0 | 17.6 | 17.3 | 19.4 | 33.9 |
| 1898 | 21.6 | 14.9 | 32.2 | 22.0 | 22.5 | 23.3 | 37.4 |
| Average | 23.1 | 13.7 | 31.2 | 20.4 | 20.9 | 21.7 | 35.1 |

*a* Winchester bushels.
*b* Bushels of 60 pounds.
*c* Bushels of 32 pounds.
*d* Bushels of 56 pounds.
*e* Bushels of 48 pounds.
*f* For Ireland only.

*Wholesale prices in leading cities of the United States, 1895–1899.*

[From Division of Statistics.]

CORN (PER BUSHEL).

| Date. | New York. | | Baltimore. | | Cincinnati. | | Chicago. | | Detroit. | | St. Louis. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 2. | | No. 2. | | No. 2. | | No. 2. | | No. 2. | | No. 2. | | No. 1. white (per cwt.). | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| 1895. | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | | |
| January | 47 | 52¾ | 45 | 50 | 42½ | 45 | 40½ | 46 | 41¼ | 43¼ | 40 | 43½ | $1.22½ | $1.27½ |
| February | 46½ | 49⅝ | 44¼ | 50 | 42¼ | 45 | 40⅝ | 43½ | 40½ | 43¼ | 38 | 42¾ | 1.20 | 1.22½ |
| March | 48¾ | 56 | 47½ | 51 | 43 | 48½ | 42¼ | 45¾ | 43 | 46 | 41 | 43⅝ | 1.20 | 1.22½ |
| April | 54 | 56 | 49¼ | 53½ | 47 | 50 | 44¾ | 48 | 45½ | 48 | 42½ | 47 | 1.17½ | 1.20 |
| May | 54½ | 60¼ | 53 | 60¾ | 49 | 57 | 46½ | 54⅝ | 48 | 55 | 45¾ | 54½ | 1.12½ | 1.20 |
| June | 51⅝ | 57¾ | 50 | 57½ | 48 | 55 | 46½ | 53½ | 48 | 53 | 43⅝ | 49½ | 1.07½ | 1.15 |
| July | 46⅝ | 51¾ | 48 | 52 | 43 | 51 | 41¾ | 47⅛ | 43 | 48½ | 38½ | 43⅛ | 1.07½ | 1.15 |
| August | 39½ | 49⅝ | 42 | 51 | 37½ | 44 | 36½ | 44½ | 38¾ | 44½ | 33⅝ | 39 | 1.12½ | 1.17½ |
| September | 37 | 41¾ | 38 | 42½ | 32 | 39 | 30¾ | 36 | 34 | 40 | 27½ | 33½ | 1.12½ | 1.17½ |
| October | 36½ | 40 | 32 | 40 | 31 | 33¾ | 28 | 32 | 30½ | 34 | 26 | 28½ | .95 | 1.07½ |
| November | 34¾ | 37½ | 32 | 37 | 30 | 32½ | 26⅝ | 29½ | 28¾ | 32 | 24 | 26¾ | .87½ | .95 |
| December | 32½ | 35½ | 31 | 34½ | 26 | 30 | 24⅞ | 26¾ | 26½ | 29 | 23½ | 25½ | .82½ | .90 |
| 1896. | | | | | | | | | | | | | | |
| January | 34⅝ | 37 | 31¾ | 34 | 27½ | 30 | 25⅛ | 28¼ | 27½ | 29¼ | 23⅝ | 26⅝ | .83¾ | .85 |
| February | 36 | 37¾ | 32½ | 35 | 29½ | 31 | 27¾ | 29 | 28 | 30 | 26 | 27⅝ | .81¼ | .85 |
| March | 37 | 40 | 33½ | 36½ | 29½ | 31 | 28⅛ | 29¼ | 29 | 30½ | 26 | 27¼ | .82½ | .83¾ |
| April | 35⅝ | 41 | 34½ | 36 | 31 | 32¼ | 28¾ | 30⅝ | 28½ | 32 | 25¾ | 27¾ | .85 | .91¼ |
| May | 33½ | 35⅝ | 33 | 36 | 30 | 32¼ | 27½ | 29½ | 28 | 28½ | 25¼ | 27¼ | .85 | .90 |
| June | 33 | 34¼ | 33 | 36½ | 29 | 30 | 26⅛ | 28½ | 27 | 29 | 24⅝ | 26½ | .82½ | .83¾ |
| July | 30⅝ | 34 | 30 | 35 | 27½ | 30½ | 24¼ | 27¾ | 25 | 29 | 22 | 25½ | .80 | .80 |
| August | 26¼ | 31¼ | 26½ | 31 | 24 | 27½ | 20½ | 25 | 22½ | 26½ | 18½ | 22¾ | .77½ | .81¼ |
| September | 25¼ | 27⅝ | 26 | 30 | 22½ | 26 | 19⅛ | 22¼ | 20½ | 24½ | 17¾ | 21 | .75 | .77½ |
| October | 28 | 34½ | 27 | 35½ | 26 | 30 | 22¼ | 26½ | 24½ | 30 | 21 | 24¼ | .78¾ | .87½ |
| November | 28⅝ | 31¾ | 23¼ | 30½ | 22 | 27 | 22¾ | 25½ | 22 | 25 | 21¼ | 23½ | .87½ | .90 |
| December | 28⅝ | 29¾ | 22 | 30 | 22 | 24 | 22½ | 23¾ | 20½ | 22 | 19⅞ | 21½ | .85 | .87½ |
| 1897. | | | | | | | | | | | | | | |
| January | 28¼ | 29¼ | 22 | 28¼ | 22⅛ | 24 | 21⅝ | 23⅝ | 21½ | 23 | 19¼ | 20⅞ | .77½ | .87½ |
| February | 28 | 29⅝ | 26 | 29 | 23½ | 25 | 21⅞ | 23¼ | 21½ | 23½ | 19⅜ | 20½ | .77½ | .82½ |
| March | 27 | 30¼ | 26½ | 31 | 24 | 25½ | 22⅝ | 24½ | 23 | 25 | 20¼ | 21½ | .80 | .85 |
| April | 28¼ | 30⅝ | 23½ | 31 | 25 | 30 | 23½ | 25¼ | 24 | 26 | 20⅜ | 22¾ | .81¼ | .85 |
| May | 29 | 30¼ | 31 | 34 | 26½ | 31 | 23 | 25½ | 23 | 27 | 20⅝ | 24 | .82½ | .97½ |
| June | 28½ | 30 | 30 | 33 | 26 | 27½ | 23¼ | 25⅝ | 24 | 27 | 21½ | 23½ | .90 | .97½ |
| July | 28¼ | 33⅞ | 30 | 35 | 27½ | 29½ | 24⅝ | 28¼ | 26½ | 28½ | 21½ | 25⅛ | .90 | .97½ |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

CORN (PER BUSHEL)—Continued.

| Date. | New York. | | Baltimore. | | Cincinnati. | | Chicago. | | Detroit. | | St. Louis. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 2. | | No. 2. | | No. 2. | | No. 2. | | No. 2. | | No. 2. | | No. 1, white (per cwt.). | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| 1897. | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | | |
| August | 31¼ | 38 | 34 | 38 | 28¾ | 33 | 26⅛ | 32⅝ | 28½ | 32½ | 25 | 27¾ | $1.05 | $1.10 |
| September | 32 | 37½ | 36 | 39 | 30⅛ | 33½ | 27¼ | 32 | 30 | 32½ | 25 | 29½ | 1.07½ | 1.12½ |
| October | 29⅝ | 33½ | 31 | 37½ | 26½ | 31 | 24 | 29 | 24½ | 31 | 24 | 27¼ | 1.10 | 1.12½ |
| November | 30⅝ | 32¾ | 30 | 35½ | 26 | 28½ | 25⅝ | 27⅝ | 25¾ | 26⅛ | 24⅜ | 26½ | .90 | .97½ |
| December | 31¼ | 34 | 27½ | 35½ | 27 | 30 | 25 | 27½ | 26⅛ | 30½ | 24 | 26¼ | .90 | .92½ |
| 1898. | | | | | | | | | | | | | | |
| January | 33 | 35⅛ | 29 | 35¾ | 29 | 30 | 26 | 28¼ | 28½ | 30 | 25¼ | 26¾ | .85 | .97½ |
| February | 34¼ | 37¼ | 32 | 36 | 29½ | 32 | 27¼ | 30⅝ | 28¾ | 33½ | 26 | 28½ | .97½ | 1.10 |
| March | 34¼ | 36¼ | 32¼ | 35 | 31⅝ | 32¼ | 28½ | 29¾ | 29½ | 32 | 26⅛ | 27⅞ | 1.05 | 1.12½ |
| April | 34⅝ | 40⅝ | 34 | 42 | 31½ | 38 | 28⅞ | 35¼ | 31 | 36⅛ | 27 | 32⅝ | 1.10 | 1.15 |
| May | 36⅞ | 41⅞ | 36¾ | 42½ | 37 | 40 | 32⅝ | 37 | 35 | 39⅛ | 32 | 35½ | 1.10 | 1.12½ |
| June | 35⅛ | 38⅝ | 35½ | 37½ | 34¼ | 36 | 31 | 33¾ | 31¼ | 36 | 30 | 32½ | 1.05 | 1.12½ |
| July | 35½ | 38⅝ | 35 | 42 | 34½ | 37½ | 31¾ | 35½ | 32 | 36 | 30½ | 33¾ | 1.07½ | 1.12½ |
| August | 35 | 38 | 33 | 41 | 31 | 36½ | 29¾ | 33¾ | 32 | 35½ | 28¼ | 33 | 1.10 | 1.17½ |
| September | 34 | 35⅛ | 34 | 36½ | 31 | 31½ | 29⅛ | 31⅝ | 30½ | 32½ | 28½ | 29⅝ | 1.12½ | 1.15 |
| October | 34¼ | 38¾ | 34 | 38 | 31 | 35 | 28¾ | 32⅞ | 30 | 35½ | 29 | 32½ | 1.05 | 1.15 |
| November | 37½ | 39¼ | 32 | 39 | 34 | 37 | 31⅜ | 34½ | 34 | 36 | 30 | 32¼ | 1.05 | 1.07½ |
| December | 38⅞ | 44¼ | 36 | 43½ | 34 | 38½ | 33⅛ | 38 | 34 | 38 | 31¾ | 36½ | 1.05 | 1.15 |
| 1899. | | | | | | | | | | | | | | |
| January | 41⅝ | 45⅝ | 39¼ | 41⅝ | 35½ | 38 | 35¼ | 38⅛ | 37 | 38 | 34¾ | 30¼ | ------ | ------ |
| February | 42¼ | 45 | 37¾ | 42 | 33 | 37 | 33½ | 37 | 35½ | 37 | 33 | 35 | ------ | ------ |
| March | 41 | 45½ | 36 | 39⅝ | 35 | 37½ | 33 | 36½ | 34½ | 36⅛ | 33 | 34¾ | ------ | ------ |
| April | 41 | 45½ | 38 | 43 | 36½ | 37½ | 34 | 35⅛ | 35⅛ | 37½ | 33½ | 35 | ------ | ------ |
| May | 39¼ | 43½ | 36⅝ | 38¾ | 34 | 36½ | 32½ | 34⅝ | 34½ | 35⅛ | 31½ | 34½ | ------ | ------ |
| June | 40⅛ | 42⅝ | 37 | 39½ | 35 | 36½ | 33¼ | 35½ | 34½ | 35 | 32 | 33½ | ------ | ------ |
| July | 37⅝ | 41½ | 35 | 38¾ | 35 | 36⅛ | 31 | 34⅞ | 34 | 35½ | 31½ | 33⅛ | ------ | ------ |
| August | 36½ | 41¼ | 34¾ | 37½ | 32 | 34½ | 30½ | 33 | 33½ | 35 | 30 | 31½ | ------ | ------ |
| September | 38⅝ | 41⅝ | 36½ | 40½ | 33¾ | 35 | 31¼ | 35 | 33¼ | 35½ | 30 | 31 | ------ | ------ |
| October | 39¾ | 42⅜ | 37½ | 39¼ | 34 | 36 | 31 | 33 | 34½ | 36½ | 30¼ | 31¾ | ------ | ------ |
| November | 39⅝ | 41¾ | 37½ | 39¾ | 31½ | 35 | 30¾ | 33¼ | 33 | 35½ | 30 | 31½ | ------ | ------ |
| December | 39⅝ | 40⅞ | 36⅝ | 38⅞ | 31½ | 34 | 30 | 31½ | 32 | 33½ | 29½ | 31 | ------ | ------ |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

WHEAT (PER BUSHEL).

| Date. | New York. | | Baltimore. | | Chicago. | | Detroit. | | St. Louis. | | Minneapolis. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 2, red winter. | | Southern. | | No. 2, spring. | | No. 2 red. | | No. 2, red winter. | | No. 2, northern. | | No. 1, California (per cwt.). | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| 1895. | | | | | | | | | | | | | | |
| January | \$0.56 | \$0.62⅝ | \$0.55 | \$0.63 | \$0.48⅞ | \$0.55 | \$0.52½ | \$0.56¼ | \$0.48¾ | \$0.54½ | \$0.53½ | \$0.58 | \$0.82½ | \$0.88¾ |
| February | .55½ | .58⅛ | .55 | .59 | .49⅝ | .51⅞ | .52½ | .54¾ | .56 | .52½ | .53¼ | .56¼ | .81¼ | .83¾ |
| March | .58⅛ | .62¼ | .58 | .63 | .51⅛ | .55¼ | .54¾ | .58¾ | .52¼ | .56½ | .56¾ | .59¾ | .83¾ | .90 |
| April | .60 | .70 | .60 | .72 | .53⅞ | .63½ | .56¼ | .67 | .54¼ | .65 | .57¼ | .65½ | .85 | .90 |
| May | .65¾ | .83½ | .67 | .83 | .60⅝ | .81½ | .65 | .85 | .64 | .85 | .62¼ | .80 | .85 | .92½ |
| June | .72¼ | .84 | .70 | .83 | .69 | .81 | .71½ | .86 | .71½ | .85½ | .69¾ | .80¾ | .87½ | .93¾ |
| July | .65⅞ | .76⅞ | .64 | .74¼ | .64 | .71½ | .65 | .74¾ | .63¾ | .71¼ | .60½ | .69½ | .87½ | .95 |
| August | .64⅝ | .74¼ | .61 | .72½ | .59 | .68¾ | .61 | .73 | .60½ | .68½ | .57½ | .67 | .92½ | .96¼ |
| September | .60¼ | .69½ | .57 | .68 | .55½ | .62¼ | .57½ | .67¾ | .58½ | .64⅝ | .53½ | .57⅞ | .90 | .95 |
| October | .65⅜ | .72⅞ | .64 | .69 | .57⅞ | .61⅝ | .62¼ | .67¼ | .61¼ | .65¼ | .52½ | .55 | .95 | .97½ |
| November | .66½ | .69⅞ | .65 | .67½ | .55¾ | .58¼ | .63¼ | .65½ | .60¼ | .63⅝ | .51 | .52½ | .95 | .98¾ |
| December | .67¼ | .71⅜ | .62 | .67½ | .54 | .59½ | .63½ | .67¼ | .61½ | .70 | .50 | .54¼ | .98¾ | 1.02½ |
| 1896. | | | | | | | | | | | | | | |
| January | .68½ | .78¼ | .66 | .76 | .57 | .64½ | .65½ | .72¾ | .63 | .72 | .53½ | .58 | 1.01¼ | 1.12½ |
| February | .78⅞ | .82⅞ | .74 | .78 | .62 | .67 | .72½ | .75¾ | .71 | .74½ | .59 | .61½ | 1.12½ | 1.13¾ |
| March | .76¾ | .82⅝ | .74 | .78 | .61 | .66½ | .68 | .74¾ | .67¾ | .72½ | .57¼ | .61¼ | 1.07½ | 1.12½ |
| April | .73⅝ | .83⅝ | .73 | .78 | .61¾ | .67 | .67¼ | .75½ | .65½ | .72¾ | .58¾ | .62⅝ | 1.07½ | 1.07½ |
| May | .71⅝ | .75¾ | .66 | .74 | .58 | .63½ | .65 | .69 | .55¾ | .68¼ | .55⅝ | .60½ | 1.05 | 1.07½ |
| June | .63¾ | .76⅛ | .51 | .68 | .54 | .61½ | .58 | .67½ | .52½ | .60 | .51⅝ | .58½ | .96¼ | 1.02½ |
| July | .62 | .67½ | .53 | .64½ | .54¼ | .59 | .57½ | .64¾ | .52½ | .58¾ | .52⅝ | .55⅝ | .92½ | .95 |
| August | .64¾ | .68⅝ | .57 | .65½ | .54 | .59 | .61½ | .64⅞ | .58 | .64 | .50 | .54¾ | .93¾ | .96¼ |
| September | .65 | .77⅝ | .59 | .71¾ | .55½ | .67½ | .59⅝ | .71 | .56¼ | .58¼ | .51 | .64 | .96½ | 1.06¼ |
| October | .77⅛ | .90½ | .69 | .84 | .67 | .77 | .70½ | .84½ | .68 | .80½ | .63½ | .75 | 1.15 | 1.33¾ |
| November | .85¾ | 1.02⅝ | .76 | .96 | .72 | .82 | .80½ | .97 | .76 | .91 | .73 | .81½ | 1.48¾ | 1.50 |
| December | .99⅞ | 1.06⅞ | .88 | .96 | .76½ | .81½ | .90 | .96¾ | .89 | .92⅞ | .74½ | .80⅝ | 1.47½ | 1.50 |
| 1897. | | | | | | | | | | | | | | |
| January | .91¾ | 1.01⅝ | .87 | .97 | .73 | .81 | .85 | .94¾ | .80 | .92½ | .71⅝ | .79⅜ | 1.50 | 1.56¼ |
| February | .88¼ | .96¾ | .87 | .92 | .72¼ | .76½ | .85 | .89 | .80⅞ | .89½ | .71⅛ | .73⅝ | 1.32½ | 1.40 |
| March | .81⅝ | .89⅛ | .83 | .92 | .71 | .76 | .85 | .91½ | .90⅞ | .95½ | .69⅝ | .74½ | 1.28¾ | 1.36¼ |
| April | -------- | -------- | .73 | .85 | .66¼ | .77½ | .83½ | .93¾ | .90 | 1.03 | .65½ | .77⅝ | 1.21¼ | 1.30 |
| May | -------- | -------- | .80 | .90 | .68¾ | .76 | .79½ | .92½ | .82½ | .97 | .69¼ | .75 | 1.30 | 1.32½ |
| June | -------- | -------- | .55 | .81 | .67 | .73 | .76 | .83 | .74 | .84½ | .68½ | .71⅞ | 1.22½ | 1.23¾ |
| July | -------- | -------- | .50 | .85 | .68¼ | .78⅞ | .74½ | .79¼ | .65½ | .79 | .69¾ | .79¾ | 1.21½ | 1.40 |
| August | .86⅝ | 1.11¼ | .80 | 1.07½ | .76 | 1.00 | .77½ | 1.01 | .79 | 1.03 | .79¼ | 1.07½ | 1.46¾ | 1.55 |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

WHEAT (PER BUSHEL)—Continued.

| Date. | New York. | | Baltimore. | | Chicago. | | Detroit. | | St. Louis. | | Minneapolis. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 2, red winter. | | Southern. | | No. 2, spring. | | No. 2, red. | | No. 2, red winter. | | No. 2, northern. | | No. 1, California (per cwt.). | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1897.** | | | | | | | | | | | | | | |
| September | $0.94⅛ | $1.07⅛ | $0.89 | $1.04¼ | $0.85 | $1.00 | $0.91½ | $1.00 | $0.93½ | $1.01 | $0.85 | $0.96¼ | $1.47½ | $1.56¼ |
| October | .94⅝ | 1.05 | .88 | 1.01 | .83 | .90 | .91 | .97½ | .93¾ | 1.01 | .85 | .92½ | 1.45 | 1.47½ |
| November | .97¾ | 1.03⅛ | .90 | 1.01 | .87 | .91 | .91 | .97 | .94¼ | .99¼ | .87¼ | .92½ | 1.40 | 1.48¾ |
| December | .97 | 1.03¾ | .91 | 1.00 | .86 | .92 | .89¼ | .94½ | .95½ | 1.02 | .86⅝ | .93¼ | 1.40 | 1.42½ |
| **1898.** | | | | | | | | | | | | | | |
| January | .99¾ | 1.10½ | .90 | 1.01½ | .89⅛ | 1.10 | .90 | .97¾ | .92½ | 1.00½ | .87½ | .96 | 1.37½ | 1.41¼ |
| February | 1.02¼ | 1.10¼ | .93 | 1.04 | .95 | 1.08 | .93½ | .99¼ | .94¾ | 1.01 | .92¾ | 1.00 | 1.41¼ | 1.42½ |
| March | .99⅞ | 1.08⅞ | .94 | 1.03 | 1.00 | 1.06¾ | .94¼ | .98½ | .96 | 1.00 | .94½ | .99½ | 1.40 | 1.46¼ |
| April | 1.01 | 1.28 | .95 | 1.15 | 1.01 | 1.23½ | .94½ | 1.12½ | .97 | 1.10 | .95¼ | 1.16¾ | 1.48¾ | 1.80 |
| May | 1.16½ | 1.93½ | 1.10 | 1.46½ | 1.17 | 1.85 | 1.10 | 1.60 | 1.00 | 1.27 | 1.14½ | 1.55 | 1.60 | 1.77½ |
| June | .82 | 1.21 | .60 | 1.16½ | .75 | 1.20 | .82 | 1.12 | .69 | 1.00½ | .80 | 1.30 | 1.60 | 1.77½ |
| July | .74½ | .94 | .62 | .87 | .63¾ | .88 | .66½ | .90 | .64½ | .79 | .80 | .87½ | 1.22½ | 1.25 |
| August | .73⅛ | .81¾ | .60 | .81 | .65⅛ | .75 | .67 | .74 | .64 | .73 | .70 | .87 | 1.08¾ | 1.20 |
| September | .68¾ | .79⅞ | .60 | .73¼ | .62¾ | .68 | .67 | .70 | .65 | .70 | .55 | .63 | 1.10 | 1.18¾ |
| October | .72 | .80¼ | .63 | .77½ | .62 | .70¼ | .65½ | .74 | .65¾ | .72¾ | .56 | .67 | 1.15 | 1.22½ |
| November | .74⅝ | .78¾ | .65 | .74 | .64½ | .69½ | .69 | .71¾ | .67¼ | .71½ | .60 | .63 | 1.15 | 1.21¼ |
| December | .73⅛ | .81¼ | .62 | .77 | .62¼ | .70 | .66¾ | .72¼ | .68½ | .73 | .60 | .67 | 1.13¾ | 1.15 |
| **1899.** | | | | | | | | | | | | | | |
| January | .79¼ | .87⅝ | .76 | .81½ | .66½ | .76 | .70½ | .76½ | .71 | .79½ | .65½ | .72½ | 1.12½ | 1.18¾ |
| February | .81 | .87⅝ | .74½ | .78 | .69¾ | .74½ | .72¼ | .74½ | .72½ | .76 | .67⅝ | .69¼ | 1.10 | 1.13¾ |
| March | .78⅝ | .87½ | .72 | .78 | .66 | .74½ | .69 | .75 | .69 | .76 | .64 | .70¼ | 1.06¼ | 1.15 |
| April | .79⅝ | .85¼ | .75½ | .79½ | .70 | .76½ | .71½ | .76¾ | .73⅜ | .80 | .68 | .72 | 1.05 | 1.10 |
| May | .80½ | .87⅛ | .73¼ | .79¼ | .68⅝ | .79½ | .73¼ | .80 | .73¼ | .81⅛ | .67¼ | .73 | 1.06¼ | 1.12½ |
| June | .80 | .85⅞ | .75 | .79 | .71¼ | .79¼ | .75¼ | .80¼ | .73¾ | .78½ | .70½ | .73⅝ | 1.10 | 1.12½ |
| July | .75⅞ | .81⅝ | .71 | .75¾ | .68⅝ | .75⅝ | .71¼ | .78 | .69⅝ | .75 | .65⅞ | .71¾ | 1.05 | 1.10 |
| August | .74⅜ | .78¼ | .71 | .73¼ | .69 | .74½ | .70 | .74 | .68⅛ | .73¼ | .66 | .70¼ | 1.03¾ | 1.07½ |
| September | .73¾ | .77⅝ | .70½ | .74½ | .69⅝ | .75⅛ | .70½ | .73½ | .68 | .72 | .64⅞ | .67⅞ | 1.02½ | 1.07½ |
| October | .75 | .78¾ | .71 | .75½ | .68⅝ | .74¾ | .70½ | .73⅜ | .69½ | .73 | .64¾ | .69⅜ | 1.07½ | 1.12½ |
| November | .72¼ | .75⅝ | .68½ | .72 | .65 | .71½ | .67½ | .70¾ | .68½ | .70½ | .61¾ | .64 | .97½ | 1.07½ |
| December | .72⅛ | .76 | .70 | .72 | .64 | .69¼ | .68 | .72 | .69½ | .72 | .60 | .64 | .96¼ | .98¾ |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

OATS (PER BUSHEL).

| Date. | New York. | | Baltimore. | | Cincinnati. | | Chicago. | | Milwaukee. | | Duluth. | | Detroit. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 2, mixed. | | No. 2, mixed. | | No. 2, mixed. | | No. 2. | | No. 2, white. | | | | No. 2, white. | | No. 1, white (per cwt.). | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | | |
| January | 33 | 34¾ | 34 | 36 | 23¾ | 33 | 27½ | 28¾ | 30½ | 32 | 29½ | 31 | 33 | 33½ | $0.92½ | $0.97½ |
| February | 33½ | 34¼ | 33½ | 35 | 30½ | 32 | 26½ | 28½ | 30½ | 32¼ | 29½ | 30½ | 33 | 34 | .92½ | .95 |
| March | 33½ | 34 | 33½ | 35½ | 31 | 32½ | 28 | 29½ | 31¼ | 32¾ | 30 | 31¼ | 33½ | 34½ | .92½ | .97½ |
| April | 31¾ | 33¾ | 33½ | 34½ | 30½ | 32¼ | 27½ | 29½ | 31¾ | 33 | 30½ | 31¼ | 33¼ | 34½ | .97½ | 1.00 |
| May | 31¼ | 33¾ | 33½ | 35 | 30½ | 32 | 27¼ | 30¾ | 31¾ | 34 | 30½ | 32½ | 33½ | 35 | .97½ | 1.00 |
| June | 27¾ | 34 | 32 | 34½ | 29½ | 34½ | 25 | 30¾ | 28¼ | 33½ | 25 | 27½ | 32¼ | 35 | .92½ | 1.00 |
| July | 26¾ | 29 | 29½ | 32 | 26 | 28¾ | 22¾ | 25½ | 26½ | 29½ | 19½ | 25½ | 27½ | 31¾ | .90 | .95 |
| August | 24 | 28½ | 24¾ | 30 | 21 | 27 | 18¾ | 22¾ | 20½ | 27¾ | 18½ | 20 | 23 | 28 | .90 | .92½ |
| September | 23½ | 24¾ | 24 | 25 | 21¼ | 23 | 18 | 20½ | 20½ | 23½ | 18 | 20½ | 22½ | 24½ | .72½ | .90 |
| October | 22½ | 24½ | 23 | 25 | 19 | 21¼ | 17¾ | 18¾ | 19 | 22½ | 18 | 19 | 21 | 23½ | .70 | .75 |
| November | 22¾ | 24¾ | 22 | 23½ | 19⅛ | 22 | 17½ | 18¾ | 19 | 21 | 17¾ | 19 | 21½ | 22¾ | .67½ | .72½ |
| December | 23¼ | 23¼ | 22½ | 23 | 19½ | 21⅝ | 16¾ | 17½ | 18 | 20½ | 15½ | 18¾ | 20½ | 21½ | .75 | .80 |
| **1896.** | | | | | | | | | | | | | | | | |
| January | 23¼ | 25 | 22½ | 23½ | 19¾ | 22 | 17 | 19½ | 18¼ | 21 | 15½ | 19 | 20½ | 23 | .75 | .80 |
| February | 24¾ | 25⅞ | 23½ | 27 | 21¼ | 23 | 19¼ | 20¼ | 20 | 22 | 18 | 19 | 22½ | 23¾ | .72½ | .80 |
| March | 24¾ | 26 | 24½ | 26 | 21 | 22¾ | 18¼ | 20¼ | 19 | 21½ | 17½ | 19 | 22¼ | 23¾ | .72½ | .77½ |
| April | 24¾ | 25¾ | 24½ | 25 | 20¾ | 23 | 18¼ | 20 | 20 | 21½ | 17¼ | 19 | 21½ | 23½ | .77½ | .80 |
| May | 23 | 25½ | 24¼ | 25 | 20 | 22½ | 18 | 19⅝ | 19½ | 21¼ | 17 | 20¾ | 21 | 23 | .77½ | .85 |
| June | 21½ | 23 | 20 | 24½ | 17 | 21⅝ | 15½ | 18½ | 18 | 20 | 15¼ | 19 | 18¾ | 22 | .82½ | .87½ |
| July | 20¼ | 22¾ | 20 | 25 | 17½ | 23 | 15 | 18⅝ | 17½ | 20⅝ | 15¼ | 19½ | 19 | 23½ | .82½ | .87½ |
| August | 20½ | 23¾ | 23 | 25 | 17 | 21¼ | 15¾ | 18½ | 18½ | 22 | 17¼ | 20½ | 22 | 24½ | .82½ | .87½ |
| September | 18⅞ | 21 | 21 | 23½ | 15½ | 18½ | 14¾ | 17¼ | 16½ | 21 | 15¾ | 19¾ | 18½ | 22 | .87½ | .90 |
| October | 21 | 23¾ | 20½ | 23 | 17 | 20 | 17¾ | 19⅝ | 17 | 21½ | 17½ | 20½ | 20 | 22¼ | .90 | 1.07½ |
| November | 22¼ | 24 | 22 | 23½ | 19 | 21½ | 17½ | 19¼ | 16½ | 22¼ | 17½ | 19 | 20¼ | 21¼ | 1.07½ | 1.15 |
| December | 22 | 23½ | 21 | 23 | 18¼ | 20½ | 16¼ | 18¾ | 17¾ | 21½ | 17¾ | 19 | 19¾ | 21½ | 1.12½ | 1.15 |
| **1897.** | | | | | | | | | | | | | | | | |
| January | 21½ | 22½ | 21 | 22 | 18¼ | 20 | 15¾ | 17 | 18 | 19½ | 16¼ | 18¾ | 19½ | 20 | 1.27½ | 1.30 |
| February | 21 | 21¾ | 21 | 22 | 16¾ | 19½ | 15⅝ | 16½ | 16½ | 19½ | 16¼ | 17¼ | 19¾ | 20 | 1.27½ | 1.30 |
| March | 21½ | 22½ | 21 | 23½ | 17½ | 21 | 16 | 17 | 17½ | 20¾ | 16⅜ | 17¼ | 20 | 21½ | 1.20 | 1.30 |
| April | 22 | 23½ | 23½ | 24 | 20 | 21½ | 17 | 18¼ | 18½ | 22½ | 16½ | 19 | 21¼ | 22½ | 1.20 | 1.22½ |
| May | 21½ | 23¼ | 23½ | 26 | 19½ | 22 | 16½ | 18¾ | 20 | 23¼ | 18½ | 22 | 22 | 24 | 1.22½ | 1.25 |
| June | 21½ | 23 | 23 | 25½ | 19 | 22 | 17½ | 18½ | 20 | 23 | 20 | 21½ | 21½ | 23¾ | 1.20 | 1.25 |
| July | 21½ | 22½ | 23 | 24 | 19½ | 21½ | 17 | 18½ | 20½ | 22½ | 19¼ | 21¼ | 21¼ | 24¼ | 1.17½ | 1.22½ |
| August | 21¼ | 22¼ | 20 | 24 | 17 | 21 | 16¼ | 20⅛ | 20 | 23 | 18 | 22½ | 19¾ | 23½ | 1.20 | 1.25 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

OATS (PER BUSHEL)—Continued.

| Date. | New York. | | Baltimore. | | Cincinnati. | | Chicago. | | Milwaukee. | | Duluth. | | Detroit. | | San Francisco. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 2, mixed. | | No. 2, mixed. | | No. 2, mixed. | | No. 2. | | No. 2, white. | | | | No. 2, white. | | No. 1, white (per cwt.). | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1897.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | | |
| September | 23¼ | 25 | 21 | 23½ | 19½ | 21¼ | 18¾ | 20¾ | 21 | 23½ | 20½ | 23 | 22½ | 23¼ | $1.27½ | $1.30 |
| October | 22¼ | 24½ | 22¾ | 23½ | 20 | 21½ | 17¾ | 19¾ | 21 | 22¾ | 20¼ | 21½ | 22 | 23½ | 1.17½ | 1.27½ |
| November | 24½ | 26½ | 23 | 27 | 20½ | 24½ | 19½ | 22¼ | 22¼ | 24½ | 21½ | 22¾ | 22 | 26 | 1.15 | 1.20 |
| December | 26¼ | 29¼ | 26½ | 28 | 23¼ | 25 | 21 | 23¼ | 23 | 26 | 22 | 25½ | 24½ | 26 | 1.12½ | 1.17½ |
| **1898.** | | | | | | | | | | | | | | | | |
| January | 28¼ | 29¼ | 27½ | 28 | 24 | 26 | 21¼ | 24 | 23¾ | 25¼ | 23½ | 25 | 24½ | 26¾ | 1.15 | 1.22½ |
| February | 29 | 32 | 28 | 33 | 25½ | 28¾ | 24 | 27 | 24¾ | 29 | 24 | 28 | 26½ | 32¼ | 1.20 | 1.22½ |
| March | 30 | 32 | 30 | 32½ | 27½ | 29 | 24¾ | 26¾ | 28 | 30 | 24¾ | 27½ | 29¾ | 30¾ | 1.20 | 1.32½ |
| April | 29½ | 35½ | 30 | 35 | 28 | 31 | 25 | 31¾ | 28 | 33 | 25 | 32½ | 30¼ | 32¼ | 1.32½ | 1.42½ |
| May | 32½ | 36 | 33 | 36 | 29 | 34½ | 26 | 32 | 28¾ | 34½ | 27 | 33½ | 30½ | 36¼ | 1.40 | 1.42½ |
| June | 27¾ | 32½ | 27½ | 33 | 25½ | 28 | 21 | 26½ | 25½ | 29½ | 22½ | 28 | 27 | 30¼ | 1.35 | 1.37½ |
| July | 25½ | 28 | 26½ | 32 | 23½ | 27 | 20¾ | 26 | 24 | 29 | 23 | 25 | 26¼ | 29¾ | 1.30 | 1.37½ |
| August | 26¼ | 28½ | 24 | 33 | 21½ | 24¼ | 20¼ | 22½ | 23 | 28¼ | 20 | 24 | 24½ | 27½ | 1.20 | 1.32½ |
| September | 25½ | 26¼ | 24 | 26 | 22 | 25 | 20½ | 22¾ | 22¼ | 25½ | 21 | 23¾ | 23¼ | 25¼ | 1.17½ | 1.27½ |
| October | 25¾ | 29½ | 25½ | 28 | 23 | 26¼ | 21½ | 25 | 24 | 27¾ | 23 | 25½ | 24½ | 29 | 1.22½ | 1.27½ |
| November | 29 | 30½ | 27½ | 32 | 26½ | 29 | 24¼ | 27¾ | 27 | 30 | 25 | 27 | 28½ | 29½ | 1.22½ | 1.27½ |
| December | 30¾ | 33¾ | 31½ | 32½ | 28 | 30 | 26 | 27¾ | 22¼ | 30 | 26½ | 30 | 29½ | 30¾ | 1.27½ | 1.32½ |
| **1899.** | | | | | | | | | | | | | | | | |
| January | 33 | 35 | 32 | 33½ | 28¼ | 31 | 26½ | 27¾ | 28¾ | 31¼ | 28¾ | 30½ | 30½ | 33 | 1.30 | 1.37½ |
| February | 34¼ | 35½ | 33 | 35 | 28¾ | 31½ | 26¾ | 28¼ | 29½ | 31½ | 28¼ | 30 | 32¼ | 33 | 1.32 | 1.40 |
| March | 32 | 35¼ | 32 | 34 | 28½ | 31 | 25¼ | 27¾ | 28¾ | 30¾ | 25¾ | 29½ | 31 | 32¼ | 1.35 | 1.42½ |
| April | 32½ | 33½ | 32 | 33 | 29 | 30½ | 26½ | 27¼ | 29¼ | 31 | 27¼ | 28 | 32¼ | 33 | 1.37½ | 1.45 |
| May | 31 | 32½ | 29½ | 33 | 27½ | 29¾ | 24 | 27¾ | 26¾ | 31 | 26½ | 28 | 30¼ | 32¾ | 1.40 | 1.45 |
| June | 30½ | 31¼ | 29½ | 31 | 27 | 29 | 24¼ | 26¼ | 27½ | 29¼ | 26½ | 28½ | 28½ | 30¼ | 1.37½ | 1.42½ |
| July | 28 | 30½ | 28½ | 31 | 22 | 28½ | 19¾ | 25 | 24 | 28¾ | 22½ | 26¾ | 25½ | 30 | 1.22½ | 1.27½ |
| August | 26 | 27½ | 24½ | 29 | 21½ | 22½ | 19¼ | 22 | 23 | 25¼ | 19½ | 23¼ | 23¼ | 25½ | 1.22½ | 1.27½ |
| September | 25½ | 29 | 25 | 28 | 22½ | 25½ | 21 | 23½ | 22¼ | 26 | 20¼ | 24 | 23¼ | 28½ | 1.27½ | 1.30 |
| October | 28½ | 29½ | 27½ | 29 | 24¾ | 26 | 22 | 23½ | 24¾ | 26 | 22¼ | 24½ | 26 | 27½ | 1.25 | 1.30 |
| November | 28½ | 30 | 27½ | 29½ | 25¼ | 26½ | 22½ | 24 | 25½ | 26½ | 22½ | 23¾ | 27 | 28 | 1.25 | 1.30 |
| December | 28½ | 30 | 28 | 29½ | 25½ | 26¾ | 22¼ | 23 | 24¾ | 25½ | 22½ | 23½ | 26½ | 27½ | 1.22½ | 1.27½ |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

RYE (PER BUSHEL).

| Date. | New York. | | Cincinnati. | | Chicago. | | Duluth. | |
|---|---|---|---|---|---|---|---|---|
| | Prime State. | | No. 2. | | No. 2. | | | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | 54 | 56½ | 54¼ | 55½ | 48 | 50½ | 46 | 46 |
| February | 54 | 55 | 54¼ | 58½ | 50 | 53½ | 46 | 46 |
| March | 54 | 55 | 57½ | 60 | 51 | 55 | 46 | 49 |
| April | 57 | 65 | 58 | 75 | 54 | 66 | 49 | 61 |
| May | ------- | ------- | 62 | 73 | 62½ | 67 | 61 | 63 |
| June | ------- | ------- | 63 | 72 | 59½ | 70 | 50 | 63 |
| July | ------- | ------- | 45 | 63 | 46 | 58 | 45 | 49 |
| August | 55 | 57 | 42 | 50 | 39 | 45 | 37½ | 43 |
| September | 45 | 55 | 42 | 46 | 37 | 40 | 34½ | 37½ |
| October | 45 | 48 | 41 | 46 | 37 | 41 | 35 | 39 |
| November | 42 | 47 | 40 | 42 | 35½ | 37 | 32 | 36 |
| December | 45 | 45 | 40 | 42 | 32 | 35¼ | 29 | 32½ |
| **1896.** | | | | | | | | |
| January | 45 | 45 | 37¾ | 44 | 32½ | 41¼ | 29 | 34 |
| February | 44 | 50 | 41¼ | 44 | 38 | 41 | 34 | 35½ |
| March | 47½ | 49 | 39 | 42 | 35¼ | 40 | 33½ | 36 |
| April | 44¾ | 47½ | 40 | 44 | 35¼ | 37½ | 34 | 36 |
| May | 43½ | 45¾ | 36 | 44 | 33 | 36½ | 32½ | 35½ |
| June | 37 | 44 | 33 | 36 | 28½ | 34 | 28½ | 32½ |
| July | 35½ | 40 | 26½ | 35 | 29 | 31¾ | 29½ | 30 |
| August | 36½ | 40 | 29½ | 35 | 28 | 32 | 28½ | 33 |
| September | 38 | 42 | 30½ | 36½ | 30¼ | 36 | 31 | 36 |
| October | 39 | 48 | 36½ | 43 | 34 | 41 | 34 | 40 |
| November | 40 | 44 | 35 | 40 | 36 | 43 | 34 | 40 |
| December | 32 | 44 | 35 | 42 | 37 | 42½ | 36 | 39 |
| **1897.** | | | | | | | | |
| January | 40 | 46 | 36 | 44 | 35¼ | 38¼ | 34 | 39 |
| February | 39 | 45 | 36 | 42 | 32½ | 36 | 33 | 35¼ |
| March | 40 | 44 | 36 | 41½ | 32 | 34½ | 32¾ | 35 |
| April | 37 | 45 | 36 | 39 | 31¾ | 36¼ | 30 | 37½ |
| May | 38 | 43 | 35 | 42½ | 32¾ | 35½ | 33 | 35½ |
| June | 38 | 42 | 33 | 39 | 32½ | 35 | 33½ | 35 |
| July | 38 | 46 | 33 | 36 | 34 | 42 | 34 | 41½ |
| August | 42 | 55 | 35 | 52 | 41 | 56 | 42 | 53 |
| September | 47 | 58 | 46 | 50 | 46½ | 53 | 45 | 52½ |
| October | 52 | 54½ | 45 | 47 | 44 | 47½ | 44 | 48 |
| November | 53 | 54½ | 46 | 47 | 45 | 48 | 45 | 47½ |
| December | 53 | 55 | 46 | 48 | 45¾ | 47 | 45½ | 46¾ |
| **1898.** | | | | | | | | |
| January | 54¼ | 57½ | 45½ | 53 | 44½ | 48 | 45 | 47½ |
| February | 55½ | 59½ | 48 | 53 | 46¾ | 50½ | 46¼ | 50 |
| March | 58 | 60 | 52 | 54½ | 48¾ | 50½ | 48 | 49½ |
| April | 57½ | 69 | 52 | 66 | 50 | 62 | 49 | 62¼ |
| May | 60 | 74¾ | 52 | 80 | 48 | 75 | 48 | 72 |
| June | 49 | 58 | 40 | 51 | 41 | 49 | 41 | 51 |
| July | 50 | 55½ | 40 | 45 | 42¾ | 48½ | 41½ | 48½ |
| August | 49½ | 52½ | 45 | 50 | 41 | 46½ | 40½ | 45½ |
| September | 50 | 54½ | 45 | 48½ | 42½ | 49 | 42¾ | 47 |
| October | 53 | 60 | 48 | 57 | 44½ | 51½ | 44 | 50 |
| November | 58 | 60 | 56 | 59 | 49½ | 52¾ | 50 | 51 |
| December | 59¼ | 64 | 56 | 58½ | 52½ | 55½ | 50 | 54 |
| **1899.** | | | | | | | | |
| January | 63¾ | 67½ | 57 | 65 | 53½ | 58¾ | 53 | 58 |
| February | 64½ | 68 | 60 | 65 | 54 | 56¼ | 54½ | 56 |
| March | 63 | 67½ | 59 | 65 | 49¼ | 56½ | 48½ | 55¾ |
| April | 63 | 68½ | 60 | 65 | 52 | 59 | 50½ | 58 |
| May | 65 | 67 | 62 | 68 | 56½ | 62 | 56 | 58½ |
| June | 64 | 66½ | 64 | 68 | 56 | 62 | 56 | 59½ |
| July | 60 | 65½ | 57 | 67 | 51 | 60 | 50 | 58 |
| August | 59 | 61¾ | 56 | 60 | 51½ | 56½ | 50½ | 53½ |
| September | 61½ | 66 | 58 | 65 | 54 | 58 | 52¾ | 57½ |
| October | 61 | 63 | 61½ | 65½ | 54¼ | 58 | 53 | 57¼ |
| November | 56 | 62 | 59 | 64 | 49 | 53 | 48 | 52 |
| December | 58½ | 61½ | 60 | 65½ | 49 | 52 | 47 | 49½ |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

BARLEY (PER BUSHEL).

| Date. | New York. No. 2, western. Low. | New York. No. 2, western. High. | Cincinnati. No. 2, fall. Low. | Cincinnati. No. 2, fall. High. | Chicago. No. 3. Low. | Chicago. No. 3. High. | San Francisco. No. 1, brewing. Low. | San Francisco. No. 1, brewing. High. |
|---|---|---|---|---|---|---|---|---|
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cwt.* | *Cwt.* |
| January | 63 | 65 | 58 | 59 | 55 | 56 | $0.87½ | $0.97½ |
| February | 63 | 64½ | 58 | 59 | 54 | 56½ | 87½ | .90 |
| March | 64 | 65 | 58 | 59 | 53 | 55 | 90 | .92½ |
| April | 57 | 64 | 58 | 59 | 51½ | 54 | 87½ | .90 |
| May | ----- | ----- | 58 | 59 | 51 | 52 | 87½ | .90 |
| June | ----- | ----- | 58 | 59 | 51 | 54 | 65 | .72½ |
| July | ----- | ----- | 58 | 59 | 52 | 52 | 70 | .73¾ |
| August | ----- | ----- | 58 | 59 | ----- | ----- | 72½ | .75 |
| September | 44 | 50 | 58 | 59 | 40 | 48 | 70 | .75 |
| October | 40 | 50 | ----- | ----- | 38 | 43 | 67½ | .72½ |
| November | 38 | 50 | ----- | ----- | 36 | 42 | 70 | .80 |
| December | 40 | 48 | ----- | ----- | 33 | 40 | 77½ | .80 |
| **1896.** | | | | | | | | |
| January | 38 | 47 | ----- | ----- | 23 | 40 | 80 | .80 |
| February | 38 | 48 | ----- | ----- | 26 | 38 | 80 | .80 |
| March | 37 | 48 | ----- | ----- | 24 | 38 | 82½ | .82½ |
| April | 35 | 45 | ----- | ----- | 25 | 38 | 82½ | .85 |
| May | 35 | 41 | ----- | ----- | 25 | 36 | 80 | .85 |
| June | 25 | 41 | ----- | ----- | 23 | 34 | 80 | .80 |
| July | 25 | 33 | ----- | ----- | ----- | ----- | 77½ | .80 |
| August | 27 | 33½ | ----- | ----- | ----- | ----- | 77½ | .77½ |
| September | 30 | 32½ | ----- | ----- | 20 | 35 | 76¼ | .77½ |
| October | 30 | 36 | ----- | ----- | 23½ | 37 | 80 | .90 |
| November | 30 | 32¼ | 36 | 36 | 23 | 38 | 90 | .95 |
| December | 31 | 33½ | 35 | 36 | 22 | 37 | 95 | .95 |
| **1897.** | | | | | | | | |
| January | 33½ | 35½ | 35 | 36 | 23½ | 35 | 95 | 1.00 |
| February | 31¼ | 33¾ | 35 | 36 | 22½ | 35 | 90 | .92½ |
| March | 31 | 33 | 35 | 36 | 22½ | 33 | 82½ | .92½ |
| April | 31 | 33 | 35 | 36 | 22 | 34 | 82½ | .87½ |
| May | 31 | 32½ | 35 | 36 | 24½ | 35 | 85 | .87½ |
| June | 30 | 32 | 35 | 36 | 26 | 34 | 85 | .90 |
| July | 31¾ | 33½ | 35 | 36 | 25½ | 34 | $0.87½ | $1.00 |
| August | 34½ | 47 | 35 | 36 | 25 | 46 | 1.02½ | 1.12½ |
| September | 39 | 47 | 35 | 46 | 26 | 47 | 1.07½ | 1.10 |
| October | 50 | 53 | 45 | 46 | 25 | 43 | 1.02½ | 1.10 |
| November | 42½ | 49 | 45 | 46 | 25¼ | 45 | 1.02½ | 1.07½ |
| December | 43½ | 49 | 45 | 46 | 25½ | 42 | 1.02½ | 1.05 |
| **1898.** | | | | | | | | |
| January | 50 | 52 | 45 | 46 | 26½ | 42 | .92½ | .97½ |
| February | 52 | 53 | 45 | 46 | 27½ | 42 | .97½ | 1.07½ |
| March | 52 | 54 | 45 | 46 | 32 | 43 | 1.07½ | 1.20 |
| April | 54 | 55 | 45 | 46 | 34 | 52 | 1.22½ | 1.42½ |
| May | 55 | 61 | 45 | 57 | 36 | 53 | 1.25 | 1.35 |
| June | 48 | 60 | ----- | ----- | 30 | 46 | 1.15 | 1.22½ |
| July | 46 | 48 | ----- | ----- | 30 | 38 | 1.17½ | 1.22½ |
| August | 46 | 48 | ----- | ----- | 30 | 47½ | 1.15 | 1.20 |
| September | 46 | 48 | ----- | ----- | 32½ | 45 | 1.15 | 1.22½ |
| October | 48 | 50 | ----- | ----- | 32 | 49 | 1.20 | 1.22½ |
| November | 52 | 56 | ----- | ----- | 36 | 50 | 1.20 | 1.27½ |
| December | 57 | 60 | ----- | ----- | 40 | 50½ | 1.22½ | 1.30 |
| **1899.** | | | Extra No. 3, spring. | | | | | |
| January | 57 | 62 | 50 | 56 | 41 | 54 | 1.40 | 1.47½ |
| February | 60 | 62 | 50 | 56 | 41 | 53 | 1.40 | 1.42½ |
| March | 53 | 60 | 50 | 53 | 38 | 51 | 1.35 | 1.42½ |
| April | 54 | 55 | 50 | 53 | 39 | 48 | 1.20 | 1.37½ |
| May | 50 | 54 | 50 | 53 | 36 | 42 | 1.17½ | 1.25 |
| June | 46 | 52 | ----- | ----- | 35½ | 42 | 1.02½ | 1.22½ |
| July | 48 | 50 | ----- | ----- | 34 | 42 | 1.05 | 1.15 |
| August | 46 | 50 | ----- | ----- | 34 | 43 | .97½ | 1.05 |
| September | 50 | 52 | 44 | 50 | 36 | 47 | .95 | 1.01¼ |
| October | 50 | 54 | 50 | 50 | 37 | 46 | 1.00 | 1.03¾ |
| November | 46 | 50 | 48 | 50 | 34 | 45 | .96¼ | 1.01¼ |
| December | 49 | 52 | 45 | 50 | 35 | 45 | .85 | .97½ |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

POTATOES.

| Date. | New York. | | Chicago. | | Milwaukee. | | St. Louis. | |
|---|---|---|---|---|---|---|---|---|
| | Burbank, per 180 pounds. | | Burbank, per bushel. | | Per bushel. | | Burbank, per bushel. | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| 1895. | | | | | | | | |
| January | -------- | -------- | $0.44 | $0.60 | $0.40 | $0.65 | $0.57 | $0.65 |
| February | -------- | -------- | .50 | .68 | .50 | .70 | .60 | .63 |
| March | -------- | -------- | .52 | .72 | .55 | .70 | .65 | .82 |
| April | -------- | -------- | .60 | .75 | .60 | .75 | .65 | .80 |
| May | -------- | -------- | .40 | .70 | .40 | .70 | .60 | .65 |
| June | -------- | -------- | .20 | .55 | .20 | 1.00 | .55 | .63 |
| July | -------- | -------- | -------- | -------- | .30 | .95 | .50 | .80 |
| August | -------- | -------- | -------- | -------- | .30 | .50 | -------- | -------- |
| September | -------- | -------- | .23 | .28 | .20 | .35 | -------- | -------- |
| October | -------- | -------- | .17 | .28 | .15 | .35 | .20 | .33 |
| November | -------- | -------- | .17 | .26 | .15 | .25 | .23 | .30 |
| December | -------- | -------- | .18 | .24 | .15 | .25 | .21 | .30 |
| 1896. | | | | | | | | |
| January | -------- | -------- | .18 | .24 | .15 | .25 | .22 | .27½ |
| February | -------- | -------- | .18 | .23 | .15 | .25 | .22 | .27 |
| March | -------- | -------- | .16 | .21 | .12 | .25 | .20 | .24 |
| April | -------- | -------- | .16 | .22 | .12 | .22 | .20 | .27 |
| May | -------- | -------- | .10 | .23 | .10 | .22 | .23 | .30 |
| June | -------- | -------- | .10 | .29 | .10 | .25 | .20 | .45 |
| July | -------- | -------- | -------- | -------- | .10 | .35 | .20 | .20 |
| August | -------- | -------- | -------- | -------- | .23 | .30 | -------- | -------- |
| September | -------- | -------- | .21 | .31 | .23 | .35 | -------- | -------- |
| October | -------- | -------- | .18 | .25 | .18 | .30 | .27 | .35 |
| November | -------- | -------- | .18 | .26 | .18 | .25 | .21 | .32½ |
| December | -------- | -------- | .18 | .26 | .18 | .25 | .27 | .30 |
| 1897. | | | | | | | | |
| January | -------- | -------- | .18 | .27 | .18 | .25 | .24 | .32 |
| February | -------- | -------- | .21 | .26 | .18 | .25 | .25 | .30 |
| March | -------- | -------- | .18 | .25 | .20 | .25 | .21 | .30 |
| April | -------- | -------- | .18 | .25 | .15 | .25 | .23 | .30 |
| May | -------- | -------- | .19 | .26 | .15 | .25 | .24 | .28 |
| June | -------- | -------- | .18 | .38 | .15 | 1.00 | .27 | .40 |
| July | -------- | -------- | $0.23 | $0.28 | $0.20 | $1.00 | -------- | -------- |
| August | -------- | -------- | -------- | -------- | .50 | .70 | $0.55 | $0.58 |
| September | -------- | -------- | .52 | .58 | .35 | .50 | .50 | .65 |
| October | -------- | -------- | .38 | .52 | .35 | .45 | .40 | .60 |
| November | -------- | -------- | .40 | .55 | .35 | .55 | .37 | .53 |
| December | -------- | -------- | .50 | .62 | .45 | .55 | .53½ | .65 |
| 1898. | | | | | | | | |
| January | $2.12 | $2.50 | .57 | .62 | .45 | .55 | .60 | .68 |
| February | 2.12 | 2.50 | .57 | .64 | .50 | .60 | .62 | .68 |
| March | 2.25 | 2.75 | .60 | .67 | .50 | .60 | .58 | .70 |
| April | 2.25 | 3.00 | .58 | .66 | .45 | .75 | .52½ | .75 |
| May | 2.00 | 3.12 | .60 | .87 | .50 | .90 | .60 | .85 |
| June | 1.50 | 3.25 | .32 | .65 | .35 | .65 | .55 | .70 |
| July | 1.50 | 3.00 | .44 | .50 | .35 | .80 | .40 | .50 |
| August | 1.25 | 2.00 | -------- | -------- | .35 | .50 | -------- | -------- |
| September | 1.37 | 2.00 | .32 | .48 | .30 | .40 | .35 | .50 |
| October | 1.25 | 2.00 | .29 | .36 | .25 | .35 | .35 | .43 |
| November | 1.25 | 1.50 | .29 | .35 | .25 | .30 | .30 | .41 |
| December | 1.25 | 1.62 | .30 | .36 | .25 | .30 | .33 | .40 |
| 1899. | | | | | | | | |
| January | 1.25 | 1.62 | .34 | .38 | .20 | .35 | .39½ | .45 |
| February | 1.25 | 2.00 | .34 | .50 | .20 | .45 | .42 | .55 |
| March | 1.25 | 2.37 | .48 | .75 | .30 | .65 | .53 | .75 |
| April | 2.00 | 2.37 | .49 | .68 | .40 | .60 | .56 | .72 |
| May | 1.00 | 3.50 | .33 | .52 | .20 | .55 | .40 | .55 |
| June | 1.00 | 3.50 | .34 | .60 | .15 | .40 | .42 | .52 |
| July | .50 | 3.00 | .28 | .28 | .20 | .90 | -------- | -------- |
| August | .75 | 2.00 | -------- | -------- | .20 | .35 | .25 | .30 |
| September | .75 | 1.50 | .30 | .40 | .20 | .30 | .32 | .40 |
| October | .75 | 1.65 | .26 | .32 | .18 | .30 | .32 | .40 |
| November | .75 | 1.50 | .31 | .42 | .18 | .35 | .33 | .44 |
| December | .90 | 2.00 | .35 | .46 | .25 | .40 | .43 | .48 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

HAY (BALED).

| Date. | New York. No. 1, per hundredweight. Low. | New York. No. 1, per hundredweight. High. | Chicago. No. 1 Timothy, per ton. Low. | Chicago. No. 1 Timothy, per ton. High. | Cincinnati. No. 1 Timothy, per ton. Low. | Cincinnati. No. 1 Timothy, per ton. High. | St. Louis. Choice Timothy, per ton. Low. | St. Louis. Choice Timothy, per ton. High. |
|---|---|---|---|---|---|---|---|---|
| **1895.** | | | | | | | | |
| January | $0.70 | $0.75 | $10.00 | $10.25 | $10.00 | $10.75 | $10.75 | $11.75 |
| February | .65 | .70 | 10.00 | 10.25 | 10.00 | 10.50 | 10.50 | 11.75 |
| March | .70 | .75 | 10.00 | 10.25 | 10.00 | 10.50 | 10.75 | 11.50 |
| April | .70 | .75 | 10.00 | 10.25 | 10.00 | 11.00 | 10.50 | 11.75 |
| May | .70 | .80 | 10.00 | 10.25 | 10.75 | 11.00 | 11.00 | 11.75 |
| June | .70 | .85 | 10.50 | 14.00 | 11.00 | 19.00 | 11.00 | 17.00 |
| July | .80 | .95 | 14.00 | 14.50 | 15.00 | 17.00 | 14.50 | 16.00 |
| August | .80 | 1.05 | 12.50 | 13.00 | 12.50 | 14.00 | 13.00 | 17.25 |
| September | .80 | .90 | 12.00 | 12.50 | 13.00 | 14.00 | 12.50 | 14.50 |
| October | .80 | .90 | 12.00 | 12.50 | 13.75 | 14.75 | 12.50 | 15.00 |
| November | .85 | .85 | 12.00 | 12.50 | 14.00 | 15.00 | 12.50 | 15.00 |
| December | .85 | .90 | 12.00 | 12.50 | 13.75 | 14.75 | 13.00 | 15.50 |
| **1896.** | | | | | | | | |
| January | .85 | 1.00 | 11.50 | 12.00 | 14.00 | 14.75 | 12.00 | 14.50 |
| February | .90 | .95 | 11.00 | 11.50 | 14.00 | 14.75 | 12.00 | 13.50 |
| March | .90 | .95 | 11.50 | 12.00 | 13.50 | 14.25 | 12.00 | 14.00 |
| April | .90 | 1.00 | 12.00 | 12.50 | 14.00 | 15.00 | 12.50 | 15.50 |
| May | .90 | 1.05 | 11.50 | 12.00 | 14.00 | 14.50 | 13.00 | 15.50 |
| June | .95 | 1.05 | 9.50 | 10.00 | 12.00 | 14.00 | 12.00 | 13.75 |
| July | .95 | 1.00 | 9.00 | 10.00 | 11.50 | 12.50 | 10.00 | 14.00 |
| August | .90 | 1.00 | 9.00 | 9.50 | 9.00 | 13.50 | 10.00 | 13.00 |
| September | .75 | .92½ | 8.00 | 8.50 | 9.00 | 10.50 | 9.00 | 11.00 |
| October | .75 | .90 | 8.00 | 8.50 | 9.50 | 10.50 | 9.50 | 12.00 |
| November | .82½ | .85 | 8.50 | 9.00 | 9.00 | 10.75 | 9.50 | 12.50 |
| December | .75 | .82½ | 8.00 | 8.50 | 9.00 | 10.75 | 10.50 | 12.50 |
| **1897.** | | | | | | | | |
| January | .75 | .85 | 8.00 | 8.50 | 10.00 | 10.50 | 9.50 | 11.00 |
| February | .77½ | .80 | 7.50 | 8.00 | 10.00 | 10.50 | 9.00 | 11.00 |
| March | .80 | .80 | 8.00 | 8.50 | 10.00 | 11.50 | 9.00 | 12.00 |
| April | .77½ | .85 | 8.00 | 8.50 | 10.50 | 11.50 | 11.00 | 14.00 |
| May | .80 | .82½ | 8.50 | 9.00 | 11.00 | 11.50 | 11.50 | 13.75 |
| June | .75 | .80 | 8.50 | 9.00 | 9.50 | 11.00 | 9.25 | 12.75 |
| July | $0.77½ | $0.80 | $8.50 | $9.00 | $9.00 | $11.00 | $9.50 | $12.50 |
| August | .75 | .90 | 8.50 | 9.00 | 8.00 | 9.25 | 8.50 | 11.00 |
| September | .72½ | .80 | 8.50 | 9.00 | 8.00 | 8.75 | 8.50 | 10.00 |
| October | .75 | .80 | 8.00 | 8.50 | 8.00 | 9.25 | 9.00 | 10.50 |
| November | .75 | .80 | 8.00 | 8.50 | 8.00 | 9.00 | 9.00 | 10.50 |
| December | .75 | .80 | 8.00 | 8.50 | 8.50 | 9.00 | 9.75 | 11.00 |
| **1898.** | | | | | | | No. 1 Timothy. | |
| January | .72½ | .80 | 8.00 | 8.50 | 8.50 | 9.00 | 8.25 | 9.50 |
| February | .72½ | .75 | 8.00 | 8.50 | 8.00 | 9.00 | 8.50 | 9.50 |
| March | .75 | .80 | 9.00 | 9.50 | 8.00 | 9.00 | 9.00 | 10.00 |
| April | .75 | .80 | 8.50 | 9.00 | 8.50 | 10.00 | 9.00 | 12.50 |
| May | .80 | .80 | 9.50 | 10.50 | 9.00 | 10.25 | 10.50 | 12.00 |
| June | .77½ | .80 | 9.00 | 9.50 | 8.25 | 9.00 | 10.50 | 11.50 |
| July | .77½ | .77½ | 8.00 | 8.50 | 8.25 | 9.00 | 9.00 | 10.00 |
| August | .70 | .77½ | 8.00 | 8.50 | 7.50 | 9.00 | 7.00 | 10.00 |
| September | .65 | .70 | 7.50 | 8.00 | 7.50 | 8.00 | 7.00 | 8.00 |
| October | .65 | .67½ | 7.50 | 8.00 | 7.75 | 8.25 | 7.00 | 8.50 |
| November | .65 | .65 | 8.00 | 8.50 | 8.00 | 8.00 | 7.50 | 8.50 |
| December | .65 | .67½ | 8.00 | 8.25 | 8.00 | 8.25 | 7.50 | 8.50 |
| **1899.** | | | | | | | | |
| January | .65 | .65 | 7.50 | 9.00 | 7.75 | 8.50 | 8.00 | 9.90 |
| February | .65 | .65 | 7.75 | 8.50 | 8.00 | 8.75 | 8.00 | 8.75 |
| March | .65 | .67½ | 8.50 | 10.00 | 9.00 | 11.00 | 8.00 | 10.00 |
| April | .67½ | .75 | 9.50 | 10.50 | 10.50 | 11.50 | 9.00 | 11.00 |
| May | .75 | .90 | 9.50 | 10.50 | 10.50 | 11.00 | 10.50 | 11.50 |
| June | .80 | .95 | 10.00 | 11.50 | 10.50 | 12.00 | 10.50 | 11.50 |
| July | .85 | .95 | 10.00 | 13.00 | 9.00 | 12.50 | 10.00 | 12.00 |
| August | .87½ | .95 | 9.00 | 13.00 | 9.00 | 10.50 | 8.00 | 12.00 |
| September | .80 | .90 | 9.50 | 11.50 | 9.00 | 11.25 | 8.00 | 10.50 |
| October | .80 | .92½ | 9.50 | 11.00 | 11.00 | 12.00 | 9.50 | 10.50 |
| November | .80 | .87½ | 10.50 | 11.50 | 11.50 | 13.00 | 10.00 | 10.75 |
| December | .87½ | .87½ | 10.50 | 11.50 | 12.00 | 13.00 | 10.00 | 11.50 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

HOPS (PER POUND).

| Date. | New York. Choice State. Low. | New York. Choice State. High. | Cincinnati. Choice. Low. | Cincinnati. Choice. High. | Milwaukee. Wisconsin. Low. | Milwaukee. Wisconsin. High. | Chicago. Pacific coast, common to choice. Low. | Chicago. Pacific coast, common to choice. High. |
|---|---|---|---|---|---|---|---|---|
| | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| **1895.** | | | | | | | | |
| January | 11 | 11 | 10 | 11 | 7 | 10 | 8 | 11 |
| February | 10½ | 11 | 10 | 11 | 7 | 10 | 8 | 11 |
| March | 10½ | 10½ | 9½ | 11 | 6½ | 10 | 7 | 10 |
| April | 9 | 10 | 9 | 11 | 6 | 9 | 6 | 9 |
| May | 8½ | 9 | 9 | 10 | 5 | 8 | 6 | 9 |
| June | 8 | 8½ | 8 | 9½ | 5 | 7 | 6 | 9 |
| July | 8½ | 9 | 8 | 9 | 5 | 7 | 6 | 9 |
| August | 6½ | 8½ | 6½ | 8½ | 5 | 7 | 5 | 9 |
| September | 6½ | 10 | 6 | 9 | 6 | 8 | 8 | 10 |
| October | 9½ | 9½ | 9 | 10 | 6 | 8 | 7 | 10 |
| November | 9 | 10 | 9 | 10 | 5 | 7½ | 7 | 9 |
| December | 9 | 10 | 8 | 9 | 5 | 7 | 5 | 9 |
| **1896.** | | | | | | | | |
| January | 8 | 9 | 7 | 9 | 6 | 8 | 5 | 8 |
| February | 7½ | 8 | 7 | 8 | 5 | 8 | 5 | 8 |
| March | 7½ | 8 | 6 | 8 | 5 | 8 | 5 | 7 |
| April | 7½ | 8 | 6 | 7½ | 5 | 8 | 5 | 7 |
| May | 7 | 7½ | 6 | 7½ | 5 | 8 | 5 | 7 |
| June | 7½ | 7½ | 6 | 7 | 5 | 8 | 5 | 7 |
| July | 7 | 7½ | 6 | 7 | 5 | 8 | 5 | 7 |
| August | 7 | 7 | 6 | 7 | 5 | 7 | 4 | 7 |
| September | 7 | 9 | 6 | 7 | 5 | 7 | 4 | 7 |
| October | 9 | 11 | 10 | 12 | 5 | 7 | 6 | 10 |
| November | 10½ | 15 | 12 | 15 | ------- | ------- | 11 | 14 |
| December | 13 | 14 | 14 | 15 | ------- | ------- | 11 | 14 |
| **1897.** | | | | | | | | |
| January | 13 | 13½ | 13 | 13½ | ------- | ------- | 11 | 14 |
| February | 12 | 13 | 13 | 13½ | ------- | ------- | 11 | 14 |
| March | 10½ | 12 | 11 | 12½ | ------- | ------- | 10 | 13 |
| April | 9½ | 10 | 10 | 10½ | ------- | ------- | 9 | 12 |
| May | 8 | 9½ | 9 | 10 | ------- | ------- | 7 | 12 |
| June | 8 | 8 | 9 | 9 | ------- | ------- | 8 | 11 |
| July | 7 | 8 | 9 | 9 | ------- | ------- | 8 | 11 |
| August | 7 | 7 | 8 | 9 | ------- | ------- | 6 | 10 |
| September | 7 | 15 | 8 | 16 | ------- | ------- | 8 | 11 |
| October | 14 | 15 | 16 | 16 | 12 | 13 | 15 | 17 |
| November | 15 | 17 | 16 | 18 | 12 | 13 | 10 | 17 |
| December | 16 | 18 | 18 | 18 | 12 | 13 | 12 | 17 |
| **1898.** | | | | | | | | |
| January | 18 | 19 | 16 | 16 | 12 | 13 | 10 | 17 |
| February | 18 | 19 | 16 | 16 | 12 | 15 | 10 | 17 |
| March | 17 | 18 | 16 | 16 | 14 | 15 | 10 | 17 |
| April | 15 | 17 | 15 | 15 | 14 | 15 | 10 | 16 |
| May | 12 | 15 | 16 | 16 | 14 | 14 | 10 | 14 |
| June | 12 | 13 | 15 | 15½ | 14 | 14 | 10 | 13 |
| July | 11 | 12 | 14 | 15 | 14 | 14 | 8 | 10 |
| August | 11 | 12 | 14 | 14 | 13 | 14 | 5 | 10 |
| September | 11 | 15 | 14 | 14 | 13 | 14 | 5 | 10 |
| October | 15 | 19 | 14 | 19 | 15 | 16 | 16 | 18½ |
| November | 18 | 20 | 20 | 20 | 15 | 16 | 15 | 19 |
| December | 18 | 20 | 19 | 19 | 15 | 16 | 16 | 19 |
| **1899.** | | | | | | | | |
| January | 18 | 18 | 19 | 19 | 15 | 16 | 15 | 18 |
| February | 18 | 18 | 18 | 19 | 15 | 16 | 12 | 18 |
| March | 17 | 18 | 18 | 19 | 15 | 16 | 13 | 18 |
| April | 15 | 17 | 18 | 18½ | 15 | 16 | 13 | 18 |
| May | 16 | 16 | 16½ | 18 | 15 | 16 | 12 | 18 |
| June | 15 | 16 | 16 | 18 | 15 | 16 | 12 | 18 |
| July | 15 | 16 | 16 | 18 | 15 | 16 | 12 | 18 |
| August | 14 | 15 | 16 | 17 | 15 | 16 | 12 | 18 |
| September | 12 | 13 | 16 | 16 | 15 | 16 | 12½ | 16 |
| October | 13 | 15 | 13 | 13 | 14 | 15 | 9 | 16 |
| November | 13 | 14 | 13½ | 13½ | 14 | 14 | 9 | 13 |
| December | 12½ | 14 | 13 | 13 | 14 | 14 | 7 | 13 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

FLAXSEED (PER BUSHEL).

| Date. | New York. | Cincinnati. | | Chicago. | | Milwaukee. | |
|---|---|---|---|---|---|---|---|
| | Domestic. | | | No. 1. | | | |
| | Average. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | | | | | | | |
| January | ---------- | $1.12 | $1.12 | $1.38½ | $1.43 | $1.39 | $1.43 |
| February | ---------- | 1.12 | 1.12 | 1.39½ | 1.44 | 1.37½ | 1.44 |
| March | ---------- | 1.12 | 1.12 | 1.37½ | 1.42½ | 1.38½ | 1.42½ |
| April | ---------- | 1.12 | 1.12 | 1.38¾ | 1.43½ | 1.37½ | 1.44 |
| May | ---------- | 1.12 | 1.12 | 1.46½ | 1.51½ | 1.44 | 1.51 |
| June | ---------- | 1.12 | 1.25 | 1.47 | 1.52½ | 1.47 | 1.52½ |
| July | ---------- | 1.25 | 1.25 | 1.19 | 1.47 | 1.20 | 1.47 |
| August | ---------- | 1.00 | 1.25 | .99½ | 1.16 | .99¼ | 1.15 |
| September | ---------- | 1.00 | 1.00 | .90¾ | 1.04 | .91 | 1.04 |
| October | ---------- | 1.00 | 1.00 | .89 | .99½ | .89½ | .99 |
| November | ---------- | .90 | 1.00 | .90¼ | .93¾ | .91 | .93½ |
| December | ---------- | .90 | .90 | .91¼ | .94½ | .91½ | .94½ |
| **1896.** | | | | | | | |
| January | ---------- | .90 | .90 | .89 | .93½ | .91 | .93 |
| February | ---------- | .90 | .90 | .89 | .92½ | .90 | .92¾ |
| March | ---------- | .90 | .90 | .87 | .90½ | .89 | .90¼ |
| April | ---------- | .90 | .90 | .88 | .92½ | .88 | .92 |
| May | ---------- | .90 | .90 | .81 | .99¼ | .83 | .91 |
| June | ---------- | .80 | .90 | .78¼ | .82½ | .76 | .82½ |
| July | ---------- | .80 | .80 | .70½ | .76 | .70 | .76 |
| August | $0.75½ | .65 | .80 | .63½ | .73½ | .63½ | .73 |
| September | .73¾ | .65 | .70 | .63¼ | .78½ | .63½ | .78 |
| October | .80⅝ | .65 | .70 | .68½ | .79¾ | .69½ | .78 |
| November | .85$\frac{9}{16}$ | .65 | .70 | .70¼ | .79½ | .71 | .79½ |
| December | .87¼ | .65 | .70 | .71½ | .79½ | .73½ | .79 |
| **1897.** | | | | | | | |
| January | .88 | .65 | .70 | .73 | .78¼ | .75 | .78 |
| February | .85$\frac{13}{16}$ | .65 | .70 | .73¾ | .77¾ | .75½ | .77½ |
| March | .87¾ | .65 | .70 | .75¾ | .81¾ | .78 | .81½ |
| April | .84$\frac{3}{16}$ | .65 | .70 | .71½ | .80 | .75 | .80 |
| May | .83½ | .65 | .70 | .76 | .79¾ | .76½ | .79 |
| June | .81$\frac{9}{16}$ | .65 | .70 | .75 | .80 | .76 | .80½ |
| July | $0.84$\frac{7}{16}$ | $0.65 | $0.70 | $0.77 | $0.89 | $0.77½ | $0.89 |
| August | 1.06$\frac{13}{16}$ | .65 | .75 | .87¾ | 1.20 | .88½ | 1.20 |
| September | 1.11⅝ | .70 | .85 | .96¾ | 1.09 | .98 | 1.09½ |
| October | 1.08 | .80 | .85 | .91 | 1.07½ | .91 | 1.08 |
| November | 1.11⅛ | .80 | .85 | 1.02 | 1.10½ | 1.06½ | 1.11 |
| December | 1.16 | .80 | .85 | 1.04½ | 1.22½ | 1.09 | 1.22½ |
| **1898.** | | | | | | | |
| January | 1.22 | .85 | .90 | 1.16 | 1.32 | 1.19½ | 1.32 |
| February | 1.20 | .85 | .90 | 1.22 | 1.30½ | 1.25½ | 1.30½ |
| March | ---------- | .85 | .90 | 1.17 | 1.25½ | 1.18 | 1.25¼ |
| April | ---------- | .85 | .90 | 1.16½ | 1.31½ | 1.18½ | 1.31 |
| May | ---------- | .85 | .90 | 1.23 | 1.39 | 1.26 | 1.39 |
| June | ---------- | .85 | .90 | 1.05 | 1.22 | 1.05½ | 1.22½ |
| July | ---------- | .85 | .90 | .86½ | 1.07 | .90 | 1.04½ |
| August | ---------- | .80 | .85 | .86 | .93 | .88 | .93 |
| September | .95½ | .80 | .80 | .86½ | .93 | .89 | .92¾ |
| October | .99½ | .80 | .80 | .89 | 1.07 | .90½ | 1.07 |
| November | 1.05⅛ | .80 | .90 | .97 | 1.08½ | .98 | 1.08 |
| December | 1.08⅜ | .90 | .90 | .97¼ | 1.18 | 1.03½ | 1.19 |
| **1899.** | | | | | | | |
| January | ---------- | .90 | .90 | 1.10½ | 1.20 | 1.15 | 1.20 |
| February | ---------- | .90 | .90 | 1.13½ | 1.20½ | 1.18 | 1.20½ |
| March | ---------- | .90 | 1.00 | 1.14 | 1.25 | 1.18 | 1.24½ |
| April | ---------- | 1.00 | 1.00 | 1.12 | 1.25 | 1.17 | 1.25 |
| May | ---------- | .90 | 1.00 | 1.02 | 1.17½ | 1.03½ | 1.17½ |
| June | ---------- | .90 | .90 | 1.00½ | 1.10 | 1.03 | 1.09 |
| July | ---------- | .90 | .90 | .97 | 1.04½ | .99 | 1.05 |
| August | ---------- | .90 | .90 | .96½ | 1.20 | 1.00 | 1.20 |
| September | ---------- | .90 | .90 | 1.04½ | 1.21 | 1.06 | 1.20 |
| October | ---------- | .90 | 1.00 | 1.14 | 1.32½ | 1.14 | 1.32¼ |
| November | ---------- | 1.00 | 1.00 | 1.28½ | 1.39¼ | 1.26½ | 1.39 |
| December | ---------- | 1.00 | 1.00 | 1.39 | 1.51 | 1.39 | 1.52 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

BUTTER (PER POUND).

| Date. | New York. Creamery extra. Low. | New York. Creamery extra. High. | Cincinnati. Creamery. Low. | Cincinnati. Creamery. High. | Chicago. Creamery firsts. Low. | Chicago. Creamery firsts. High. | St. Louis. Creamery extra. Low. | St. Louis. Creamery extra. High. |
|---|---|---|---|---|---|---|---|---|
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | 23 | 26½ | 18 | 21 | 21 | 25 | 23½ | 27 |
| February | 23½ | 26 | 18 | 20 | 20 | 23½ | 23 | 25 |
| March | 19 | 23 | 15 | 17 | 16 | 22½ | 19 | 24 |
| April | 19 | 21½ | 15 | 20 | 17 | 20½ | 22 | 22 |
| May | 17 | 19 | 14 | 17 | 14½ | 18 | 18 | 20 |
| June | 17½ | 20 | 13 | 17 | 15½ | 17½ | 19½ | 20 |
| July | 17 | 18½ | 13 | 16 | 15 | 17½ | 19 | 20 |
| August | 18 | 20½ | 15 | 18 | 16 | 20 | 20 | 22 |
| September | 20 | 22 | 15 | 18 | 18 | 20½ | 22 | 24 |
| October | 22 | 23 | 16 | 20 | 18 | 22 | 24 | 24 |
| November | 23 | 24 | 16 | 21 | 18 | 22½ | 24 | 25 |
| December | 24 | 28 | 16 | 24 | 21 | 26½ | 25 | 28 |
| **1896.** | | | | | | | | |
| January | 20 | 25 | 15 | 18 | 17 | 24 | 21 | 24 |
| February | 18 | 22 | 15 | 16 | 16½ | 21½ | 19 | 22 |
| March | 21 | 22 | 15 | 17 | 19 | 21½ | 22 | 22½ |
| April | 14 | 21 | 12 | 15 | 13 | 21 | 15 | 21 |
| May | 15 | 16 | 12 | 13 | 13 | 15½ | 16 | 17 |
| June | 15½ | 15½ | 12 | 13 | 13 | 15 | 15 | 16 |
| July | 15 | 15½ | 12 | 14 | 12½ | 14½ | 15 | 16 |
| August | 15 | 16½ | 12 | 15 | 12 | 16½ | 15 | 18 |
| September | 15 | 16½ | 12 | 15 | 12 | 16 | 15½ | 18 |
| October | 16 | 20 | 13 | 16 | 13 | 19 | 16½ | 21 |
| November | 20 | 23 | 15 | 20 | 16 | 22 | 19 | 23 |
| December | 21 | 24 | 16 | 20 | 18 | 23 | 21 | 24 |
| **1897.** | | | | | | | | |
| January | 20 | 22 | 15 | 16 | 17 | 21 | 20 | 21 |
| February | 19 | 21½ | 15 | 17 | 16 | 20½ | 18½ | 22 |
| March | 19 | 20 | 15 | 20 | 16 | 19 | 18½ | 19 |
| April | 17 | 22 | 13 | 20 | 14 | 21 | 16½ | 22 |
| May | 14 | 17 | 12 | 14 | 12½ | 16 | 13½ | 16½ |
| June | 15 | 15 | 12 | 13 | 13 | 15 | 14 | 15 |
| July | 15 | 15 | 12 | 13 | 12½ | 14½ | 14½ | 15 |
| August | 15 | 18½ | 12 | 18 | 12½ | 18½ | 14½ | 19 |
| September | 18 | 21 | 15 | 18 | 15½ | 20½ | 17½ | 23 |
| October | 21 | 23½ | 16 | 22 | 19 | 23 | 23 | 24 |
| November | 23 | 23½ | 14 | 18 | 19 | 23 | 22 | 24 |
| December | 22 | 24 | 18 | 20 | 18 | 23 | 21½ | 23½ |
| **1898.** | | | | | | | | |
| January | 20 | 22 | 16 | 20 | 16 | 21 | 20 | 21 |
| February | 20 | 20½ | 16 | 18 | 16 | 19½ | 19 | 19½ |
| March | 19 | 20½ | 16 | 18 | 16 | 20 | 18½ | 20 |
| April | 17 | 22 | 14 | 18 | 15 | 21 | 17 | 21 |
| May | 15 | 17 | 14 | 16 | 14 | 16½ | 15 | 16 |
| June | 16 | 17 | 13 | 15 | 14½ | 16 | 15½ | 16 |
| July | 16½ | 18½ | 14 | 15 | 14½ | 17½ | 16 | 18 |
| August | 18½ | 19 | 16 | 17 | 16 | 18½ | 18½ | 19 |
| September | 18½ | 31 | 16 | 18 | 15½ | 20 | 18½ | 21 |
| October | 20½ | 23 | 16 | 18 | 17 | 22 | 21 | 23 |
| November | 23 | 23½ | 18 | 19 | 19 | 22 | 22 | 23 |
| December | 20 | 23½ | 17 | 18 | 16 | 22 | 20 | 23 |
| **1899.** | | | | | | | | |
| January | 19 | 21 | 16 | 18 | 14 | 20½ | 19 | 21 |
| February | 19 | 25 | 17 | 20 | 14 | 21½ | 19 | 23½ |
| March | 20 | 22 | 19 | 20 | 17 | 21 | 20½ | 22 |
| April | 17 | 21½ | 18 | 19 | 14 | 21 | 17 | 21½ |
| May | 16½ | 19 | 16 | 17 | 14 | 18½ | 17 | 17½ |
| June | 18 | 18½ | 17 | 18 | 16 | 18 | 18 | 19 |
| July | 17½ | 18½ | 16½ | 18 | 15½ | 18 | 18 | 18 |
| August | 17½ | 21 | 16½ | 20 | 15½ | 20 | 18 | 21 |
| September | 20½ | 23 | 18 | 20 | 17½ | 22½ | 20 | 23½ |
| October | 23½ | 24 | 18 | 20 | 18 | 23 | 23½ | 24½ |
| November | 24 | 27 | 18 | 24 | 19 | 26 | 24½ | 26½ |
| December | 26½ | 28 | 21 | 24 | 21 | 27 | 26 | 27 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

EGGS (PER DOZEN).

| Date. | New York. Average best fresh. | | Cincinnati. | | Chicago. Fresh. | | St. Louis. Average best fresh. | |
|---|---|---|---|---|---|---|---|---|
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | 22½ | 25 | 17½ | 23 | 17½ | 20 | 14 | 19 |
| February | 24 | 34 | 20 | 26 | 22 | 30 | 19 | 25 |
| March | 11¾ | 30½ | 9¾ | 15 | 10 | 31 | 9 | 21 |
| April | 12¼ | 13¾ | 10 | 11 | 11 | 12½ | 9½ | 11¼ |
| May | 12½ | 15 | 10 | 11 | 9 | 12½ | 9 | 11 |
| June | 11½ | 14½ | 10 | 10½ | 9½ | 12 | 8 | 10¾ |
| July | 12½ | 13½ | 8 | 9 | 10 | 12 | 7½ | 8½ |
| August | 13 | 15 | 9 | 9 | 10 | 13½ | 8½ | 11 |
| September | 14½ | 17¼ | 10 | 12 | 13 | 16 | 9 | 12½ |
| October | 16 | 20 | 12 | 15 | 15 | 17 | 12½ | 15½ |
| November | 19½ | 23½ | 16 | 17 | 15 | 21 | 15½ | 19 |
| December | 21 | 24 | 16 | 19 | 15 | 22 | 17 | 20 |
| **1896.** | | | | | | | | |
| January | 17 | 25 | 14 | 17 | 15½ | 21 | 11 | 17 |
| February | 11 | 17½ | 10 | 14 | 9½ | 16 | 8¾ | 11½ |
| March | 11 | 11¾ | 8½ | 10 | 9 | 10¼ | 8½ | 9 |
| April | 10½ | 12½ | 8½ | 9½ | 9 | 10¼ | 7 | 9 |
| May | 10½ | 12 | 7 | 9 | 7½ | 10¾ | 6 | 8 |
| June | 11½ | 12½ | 7½ | 8 | 8½ | 11½ | 7 | 8½ |
| July | 11½ | 13 | 7 | 7½ | 9 | 10 | 6 | 8½ |
| August | 12 | 15 | 7½ | 10½ | 9 | 12 | 8 | 10½ |
| September | 15 | 17½ | 11 | 11 | 11½ | 14½ | 9½ | 12 |
| October | 18 | 19 | 12 | 14½ | 14½ | 17½ | 12 | 14 |
| November | 20 | 24 | 14½ | 16½ | 17 | 22 | 14 | 19 |
| December | 19 | 23 | 13½ | 16 | 16 | 22 | 13 | 19 |
| **1897.** | | | | | | | | |
| January | 15 | 22 | 10½ | 12½ | 12 | 20 | 10 | 16 |
| February | 15 | 19 | 12 | 13½ | 13 | 17 | 11 | 14 |
| March | 10 | 15½ | 7½ | 9 | 8½ | 13½ | 7 | 11½ |
| April | 9½ | 10 | 7 | 8 | 8 | 9 | 7½ | 8 |
| May | 10 | 12 | 7½ | 8 | 8 | 10 | 7½ | 8 |
| June | 10½ | 11½ | 8 | 8 | 8 | 9 | 7¼ | 8¼ |
| July | 10½ | 13 | 7 | 7 | 8 | 9½ | 6 | 7½ |
| August | 13 | 17 | 7 | 12 | 9½ | 13½ | 7½ | 12 |
| September | 16 | 18½ | 10½ | 13 | 12½ | 13½ | 10 | 13 |
| October | 16 | 19 | 13 | 14 | 13½ | 15* | 12½ | 13 |
| November | 19 | 22 | 15 | 16½ | 15 | 18 | 14 | 17 |
| December | 22½ | 25 | 16½ | 17 | 18 | 22 | 17 | 18 |
| **1898.** | | | | | | | | |
| January | 18 | 24 | 15 | 17½ | 15 | 22 | 12½ | 19 |
| February | 14 | 19 | 12 | 14 | 12½ | 16 | 10¾ | 14 |
| March | 10½ | 15½ | 8 | 10½ | 8¾ | 12½ | 8 | 11½ |
| April | 10 | 11¾ | 8 | 9 | 8½ | 10½ | 8 | 9½ |
| May | 10½ | 12 | 9 | 9 | 9 | 11 | 8½ | 9½ |
| June | 10½ | 12½ | 9 | 9 | 9½ | 11½ | 8¾ | 9 |
| July | 13 | 14 | 9 | 9 | 9 | 11½ | 9 | 9 |
| August | 14½ | 15½ | 9 | 12 | 9 | 12½ | 9 | 13 |
| September | 15½ | 17½ | 12 | 13 | 12 | 14½ | 11½ | 13½ |
| October | 17½ | 20 | 13 | 14 | 13½ | 16½ | 12½ | 15 |
| November | 20 | 24 | 14 | 19 | 17½ | 22 | 15½ | 19 |
| December | 25 | 27 | 19 | 20 | 21 | 26 | 19 | 20 |
| **1899.** | | | | | | | | |
| January | 17 | 29 | 14 | 22 | 15 | 27 | 13½ | 22 |
| February | 19 | 35 | 15 | 24 | 16 | 35 | 13½ | 32 |
| March | 12½ | 30 | 10½ | 18 | 11½ | 20 | 10 | 17 |
| April | 12½ | 14½ | 10½ | 11½ | 11 | 13 | 10 | 11½ |
| May | 13½ | 16 | 11 | 12 | 10¼ | 13 | 10¼ | 11¼ |
| June | 14½ | 15½ | 10 | 11 | 11 | 13¼ | 10 | 11 |
| July | 15 | 16½ | 8½ | 9½ | 10 | 13 | 9 | 10 |
| August | 15 | 18 | 9 | 11½ | 10 | 12½ | 9 | 12 |
| September | 18 | 21 | 12½ | 15 | 11 | 16½ | 11 | 15½ |
| October | 20 | 22 | 15 | 16½ | 15 | 17 | 14 | 15½ |
| November | 21 | 24 | 17 | 17 | 17 | 18 | 16 | 17 |
| December | 21 | 24 | 17 | 17 | 17 | 20 | 17 | 17 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

CHEESE (PER POUND).

| Date. | New York. September, colored. | | Cincinnati. Factory. | | Chicago. Full cream. | | St. Louis. Full cream. | |
|---|---|---|---|---|---|---|---|---|
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | 11¼ | 11½ | 9½ | 10¼ | 9¾ | 10½ | 11 | 11½ |
| February | 11¼ | 11½ | 9½ | 10½ | 10 | 10½ | 11 | 11½ |
| March | 11½ | 11½ | 9½ | 10 | 10 | 10½ | 11 | 11¼ |
| April | 8 | 11½ | 9½ | 10 | 10 | 11 | 10½ | 11 |
| May | 6 | 8 | 7 | 9 | 8½ | 11 | 8½ | 9½ |
| June | 6¾ | 8½ | 7 | 8½ | 6 | 8¼ | 8½ | 9 |
| July | 7⅝ | 8¾ | 7 | 8½ | 7 | 8½ | 8½ | 9 |
| August | 7¼ | 8 | 7½ | 8½ | 7 | 7¾ | 8½ | 9½ |
| September | 7¼ | 8½ | 8 | 8½ | 7¼ | 8¾ | 8¼ | 9¼ |
| October | 8¼ | 10 | 8 | 9½ | 7½ | 9¼ | 8¾ | 10¼ |
| November | 9¾ | 10¼ | 9 | 10 | 9 | 9¾ | 9½ | 10½ |
| December | 9¾ | 10 | 9½ | 10 | 9 | 9½ | 9 | 10¼ |
| **1896.** | | | | | | | | |
| January | 10 | 10¼ | 9½ | 10 | 7½ | 9¾ | 9 | 10½ |
| February | 10¼ | 10¼ | 9½ | 10 | 8 | 10½ | 9 | 10½ |
| March | 10¼ | 10¼ | 9½ | 10 | 8 | 10½ | 8¾ | 10½ |
| April | 9¾ | 10¼ | 9½ | 10 | 8 | 10½ | 9 | 10 |
| May | 9½ | 9¾ | 7 | 10 | 7¼ | 10½ | 8¼ | 10 |
| June | 6⅝ | 7¼ | 7 | 8 | 6¾ | 7½ | 8 | 8½ |
| July | 6¾ | 6¾ | 7 | 8 | 6 | 7½ | 7¾ | 8¼ |
| August | 6½ | 8½ | 7 | 7½ | 5¼ | 8½ | 7¼ | 8½ |
| September | 8 | 9¼ | 7 | 8½ | 7 | 9 | 8¼ | 9 |
| October | 9 | 10⅛ | 8 | 8½ | 7½ | 9¼ | 9 | 10¼ |
| November | 10⅛ | 10⅜ | 9½ | 10 | 7 | 9¼ | 9½ | 10 |
| December | 10⅜ | 10¾ | 9½ | 10 | 7 | 9½ | 9½ | 10 |
| **1897.** | | | | | | | | |
| January | 10¼ | 11¾ | 9 | 10 | 3 | 10 | 9¾ | 10¾ |
| February | 12 | 12¼ | 9 | 10½ | 4 | 11 | 10¾ | 11¾ |
| March | 12¼ | 12½ | 10 | 10½ | 4 | 11 | 11¼ | 11½ |
| April | 10¼ | 12¼ | 10½ | 11 | 3 | 11 | 11¼ | 11¾ |
| May | 8½ | 10½ | 8½ | 11 | 3 | 10½ | 8¾ | 11½ |
| June | 8 | 8⅝ | 7 | 8 | 3 | 8¼ | 8 | 8½ |
| July | 7½ | 8 | 7 | 8 | 4 | 8¼ | 8 | 8½ |
| August | 7¾ | 9¼ | 7 | 9½ | 4 | 9¼ | 8½ | 10¼ |
| September | 9 | 9½ | 8½ | 9½ | 4 | 9¼ | 9½ | 10¼ |
| October | 8¼ | 9⅛ | 8½ | 9½ | 4 | 8½ | 9½ | 10 |
| November | 8½ | 8¾ | 8½ | 9½ | 3 | 8½ | 9½ | 10 |
| December | 8½ | 8½ | 9 | 9½ | 3 | 8½ | 9½ | 10 |
| **1898.** | | | | | | | | |
| January | 8½ | 8¾ | 9 | 9½ | 3 | 9 | 10 | 10 |
| February | 8½ | 8¾ | 9 | 9½ | 3 | 9¼ | 10 | 10 |
| March | 8 | 8½ | 8½ | 9½ | 3 | 9¼ | 10 | 10 |
| April | 8 | 9 | 8½ | 9 | 3 | 9¼ | 9 | 10 |
| May | 6¼ | 8½ | 7 | 9 | 5 | 9¼ | 9 | 9½ |
| June | 6¾ | 7¼ | 7 | 7½ | 7¼ | 7¾ | 8 | 8¼ |
| July | 7 | 7¾ | 7 | 8 | 7¾ | 8½ | 8¼ | 8¼ |
| August | 7 | 7½ | 7½ | 9 | 8 | 8½ | 8¼ | 8¾ |
| September | 7¼ | 8½ | 7½ | 9 | 8 | 8½ | 8¾ | 10 |
| October | 8¼ | 8¾ | 8½ | 9½ | 8 | 9½ | 10 | 10 |
| November | 8½ | 9¾ | 9 | 9½ | 9 | 10½ | 10 | 10 |
| December | 9¾ | 10½ | 10 | 11 | 10 | 11 | 10 | 10½ |
| **1899.** | | | | | | | | |
| January | 10½ | 10½ | 10½ | 11½ | 9½ | 11 | 10½ | 11 |
| February | 10½ | 11 | 10½ | 11½ | 9½ | 11 | 11 | 11 |
| March | 11 | 12½ | 11 | 12¼ | 9¾ | 12 | 11 | 11½ |
| April | 12 | 12¼ | 11½ | 12¼ | 11 | 12¼ | 12½ | 12½ |
| May | 8½ | 12 | 9½ | 12 | 9½ | 11¼ | 10½ | 12½ |
| June | 7½ | 8¾ | 8 | 10 | 8 | 9½ | 9 | 9¾ |
| July | 8 | 9½ | 8½ | 9½ | 8¼ | 9 | 9½ | 10¼ |
| August | 9½ | 11¼ | 9 | 11 | 8¾ | 10 | 10½ | 10½ |
| September | 11¼ | 11¾ | 10¼ | 12 | 10 | 11¾ | 11¾ | 12½ |
| October | 12 | 12¾ | 12 | 12¼ | 11¼ | 12¼ | 13 | 13 |
| November | 12½ | 12¾ | 12½ | 12¼ | 11 | 12½ | 12 | 13 |
| December | 12¾ | 13 | 12 | 12½ | 11 | 13 | 12½ | 12½ |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

LIVE HOGS (PER 100 POUNDS).

| Date. | Cincinnati. Packing, fair to good. | | St. Louis. | | Chicago. | | Omaha. | |
|---|---|---|---|---|---|---|---|---|
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | | | | | | | | |
| January | $4.00 | $4.50 | $4.15 | $4.45 | $3.70 | $4.80 | $3.25 | $4.45 |
| February | 3.90 | 4.55 | 3.50 | 4.45 | 3.60 | 4.65 | 3.35 | 4.30 |
| March | 4.25 | 5.15 | 3.75 | 4.90 | 3.85 | 5.30 | 3.50 | 5.00 |
| April | 4.75 | 5.25 | 4.30 | 5.10 | 4.40 | 5.40 | 4.30 | 5.10 |
| May | 4.50 | 4.90 | 4.00 | 4.95 | 4.10 | 4.97½ | 3.90 | 4.70 |
| June | 4.40 | 4.90 | 4.00 | 4.70 | 4.20 | 5.10 | 4.00 | 4.85 |
| July | 5.00 | 5.35 | 4.25 | 5.35 | 4.50 | 5.70 | 4.50 | 5.10 |
| August | 4.45 | 4.95 | 4.30 | 5.15 | 3.85 | 5.40 | 4.00 | 4.75 |
| September | 4.25 | 4.40 | 3.60 | 4.50 | 3.55 | 4.65 | 3.50 | 4.42½ |
| October | 3.65 | 4.20 | 3.25 | 4.30 | 3.20 | 4.50 | 3.25 | 4.15 |
| November | 4.25 | 4.75 | 3.00 | 3.90 | 3.20 | 3.85 | 3.25 | 3.60 |
| December | 4.10 | 4.70 | 2.80 | 3.55 | 3.25 | 3.75 | 3.20 | 3.50 |
| **1896.** | | | | | | | | |
| January | 3.60 | 5.45 | 3.15 | 4.15 | 3.35 | 4.45 | 3.35 | 4.05 |
| February | 3.85 | 4.35 | 3.40 | 4.25 | 3.60 | 4.35 | 3.60 | 4.12 |
| March | 3.75 | 4.20 | 3.45 | 4.12 | 3.55 | 4.25 | 3.50 | 3.95 |
| April | 3.35 | 3.80 | 3.15 | 3.80 | 3.05 | 4.15 | 3.10 | 3.75 |
| May | 3.25 | 3.45 | 3.00 | 3.50 | 2.80 | 3.75 | 2.85 | 3.45 |
| June | 3.15 | 3.40 | 2.85 | 3.40 | 2.70 | 3.60 | 2.80 | 3.25 |
| July | 3.25 | 3.55 | 3.00 | 3.50 | 2.60 | 3.65 | 2.62 | 3.30 |
| August | 3.20 | 3.45 | 3.00 | 3.50 | 2.50 | 3.70 | 2.55 | 3.15 |
| September | 3.15 | 3.40 | 2.90 | 3.35 | 2.45 | 3.50 | 2.50 | 3.20 |
| October | 3.20 | 3.45 | 3.00 | 3.50 | 2.55 | 3.65 | 2.75 | 3.45 |
| November | 3.40 | 3.75 | 3.10 | 3.55 | 2.90 | 3.70 | 3.00 | 3.50 |
| December | 3.35 | 3.60 | 3.10 | 3.40 | 2.90 | 3.60 | 3.20 | 3.45 |
| **1897.** | | | | | | | | |
| January | 3.20 | 3.55 | 3.10 | 3.55 | 3.00 | 3.60 | 3.00 | 3.50 |
| February | 3.35 | 3.75 | 3.30 | 3.65 | 3.10 | 3.75 | 3.10 | 3.57½ |
| March | 3.60 | 4.10 | 3.40 | 4.10 | 3.35 | 4.25 | 3.40 | 4.05 |
| April | 3.90 | 4.10 | 3.70 | 4.15 | 3.50 | 4.25 | 3.70 | 4.05 |
| May | 3.60 | 3.95 | 3.40 | 3.90 | 3.25 | 4.05 | 3.30 | 3.85 |
| June | 3.30 | 3.55 | 3.20 | 3.50 | 3.05 | 3.65 | 3.05 | 3.45 |
| July | $3.40 | $3.80 | $3.25 | $3.87½ | $3.05 | $4.00 | $3.10 | $3.65 |
| August | 3.85 | 4.40 | 3.55 | 4.50 | 3.45 | 4.55 | 3.35 | 4.15 |
| September | 4.15 | 4.45 | 3.95 | 4.47½ | 3.60 | 4.65 | 3.60 | 4.17½ |
| October | 3.55 | 4.20 | 3.55 | 4.30 | 3.20 | 4.40 | 3.30 | 4.00 |
| November | 3.05 | 3.55 | 3.30 | 3.65 | 3.15 | 3.80 | 3.17½ | 3.62½ |
| December | 3.00 | 3.40 | 3.35 | 3.47½ | 3.10 | 3.60 | 2.85 | 3.45 |
| **1898.** | | | | | | | | |
| January | 3.40 | 3.90 | 3.25 | 3.90 | 3.35 | 4.00 | 3.35 | 3.80 |
| February | 3.65 | 4.20 | 3.60 | 4.10 | 3.60 | 4.27½ | 3.52½ | 4.00 |
| March | 3.75 | 4.00 | 3.70 | 4.10 | 3.65 | 4.17½ | 3.50 | 3.95 |
| April | 3.65 | 3.95 | 3.60 | 4.10 | 3.60 | 4.15 | 3.50 | 3.90 |
| May | 3.90 | 4.45 | 3.70 | 4.55 | 3.70 | 4.80 | 3.75 | 4.60 |
| June | 3.75 | 4.05 | 3.35 | 4.15 | 3.55 | 4.50 | 3.40 | 4.30 |
| July | 3.70 | 4.00 | 3.30 | 4.05 | 3.60 | 4.17½ | 3.40 | 3.95 |
| August | 3.85 | 4.00 | 3.50 | 4.05 | 3.45 | 4.20 | 3.50 | 3.92½ |
| September | 3.80 | 4.00 | 3.50 | 4.05 | 3.40 | 4.15 | 3.40 | 3.90 |
| October | 3.50 | 3.85 | 3.40 | 3.92½ | 3.25 | 4.00 | 3.35 | 3.80 |
| November | 3.35 | 3.70 | 3.20 | 3.80 | 3.10 | 3.85 | 3.10 | 3.65 |
| December | 3.15 | 3.50 | 3.10 | 3.65 | 3.15 | 3.75 | 3.10 | 4.55 |
| **1899.** | | | | | | | | |
| January | 3.45 | 3.95 | 3.40 | 3.90 | 3.30 | 4.05 | 3.30 | 3.75 |
| February | 3.55 | 4.05 | 3.55 | 4.00 | 3.45 | 4.05 | 3.30 | 3.77½ |
| March | 3.60 | 3.95 | 3.55 | 3.97½ | 3.50 | 4.00 | 3.40 | 3.75 |
| April | 3.70 | 4.00 | 3.65 | 4.12½ | 3.50 | 4.15 | 3.50 | 3.85 |
| May | 3.65 | 3.92 | 3.60 | 3.95 | 3.45 | 4.05 | 3.45 | 3.80 |
| June | 3.65 | 4.00 | 3.60 | 3.90 | 3.45 | 4.00 | 3.25 | 3.75 |
| July | 3.80 | 4.65 | 3.75 | 4.60 | 3.55 | 4.70 | 3.67½ | 4.42½ |
| August | 4.35 | 4.85 | 4.55 | 4.85 | 3.85 | 5.00 | 4.10 | 4.70 |
| September | 4.25 | 4.80 | 4.45 | 4.75 | 3.90 | 4.90 | 4.10 | 4.52½ |
| October | 4.15 | 4.75 | 4.10 | 4.65 | 3.80 | 4.90 | 3.95 | 4.57½ |
| November | 3.75 | 4.20 | 3.75 | 4.20 | 3.55 | 4.35 | 3.60 | 4.12½ |
| December | 3.75 | 4.40 | 3.80 | 4.47½ | 3.50 | 4.45 | 3.70 | 4.20 |

*Wholesale prices in leading cities of the United States, 1895-1899*—Continued.

UPLAND MIDDLING COTTON (PER POUND).

| Date. | New York. | | New Orleans. | | Memphis. | | Galveston. | | Savannah. | | Charleston. | | Wilmington. | | Norfolk. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | 5 5/8 | 5 3/4 | 5 | 5 3/16 | 5 1/16 | 5 1/8 | 5 1/16 | 5 3/16 | 5 | 5 1/8 | 5 1/8 | 5 1/4 | 4 1/8 | 5 | 5 1/4 | 5 1/4 |
| February | 5 9/16 | 5 5/8 | 5 | 5 3/16 | 5 1/16 | 5 1/8 | 5 3/16 | 5 3/16 | 5 1/16 | 5 1/8 | 5 1/8 | 5 3/16 | 4 7/8 | 5 | 5 1/16 | 5 3/16 |
| March | 5 9/16 | 6 7/16 | 5 1/16 | 5 1/8 | 5 1/16 | 5 13/16 | 5 1/8 | 5 7/8 | 5 | 5 15/16 | 5 1/8 | 5 3/4 | 5 | 5 3/4 | 5 1/16 | 5 3/4 |
| April | 6 5/8 | 7 | 5 3/4 | 6 5/8 | 5 3/4 | 6 5/8 | 5 3/4 | 6 7/16 | 5 13/16 | 6 5/8 | 6 | 6 5/8 | 5 3/4 | 6 1/8 | 5 15/16 | 6 1/2 |
| May | 6 3/4 | 7 5/8 | 6 1/8 | 7 | 6 1/4 | 6 13/16 | 6 1/4 | 6 13/16 | 6 5/16 | 6 13/16 | 6 1/8 | 6 1/4 | 6 1/4 | 6 3/4 | 6 1/4 | 6 3/4 |
| June | 7 | 7 1/4 | 6 5/8 | 7 | 7 | 7 1/2 | 6 5/8 | 6 1/2 | 6 5/8 | 6 3/4 | 6 3/8 | 6 1/4 | 6 5/8 | 6 7/8 | 6 5/8 | 6 3/4 |
| July | 7 | 7 3/16 | 6 1/8 | 6 3/4 | 6 3/8 | 6 3/4 | 6 5/8 | 6 11/16 | 6 3/4 | 6 11/16 | 6 5/8 | 6 5/8 | 6 5/8 | 7 | 6 3/4 | 7 |
| August | 7 1/8 | 8 3/16 | 6 1/2 | 7 11/16 | 6 3/4 | 7 11/16 | 6 1/2 | 7 3/4 | 6 11/16 | 7 5/8 | 6 5/8 | 7 1/2 | 6 7/8 | 7 1/2 | 7 | 7 5/8 |
| September | 8 1/8 | 9 1/8 | 7 5/8 | 8 7/8 | 7 11/16 | 8 1/2 | 7 5/8 | 9 1/4 | 7 5/8 | 8 5/8 | 7 5/8 | 8 3/8 | 7 1/2 | 8 5/8 | 7 5/8 | 8 5/8 |
| October | 8 1/2 | 9 3/8 | 8 5/16 | 9 3/16 | 8 3/8 | 8 15/16 | 8 1/4 | 9 11/16 | 8 1/8 | 8 11/16 | 8 | 8 3/4 | 8 1/4 | 9 | 8 1/4 | 9 |
| November | 8 3/4 | 9 | 8 1/8 | 8 5/16 | 8 1/16 | 8 5/8 | 8 3/16 | 8 3/4 | 7 7/8 | 8 7/16 | 7 7/8 | 8 1/2 | 8 | 8 5/8 | 8 | 8 5/8 |
| December | 8 1/4 | 8 9/16 | 7 11/16 | 8 3/16 | 7 13/16 | 8 1/4 | 7 1/8 | 8 1/4 | 7 11/16 | 8 1/8 | 7 5/8 | 8 1/8 | 7 3/4 | 8 1/4 | 7 5/8 | 8 1/4 |
| **1896.** | | | | | | | | | | | | | | | | |
| January | 8 3/16 | 8 5/8 | 7 13/16 | 8 | 7 3/4 | 8 | 7 13/16 | 8 1/16 | 7 5/8 | 7 15/16 | 7 5/8 | 7 3/4 | 7 3/4 | 7 7/8 | 7 13/16 | 8 |
| February | 7 13/16 | 8 1/4 | 7 1/2 | 8 | 7 1/2 | 7 15/16 | 7 9/16 | 8 | 7 7/16 | 7 3/4 | 7 5/8 | 7 3/4 | 7 1/2 | 7 1/2 | 7 9/16 | 7 15/16 |
| March | 7 5/8 | 8 | 7 5/8 | 7 13/16 | 7 5/8 | 7 3/4 | 7 5/8 | 7 13/16 | 7 5/16 | 7 7/8 | 7 1/4 | 7 1/2 | 7 5/8 | 7 1/2 | 7 5/8 | 7 3/4 |
| April | 7 7/8 | 8 1/2 | 7 5/8 | 7 3/4 | 7 1/2 | 7 9/16 | 7 11/16 | 7 3/4 | 7 1/8 | 7 5/8 | 7 1/2 | 7 1/2 | 7 1/2 | 7 5/8 | 7 5/8 | 7 3/4 |
| May | 8 | 8 5/8 | 7 5/8 | 7 3/4 | 7 7/16 | 7 9/16 | 7 7/16 | 7 7/8 | 7 1/2 | 7 3/4 | 7 1/2 | 7 3/4 | 7 5/8 | 7 1/2 | 7 1/2 | 7 15/16 |
| June | 7 7/16 | 8 | 6 13/16 | 7 5/8 | 7 | 7 5/8 | 6 5/8 | 7 5/8 | 7 | 7 1/2 | 6 5/8 | 7 1/2 | 7 1/8 | 7 1/2 | 7 1/2 | 7 1/2 |
| July | 7 3/16 | 7 7/16 | 6 1/2 | 6 13/16 | 6 5/8 | 6 7/8 | 6 5/8 | 6 9/16 | 6 5/8 | 7 | 6 5/8 | 6 5/8 | 7 | 7 1/2 | 6 3/4 | 7 1/2 |
| August | 7 7/16 | 8 5/8 | 6 13/16 | 8 | 6 3/4 | 7 7/8 | 6 1/2 | 8 | 6 5/8 | 7 11/16 | 6 5/8 | 7 11/16 | 7 | 7 1/2 | 6 3/4 | 7 5/8 |
| September | 8 3/16 | 8 7/8 | 7 1/2 | 8 1/8 | 7 5/8 | 8 1/16 | 7 1/4 | 8 1/4 | 7 1/8 | 7 15/16 | 7 1/4 | 8 | 7 1/4 | 8 | 7 1/2 | 8 1/4 |
| October | 7 15/16 | 8 3/4 | 7 1/2 | 7 5/8 | 7 1/8 | 7 5/8 | 7 1/4 | 7 3/4 | 7 | 7 1/2 | 7 | 7 1/2 | 7 1/4 | 7 3/4 | 7 1/4 | 7 1/2 |
| November | 7 7/8 | 8 3/16 | 7 9/16 | 7 1/2 | 7 1/8 | 7 7/16 | 7 1/4 | 7 9/16 | 6 7/8 | 7 5/8 | 6 7/8 | 7 1/4 | 7 | 7 9/16 | 7 3/16 | 7 9/16 |
| December | 7 1/16 | 7 11/16 | 6 11/16 | 7 5/8 | 6 11/16 | 7 3/16 | 6 11/16 | 7 5/16 | 6 7/16 | 7 | 6 1/2 | 7 | 6 7/16 | 7 1/8 | 6 11/16 | 7 1/4 |
| **1897.** | | | | | | | | | | | | | | | | |
| January | 7 1/16 | 7 5/16 | 6 7/8 | 7 | 6 3/4 | 6 15/16 | 6 13/16 | 7 | 6 9/16 | 6 7/8 | 6 9/16 | 7 | 6 5/8 | 6 7/8 | 6 7/8 | 6 15/16 |
| February | 7 | 7 7/16 | 6 11/16 | 7 3/16 | 6 3/4 | 7 | 6 3/4 | 7 1/8 | 6 5/8 | 7 | 6 1/2 | 7 | 6 5/8 | 6 7/8 | 6 13/16 | 7 1/16 |
| March | 7 3/16 | 7 7/16 | 6 13/16 | 7 3/16 | 6 7/8 | 7 1/16 | 7 | 7 1/4 | 6 5/8 | 7 | 6 7/8 | 7 | 6 7/8 | 7 | 7 | 7 3/16 |
| April | 7 3/16 | 7 1/2 | 6 15/16 | 7 9/16 | 6 15/16 | 7 1/2 | 7 | 7 1/2 | 6 7/8 | 7 5/8 | 6 15/16 | 7 5/8 | 7 | 7 5/8 | 7 3/16 | 7 7/16 |
| May | 7 5/8 | 7 13/16 | 7 5/8 | 7 9/16 | 7 1/4 | 7 5/8 | 7 1/4 | 7 1/2 | 7 5/8 | 7 1/2 | 7 1/4 | 7 5/8 | 7 5/8 | 7 1/2 | 7 1/2 | 7 5/8 |
| June | 7 11/16 | 7 7/8 | 7 5/8 | 7 3/4 | 7 3/16 | 7 1/2 | 7 1/4 | 7 5/8 | 7 1/4 | 7 1/4 | 7 1/4 | 7 1/2 | 7 1/2 | 7 5/8 | 7 1/2 | 7 3/4 |
| July | 7 5/8 | 8 | 7 5/8 | 7 13/16 | 7 1/2 | 7 13/16 | 7 5/8 | 7 11/16 | 7 1/8 | 7 5/8 | 7 1/8 | 7 3/4 | 7 5/8 | 8 1/8 | 7 3/4 | 8 1/8 |
| August | 7 7/8 | 8 1/4 | 7 1/16 | 7 11/16 | 7 7/16 | 7 13/16 | 7 1/8 | 7 5/8 | 7 | 7 3/4 | 7 | 7 3/4 | 7 | 8 1/8 | 8 | 8 1/8 |
| September | 6 1/2 | 7 13/16 | 6 1/16 | 7 1/16 | 6 | 7 7/16 | 6 1/4 | 7 1/8 | 5 13/16 | 7 | 5 13/16 | 7 | 6 | 7 | 6 3/16 | 8 |
| October | 6 | 6 1/2 | 5 1/2 | 6 1/8 | 5 1/2 | 6 1/16 | 5 11/16 | 6 5/8 | 5 5/8 | 5 15/16 | 5 5/8 | 6 | 5 1/2 | 6 1/8 | 5 9/16 | 6 1/4 |
| November | 5 13/16 | 6 | 5 1/4 | 5 1/2 | 5 1/4 | 5 5/8 | 5 5/8 | 5 5/8 | 5 1/2 | 5 5/16 | 5 1/2 | 5 5/16 | 5 3/16 | 5 1/2 | 5 5/8 | 5 9/16 |
| December | 5 13/16 | 5 15/16 | 5 1/4 | 5 5/8 | 5 1/2 | 5 5/16 | 5 5/8 | 5 1/2 | 5 1/8 | 5 3/16 | 5 3/16 | 5 3/16 | 5 | 5 1/2 | 5 1/2 | 5 1/8 |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

UPLAND MIDDLING COTTON (PER POUND)—Continued.

| Date. | New York. | | New Orleans. | | Memphis. | | Galveston. | | Savannah. | | Charleston. | | Wilmington. | | Norfolk. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1898.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | $5\frac{5}{8}$ | $5\frac{13}{16}$ | $5\frac{3}{16}$ | $5\frac{5}{8}$ | $5\frac{9}{16}$ | $5\frac{5}{8}$ | $5\frac{7}{16}$ | $5\frac{9}{16}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{3}{16}$ | $5\frac{5}{16}$ | $5\frac{5}{8}$ | $5\frac{7}{16}$ | $5\frac{7}{16}$ | $5\frac{1}{2}$ |
| February | $5\frac{13}{16}$ | $6\frac{5}{16}$ | $5\frac{1}{4}$ | $5\frac{11}{16}$ | $5\frac{5}{16}$ | $5\frac{3}{4}$ | $5\frac{1}{2}$ | 6 | $5\frac{3}{16}$ | $5\frac{13}{16}$ | $5\frac{1}{4}$ | $5\frac{3}{4}$ | $5\frac{1}{2}$ | $5\frac{3}{4}$ | $5\frac{1}{2}$ | $5\frac{13}{16}$ |
| March | $6\frac{1}{16}$ | $6\frac{5}{16}$ | $5\frac{7}{16}$ | $5\frac{3}{4}$ | $5\frac{1}{4}$ | $5\frac{13}{16}$ | $5\frac{5}{8}$ | $6\frac{3}{16}$ | $5\frac{9}{16}$ | $5\frac{3}{4}$ | $5\frac{1}{2}$ | $5\frac{3}{4}$ | $5\frac{3}{4}$ | 6 | $5\frac{3}{4}$ | 6 |
| April | $6\frac{3}{16}$ | $6\frac{1}{4}$ | $5\frac{9}{16}$ | $5\frac{13}{16}$ | $5\frac{1}{4}$ | 6 | $5\frac{5}{8}$ | $5\frac{3}{4}$ | $5\frac{9}{16}$ | $5\frac{7}{8}$ | $5\frac{9}{16}$ | $5\frac{13}{16}$ | $5\frac{7}{8}$ | $6\frac{1}{4}$ | $5\frac{13}{16}$ | $6\frac{3}{16}$ |
| May | $6\frac{3}{16}$ | $6\frac{5}{16}$ | $5\frac{11}{16}$ | $6\frac{1}{16}$ | $5\frac{1}{4}$ | 6 | $5\frac{11}{16}$ | 6 | $5\frac{11}{16}$ | 6 | $5\frac{5}{8}$ | $5\frac{3}{4}$ | 6 | $6\frac{1}{4}$ | $6\frac{1}{4}$ | $6\frac{3}{8}$ |
| June | $6\frac{5}{16}$ | $6\frac{5}{16}$ | $5\frac{11}{16}$ | $6\frac{1}{16}$ | $5\frac{1}{2}$ | 6 | $5\frac{13}{16}$ | 6 | $5\frac{5}{8}$ | 6 | 6 | 6 | $5\frac{1}{2}$ | $6\frac{1}{4}$ | $6\frac{3}{16}$ | $6\frac{3}{8}$ |
| July | $6\frac{3}{16}$ | $6\frac{1}{4}$ | $5\frac{1}{2}$ | $5\frac{13}{16}$ | $5\frac{3}{8}$ | $5\frac{1}{2}$ | $5\frac{11}{16}$ | $5\frac{13}{16}$ | $5\frac{5}{8}$ | $5\frac{7}{8}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{3}{4}$ | $5\frac{3}{4}$ | $5\frac{3}{4}$ | $6\frac{1}{4}$ |
| August | $5\frac{3}{4}$ | $6\frac{1}{8}$ | $5\frac{3}{8}$ | $5\frac{11}{16}$ | $5\frac{3}{8}$ | $5\frac{3}{4}$ | $5\frac{7}{16}$ | $5\frac{11}{16}$ | $5\frac{1}{2}$ | $5\frac{11}{16}$ | 5 | $5\frac{1}{2}$ | $5\frac{1}{4}$ | $5\frac{7}{8}$ | $5\frac{3}{8}$ | $5\frac{7}{8}$ |
| September | $5\frac{5}{16}$ | $5\frac{13}{16}$ | $4\frac{1}{2}$ | $5\frac{5}{8}$ | $4\frac{1}{2}$ | $5\frac{5}{16}$ | $4\frac{1}{2}$ | $5\frac{7}{16}$ | $4\frac{3}{4}$ | $5\frac{3}{16}$ | $4\frac{3}{4}$ | $5\frac{1}{2}$ | $4\frac{3}{4}$ | $5\frac{1}{4}$ | $5\frac{1}{2}$ | $5\frac{5}{8}$ |
| October | $5\frac{3}{16}$ | $5\frac{1}{2}$ | $4\frac{1}{2}$ | $5\frac{1}{4}$ | $4\frac{1}{2}$ | 5 | $4\frac{1}{2}$ | $5\frac{3}{16}$ | $4\frac{5}{8}$ | $4\frac{13}{16}$ | $4\frac{11}{16}$ | $4\frac{3}{4}$ | $4\frac{3}{4}$ | 5 | 5 | $5\frac{5}{8}$ |
| November | $5\frac{5}{16}$ | $5\frac{3}{4}$ | $4\frac{3}{4}$ | $5\frac{1}{16}$ | $4\frac{1}{2}$ | $5\frac{3}{16}$ | $4\frac{1}{2}$ | $5\frac{1}{4}$ | $4\frac{1}{2}$ | $4\frac{3}{4}$ | $4\frac{9}{16}$ | $4\frac{13}{16}$ | $4\frac{5}{8}$ | 5 | $4\frac{13}{16}$ | $5\frac{1}{4}$ |
| December | $5\frac{5}{8}$ | $5\frac{1}{2}$ | 5 | $5\frac{1}{4}$ | $5\frac{1}{4}$ | $5\frac{5}{8}$ | $5\frac{1}{4}$ | $5\frac{1}{2}$ | $4\frac{1}{2}$ | $5\frac{1}{2}$ | $4\frac{13}{16}$ | $5\frac{1}{4}$ | 5 | $5\frac{5}{8}$ | $5\frac{1}{4}$ | $5\frac{7}{16}$ |
| **1899.** | | | | | | | | | | | | | | | | |
| January | $5\frac{1}{2}$ | $6\frac{7}{16}$ | $5\frac{3}{16}$ | $5\frac{5}{8}$ | $5\frac{1}{2}$ | $5\frac{3}{4}$ | $5\frac{7}{16}$ | $6\frac{1}{16}$ | $5\frac{1}{16}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{5}{8}$ | $5\frac{5}{8}$ | $5\frac{3}{4}$ | $5\frac{5}{8}$ | 6 |
| February | $6\frac{3}{16}$ | $6\frac{1}{2}$ | $5\frac{11}{16}$ | 6 | $5\frac{11}{16}$ | $6\frac{1}{4}$ | 6 | $6\frac{1}{2}$ | $5\frac{5}{8}$ | $5\frac{13}{16}$ | $5\frac{11}{16}$ | $5\frac{13}{16}$ | $5\frac{1}{2}$ | 6 | 6 | $6\frac{1}{4}$ |
| March | $6\frac{3}{16}$ | $6\frac{9}{16}$ | $5\frac{11}{16}$ | $6\frac{1}{4}$ | $5\frac{1}{2}$ | $6\frac{1}{4}$ | $5\frac{13}{16}$ | $6\frac{1}{4}$ | $5\frac{11}{16}$ | $5\frac{1}{2}$ | $5\frac{5}{8}$ | $5\frac{13}{16}$ | 6 | 6 | 6 | $6\frac{1}{4}$ |
| April | $6\frac{1}{4}$ | $6\frac{9}{16}$ | $5\frac{5}{8}$ | $5\frac{3}{4}$ | $5\frac{5}{8}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{13}{16}$ | $5\frac{5}{8}$ | $5\frac{11}{16}$ | $5\frac{3}{4}$ | $5\frac{5}{8}$ | $5\frac{1}{2}$ | 6 | $5\frac{1}{4}$ | 6 |
| May | $6\frac{1}{4}$ | $6\frac{1}{4}$ | $5\frac{11}{16}$ | $5\frac{1}{2}$ | $5\frac{5}{8}$ | $5\frac{5}{8}$ | $5\frac{1}{4}$ | $5\frac{13}{16}$ | $5\frac{5}{8}$ | $5\frac{5}{8}$ | $5\frac{7}{8}$ | $5\frac{9}{16}$ | $5\frac{1}{2}$ | $5\frac{3}{8}$ | $5\frac{1}{2}$ | 6 |
| June | $6\frac{5}{16}$ | $6\frac{9}{16}$ | $5\frac{1}{2}$ | $5\frac{3}{8}$ | $5\frac{5}{8}$ | $5\frac{13}{16}$ | $5\frac{1}{2}$ | $5\frac{13}{16}$ | $5\frac{5}{8}$ | $5\frac{5}{8}$ | $6\frac{9}{16}$ | $6\frac{5}{8}$ | $5\frac{1}{2}$ | $5\frac{3}{4}$ | $5\frac{1}{2}$ | $6\frac{1}{4}$ |
| July | $6\frac{1}{4}$ | $6\frac{1}{4}$ | $5\frac{3}{8}$ | $5\frac{3}{4}$ | $5\frac{5}{8}$ | $5\frac{5}{8}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{5}{8}$ | $5\frac{5}{8}$ | ..... | ..... | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | 6 |
| August | $6\frac{1}{4}$ | $6\frac{1}{4}$ | $5\frac{3}{8}$ | $5\frac{13}{16}$ | $5\frac{5}{8}$ | $5\frac{13}{16}$ | $5\frac{1}{2}$ | $6\frac{1}{4}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{13}{16}$ | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $5\frac{13}{16}$ | $6\frac{1}{4}$ |
| September | $6\frac{1}{4}$ | $6\frac{1}{2}$ | $5\frac{3}{8}$ | $6\frac{1}{4}$ | $5\frac{1}{2}$ | $6\frac{5}{8}$ | $6\frac{1}{16}$ | $6\frac{1}{2}$ | $5\frac{5}{8}$ | $6\frac{1}{4}$ | $5\frac{1}{2}$ | $6\frac{5}{8}$ | $5\frac{1}{2}$ | $6\frac{1}{4}$ | 6 | $6\frac{1}{4}$ |
| October | $7\frac{3}{16}$ | $7\frac{5}{8}$ | $6\frac{1}{4}$ | $6\frac{13}{16}$ | $6\frac{3}{4}$ | $7\frac{1}{4}$ | $6\frac{13}{16}$ | $7\frac{1}{4}$ | $6\frac{3}{8}$ | $6\frac{1}{2}$ | $6\frac{1}{4}$ | 7 | $6\frac{1}{2}$ | $7\frac{1}{4}$ | $7\frac{1}{16}$ | $7\frac{3}{16}$ |
| November | $7\frac{5}{8}$ | $7\frac{13}{16}$ | $6\frac{1}{2}$ | $7\frac{7}{16}$ | 7 | $7\frac{1}{2}$ | $7\frac{3}{16}$ | $7\frac{1}{2}$ | $6\frac{1}{2}$ | $7\frac{1}{4}$ | $6\frac{3}{4}$ | $7\frac{5}{8}$ | $7\frac{1}{8}$ | $7\frac{3}{8}$ | $7\frac{1}{16}$ | $7\frac{3}{8}$ |
| December | $7\frac{1}{2}$ | $7\frac{3}{4}$ | $7\frac{3}{16}$ | $7\frac{1}{2}$ | $7\frac{1}{4}$ | $7\frac{7}{16}$ | $7\frac{1}{4}$ | $7\frac{7}{16}$ | $7\frac{1}{4}$ | $7\frac{3}{16}$ | $7\frac{3}{16}$ | $7\frac{5}{8}$ | 7 | $7\frac{1}{4}$ | $7\frac{3}{16}$ | $7\frac{1}{4}$ |

*Wholesale prices in leading cities of the United States, 1895–1899*—Continued.

WOOL (PER POUND).

| Date. | New York. | | Philadelphia. | | Chicago. | | St. Louis. | |
|---|---|---|---|---|---|---|---|---|
| | XX Ohio. | | XX Ohio, washed. | | Washed fleece, fine. | | Best tub-washed. | |
| | Low. | High. | Low. | High. | Low. | High. | Low. | High. |
| **1895.** | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* | *Cents.* |
| January | 17½ | 18 | 17 | 18 | 15 | 16 | 21 | 21 |
| February | 16½ | 17½ | 17 | 18 | 15 | 16 | 21 | 21 |
| March | 16½ | 16½ | 16 | 17 | 15 | 16 | 21 | 21 |
| April | 16 | 16½ | 16 | 17 | 14 | 15 | 20 | 21 |
| May | 16 | 16 | 16 | 17 | 14 | 15 | 19 | 20 |
| June | 16 | 16½ | 16 | 16½ | 14 | 15 | 19½ | 20½ |
| July | 16½ | 18½ | 18 | 19 | 14 | 15 | 21 | 21 |
| August | 18½ | 18½ | 18 | 19 | 14 | 15 | 20 | 21 |
| September | 18½ | 18½ | 18 | 19 | 14 | 15 | 20½ | 20½ |
| October | 18½ | 18¾ | 18 | 19 | 15 | 17 | 20½ | 21 |
| November | 18¾ | 18¾ | 18 | 19 | 15 | 17 | 20 | 21 |
| December | 19 | 19 | 18 | 19 | 15 | 17 | 20 | 20½ |
| **1896.** | | | | | | | | |
| January | 19 | 19 | 18 | 19 | 16 | 18 | 20 | 21 |
| February | 19 | 19 | 18 | 20 | 16 | 18 | 20 | 21 |
| March | 19 | 19 | 18 | 19 | 16 | 18 | 20 | 20½ |
| April | 18½ | 19 | 17½ | 18½ | 16 | 17 | 18 | 20 |
| May | 18½ | 18½ | 17 | 18 | 16 | 17 | 18 | 18 |
| June | 17½ | 17½ | 16 | 18 | 16 | 17 | 18 | 19 |
| July | 17½ | 17½ | 16½ | 18 | 14 | 16 | 17 | 18½ |
| August | 17½ | 17½ | 16 | 18 | 14 | 16 | 17 | 17½ |
| September | 17½ | 17½ | 16 | 18 | 14 | 16 | 17 | 18½ |
| October | 17½ | 17½ | 17½ | 18½ | 15 | 16 | 18 | 19 |
| November | 17½ | 17½ | 18½ | 19 | 15 | 16 | 20 | 21 |
| December | 17½ | 17½ | 19 | 21 | 15 | 16 | 20½ | 21 |
| **1897.** | | | | | | | | |
| January | 17½ | 17½ | 19 | 20 | 15 | 16 | 20½ | 21½ |
| February | 17½ | 17½ | 19 | 20 | 15 | 16 | 22 | 22 |
| March | 17½ | 17½ | 19 | 20 | 15 | 16 | 22 | 23½ |
| April | 17½ | 18½ | 20 | 22 | 18 | 20 | 24 | 24½ |
| May | 18½ | 22 | 21 | 22 | 18 | 20 | 23 | 24 |
| June | 22 | 22 | 21 | 22 | 18 | 20 | 23 | 23½ |
| **1897.** | | | | | | | | |
| July | 22 | 24 | 22 | 23 | 22 | 26 | 24 | 24½ |
| August | 24 | 25½ | 23 | 25 | 22 | 26 | 25 | 28½ |
| September | 25½ | 28 | 25 | 27 | 22 | 26 | 28 | 32 |
| October | 28 | 30½ | 28 | 29 | 26 | 28 | 31 | 32 |
| November | 29 | 31½ | 29 | 31 | 26 | 28 | 30 | 31 |
| December | 29½ | 30 | 29 | 31 | 26 | 28 | 30 | 30 |
| **1898.** | | | | | | | | |
| January | 30 | 31 | 29 | 30 | 25 | 26 | 30 | 30 |
| February | 30 | 31 | 30 | 31 | 25 | 26 | 29 | 30 |
| March | 30 | 31 | 29½ | 30½ | 25 | 26 | 28 | 29 |
| April | 30 | 31 | 28 | 30 | 24 | 28 | 27½ | 28 |
| May | 29 | 30 | 28 | 29 | 24 | 28 | 27 | 28 |
| June | 29 | 30 | 28 | 29 | 24 | 28 | 28 | 28 |
| July | 29 | 30 | 28 | 29 | 25 | 27 | 27½ | 28 |
| August | 29 | 30 | 28½ | 29½ | 25 | 27 | 27½ | 28 |
| September | 29 | 30 | 29 | 30 | 25 | 27 | 27 | 27 |
| October | 29 | 30 | 29 | 30 | 24 | 27 | 26 | 26½ |
| November | 28 | 29 | 28 | 29 | 24 | 27 | 25½ | 26 |
| December | 28 | 29 | 28 | 29 | 24 | 27 | 26 | 26 |
| **1899.** | | | | | | | | |
| January | 28 | 29 | 27 | 28 | 20 | 21 | 26 | 26 |
| February | 28 | 29 | 26½ | 27 | 20 | 21 | 26 | 26 |
| March | 28 | 29 | 26½ | 27 | 20 | 21 | 25½ | 26 |
| April | 28 | 29 | 26 | 27 | 19 | 22 | 26 | 26 |
| May | 28 | 29 | 25½ | 26½ | 19 | 22 | 26 | 26½ |
| June | 28 | 29 | 27 | 28 | 19 | 22 | 27 | 27 |
| July | 28 | 29 | 28½ | 30 | 23 | 24 | 26 | 26½ |
| August | 30 | 32 | 29 | 31 | 23 | 24 | 26½ | 27 |
| September | 30 | 32 | 31 | 32 | 23 | 24 | 26½ | 27½ |
| October | 30 | 33 | 32½ | 33½ | 26 | 28 | 28 | 28½ |
| November | 32 | 36 | 33 | 34 | 26 | 28 | 29 | 32 |
| December | 36 | 39 | 35 | 36 | 26 | 28 | 34 | 35 |

*Number and value of farm animals in the United States, 1880 to 1900.*

[From Division of Statistics.]

| January 1— | Horses. | | Mules. | | Milch Cows. | |
|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. |
| 1880 | 11,201,800 | $613,296,611 | 1,729,500 | $105,948,319 | 12,027,000 | $279,899,420 |
| 1881 | 11,429,626 | 667,954,325 | 1,720,731 | 120,096,164 | 12,368,653 | 296,277,060 |
| 1882 | 10,521,554 | 615,824,914 | 1,835,166 | 130,945,378 | 12,611,632 | 326,480,310 |
| 1883 | 10,838,111 | 765,041,308 | 1,871,079 | 148,732,390 | 13,125,685 | 396,575,405 |
| 1884 | 11,169,683 | 833,734,400 | 1,914,126 | 161,214,976 | 13,501,206 | 423,486,649 |
| 1885 | 11,564,572 | 852,282,947 | 1,972,569 | 162,497,097 | 13,904,722 | 412,903,093 |
| 1886 | 12,077,657 | 860,823,208 | 2,052,593 | 163,381,096 | 14,235,388 | 389,985,523 |
| 1887 | 12,496,744 | 901,685,755 | 2,117,141 | 167,057,538 | 14,522,083 | 378,789,589 |
| 1888 | 13,172,936 | 946,096,154 | 2,191,727 | 174,853,563 | 14,856,414 | 366,252,173 |
| 1889 | 13,663,294 | 982,194,827 | 2,257,574 | 179,444,481 | 15,298,625 | 366,226,376 |
| 1890 | 14,213,837 | 978,516,562 | 2,331,027 | 182,394,099 | 15,952,883 | 352,152,133 |
| 1891 | 14,056,750 | 941,823,222 | 2,296,532 | 178,847,370 | 16,019,591 | 346,397,900 |
| 1892 | 15,498,140 | 1,007,593,636 | 2,314,699 | 174,882,070 | 16,416,351 | 351,378,132 |
| 1893 | 16,206,802 | 992,225,185 | 2,331,128 | 164,763,751 | 16,424,087 | 357,299,785 |
| 1894 | 16,081,139 | 769,224,799 | 2,352,231 | 146,232,811 | 16,487,400 | 358,998,661 |
| 1895 | 15,893,318 | 576,730,580 | 2,333,108 | 110,927,834 | 16,504,629 | 362,601,729 |
| 1896 | 15,124,057 | 500,140,186 | 2,278,946 | 103,204,457 | 16,137,586 | 363,955,545 |
| 1897 | 14,364,667 | 452,649,396 | 2,215,654 | 92,302,090 | 15,941,727 | 369,239,993 |
| 1898 | 13,960,911 | 478,362,407 | 2,257,665 | 99,032,062 | 15,840,886 | 434,813,826 |
| 1899 | 13,665,307 | 511,074,813 | 2,134,213 | 95,963,261 | 15,990,115 | 474,233,925 |
| 1900 | 13,537,524 | 603,969,442 | 2,086,027 | 111,717,092 | 16,292,360 | 514,812,106 |

| January 1— | Other cattle. | | Sheep. | | Swine. | | Total value of farm animals. |
|---|---|---|---|---|---|---|---|
| | Number. | Value. | Number. | Value. | Number. | Value. | |
| 1880 | 21,231,000 | $341,761,154 | 40,765,900 | $90,230,537 | 34,034,100 | $145,781,515 | $1,576,917,556 |
| 1881 | 20,937,702 | 362,861,509 | 43,576,899 | 104,070,759 | 36,247,603 | 170,535,435 | 1,721,795,252 |
| 1882 | 23,280,238 | 463,069,499 | 45,016,224 | 106,594,954 | 44,122,200 | 263,543,195 | 1,906,459,250 |
| 1883 | 28,046,077 | 611,549,109 | 49,237,291 | 124,365,835 | 43,270,086 | 291,951,221 | 2,338,215,268 |
| 1884 | 29,046,101 | 683,229,054 | 50,626,626 | 119,902,706 | 44,200,893 | 246,301,139 | 2,467,868,924 |
| 1885 | 29,866,573 | 694,382,913 | 50,360,243 | 107,960,650 | 45,142,657 | 226,401,683 | 2,456,428,380 |
| 1886 | 31,275,242 | 661,956,274 | 48,322,331 | 92,443,867 | 46,092,043 | 196,569,894 | 2,365,159,862 |
| 1887 | 33,511,750 | 663,137,926 | 44,759,314 | 89,872,839 | 44,612,836 | 200,043,291 | 2,400,586,938 |
| 1888 | 34,378,363 | 611,750,520 | 43,544,755 | 89,279,926 | 44,346,525 | 220,811,082 | 2,409,043,418 |
| 1889 | 35,032,417 | 597,236,812 | 42,599,079 | 90,640,369 | 50,301,592 | 291,307,193 | 2,507,050,058 |
| 1890 | 36,849,024 | 560,625,137 | 44,336,072 | 100,659,761 | 51,602,780 | 243,418,336 | 2,418,766,028 |
| 1891 | 36,875,648 | 544,127,908 | 43,431,136 | 108,397,447 | 50,625,106 | 210,193,923 | 2,329,787,770 |
| 1892 | 37,651,239 | 570,749,155 | 44,938,365 | 116,121,290 | 52,398,019 | 241,031,415 | 2,461,755,698 |
| 1893 | 35,954,196 | 547,882,204 | 47,273,553 | 125,909,264 | 46,094,807 | 295,426,492 | 2,483,506,681 |
| 1894 | 36,608,168 | 536,789,747 | 45,048,017 | 89,186,110 | 45,206,498 | 270,384,626 | 2,170,816,754 |
| 1895 | 34,364,216 | 482,999,129 | 42,294,064 | 66,685,767 | 44,165,716 | 219,501,267 | 1,819,446,306 |
| 1896 | 32,085,409 | 508,928,416 | 38,298,783 | 65,167,735 | 42,842,759 | 186,529,745 | 1,727,926,084 |
| 1897 | 30,508,408 | 507,929,421 | 36,818,643 | 67,020,942 | 40,600,276 | 166,272,770 | 1,655,414,612 |
| 1898 | 29,264,197 | 612,296,634 | 37,656,960 | 92,721,133 | 39,759,993 | 174,351,409 | 1,891,577,471 |
| 1899 | 27,994,225 | 637,931,135 | 39,114,453 | 107,697,530 | 38,651,631 | 170,109,743 | 1,997,010,407 |
| 1900 | 27,610,054 | 689,486,260 | 41,883,065 | 122,665,913 | ---------- | ---------- | [a]2,042,650,813 |

[a] Exclusive of swine.

*Average value of farm animals in the United States on January 1, 1880, to 1900.*

[From Division of Statistics.]

| Year. | Horses. | Mules. | Milch cows. | Other cattle. | Sheep. | Swine. |
|---|---|---|---|---|---|---|
| 1880 | $54.75 | $61.26 | $23.27 | $16.10 | $2.21 | $4.28 |
| 1881 | 58.44 | 69.79 | 23.95 | 17.33 | 2.39 | 4.70 |
| 1882 | 58.53 | 71.35 | 25.89 | 19.89 | 2.37 | 5.97 |
| 1883 | 70.59 | 79.49 | 30.21 | 21.81 | 2.53 | 6.75 |
| 1884 | 74.64 | 84.22 | 31.37 | 23.52 | 2.37 | 5.57 |
| 1885 | 73.70 | 82.38 | 29.70 | 23.25 | 2.14 | 5.02 |
| 1886 | 71.27 | 79.60 | 27.40 | 21.17 | 1.91 | 4.26 |
| 1887 | 72.15 | 78.91 | 26.08 | 19.79 | 2.01 | 4.48 |
| 1888 | 71.82 | 79.78 | 24.65 | 17.79 | 2.05 | 4.98 |
| 1889 | 71.89 | 79.49 | 23.94 | 17.05 | 2.13 | 5.79 |
| 1890 | 68.84 | 78.25 | 22.14 | 15.21 | 2.27 | 4.72 |
| 1891 | 67.00 | 77.88 | 21.62 | 14.76 | 2.50 | 4.15 |
| 1892 | 65.01 | 75.55 | 21.40 | 15.16 | 2.58 | 4.60 |
| 1893 | 61.22 | 70.68 | 21.75 | 15.24 | 2.66 | 6.41 |
| 1894 | 47.83 | 62.17 | 21.77 | 14.66 | 1.98 | 5.98 |
| 1895 | 36.29 | 47.55 | 21.97 | 14.06 | 1.58 | 4.97 |
| 1896 | 33.07 | 45.29 | 22.55 | 15.86 | 1.70 | 4.35 |
| 1897 | 31.51 | 41.66 | 23.16 | 16.65 | 1.82 | 4.10 |
| 1898 | 34.26 | 43.88 | 27.45 | 20.92 | 2.46 | 4.39 |
| 1899 | 37.40 | 44.96 | 29.66 | 22.79 | 2.75 | 4.40 |
| 1900 | 44.61 | 53.56 | 31.60 | 24.97 | 2.93 | ---------- |

*Number, average price, and total value of farm animals in the United States on January 1, 1900, by States.*

| States and Territories. | Horses. | | | Mules. | | |
|---|---|---|---|---|---|---|
| | Number. | Average price per head. | Value. | Number. | Average price per head. | Value. |
| Maine | 109,747 | $58.62 | $6,432,826 | | | |
| New Hampshire | 55,578 | 57.89 | 3,217,455 | | | |
| Vermont | 84,388 | 53.50 | 4,514,500 | | | |
| Massachusetts | 66,017 | 78.07 | 5,154,136 | | | |
| Rhode Island | 10,384 | 86.37 | 896,906 | | | |
| Connecticut | 44,119 | 73.89 | 3,259,754 | | | |
| New York | 590,771 | 63.06 | 37,251,355 | 3,714 | $69.44 | $257,903 |
| New Jersey | 79,972 | 72.88 | 5,828,258 | 7,196 | 94.48 | 679,883 |
| Pennsylvania | 559,722 | 59.39 | 33,243,571 | 37,794 | 76.16 | 2,878,355 |
| Delaware | 31,192 | 59.80 | 1,865,221 | 4,879 | 78.56 | 383,297 |
| Maryland | 130,959 | 53.07 | 6,950,014 | 12,891 | 72.69 | 937,005 |
| Virginia | 236,279 | 45.70 | 10,797,007 | 36,358 | 59.89 | 2,176,305 |
| North Carolina | 148,164 | 53.50 | 7,926,938 | 112,512 | 63.47 | 7,141,558 |
| South Carolina | 68,319 | 62.03 | 4,237,798 | 98,331 | 74.12 | 7,288,769 |
| Georgia | 109,935 | 54.59 | 6,001,626 | 157,008 | 68.95 | 10,826,032 |
| Florida | 38,050 | 46.70 | 1,776,778 | 8,521 | 71.60 | 610,096 |
| Alabama | 133,546 | 45.72 | 6,105,518 | 132,321 | 60.16 | 7,961,050 |
| Mississippi | 203,492 | 43.75 | 8,903,707 | 164,713 | 59.16 | 9,743,925 |
| Louisiana | 145,029 | 36.05 | 5,228,953 | 92,722 | 62.95 | 5,837,072 |
| Texas | 1,125,645 | 20.88 | 23,507,407 | 260,562 | 35.18 | 9,166,041 |
| Arkansas | 234,127 | 33.39 | 7,817,264 | 142,594 | 44.52 | 6,348,660 |
| Tennessee | 308,073 | 43.01 | 13,251,442 | 139,164 | 47.89 | 6,664,988 |
| West Virginia | 150,329 | 43.21 | 6,495,281 | 7,264 | 52.08 | 378,309 |
| Kentucky | 350,978 | 39.54 | 13,879,085 | 96,958 | 45.28 | 4,390,251 |
| Ohio | 640,429 | 55.00 | 35,222,931 | 16,883 | 58.04 | 979,911 |
| Michigan | 412,462 | 57.59 | 23,752,443 | 2,567 | 64.73 | 166,161 |
| Indiana | 577,220 | 50.83 | 29,337,792 | 38,734 | 55.28 | 2,141,258 |
| Illinois | 983,233 | 49.31 | 48,486,673 | 78,936 | 53.79 | 4,245,658 |
| Wisconsin | 418,018 | 61.53 | 25,722,329 | 4,611 | 63.79 | 294,128 |
| Minnesota | 459,673 | 54.95 | 25,256,763 | 8,248 | 59.39 | 489,858 |
| Iowa | 979,389 | 49.84 | 48,810,774 | 31,232 | 54.72 | 1,708,906 |
| Missouri | 724,597 | 34.35 | 24,891,718 | 165,026 | 43.69 | 7,210,321 |
| Kansas | 732,676 | 36.44 | 26,695,789 | 82,586 | 46.35 | 3,827,859 |
| Nebraska | 658,807 | 42.68 | 28,120,512 | 43,876 | 54.35 | 2,384,667 |
| South Dakota | 287,839 | 39.04 | 11,236,671 | 6,626 | 49.84 | 330,266 |
| North Dakota | 180,391 | 49.35 | 8,902,389 | 6,895 | 67.48 | 465,257 |
| Montana | 146,781 | 23.79 | 3,491,193 | 878 | 40.44 | 35,509 |
| Wyoming | 70,813 | 19.12 | 1,354,196 | 1,499 | 48.41 | 72,564 |
| Colorado | 145,713 | 27.92 | 4,068,081 | 8,580 | 46.60 | 399,827 |
| New Mexico | 83,184 | 20.21 | 1,680,945 | 3,298 | 34.06 | 112,323 |
| Arizona | 52,431 | 27.03 | 1,417,338 | 1,031 | 37.32 | 38,477 |
| Utah | 71,710 | 21.58 | 1,547,792 | 1,615 | 35.62 | 57,522 |
| Nevada | 42,090 | 16.41 | 690,594 | 1,338 | 34.87 | 46,654 |
| Idaho | 127,821 | 22.40 | 2,863,504 | 889 | 36.91 | 32,810 |
| Washington | 171,391 | 39.23 | 6,722,893 | 1,470 | 58.91 | 86,596 |
| Oregon | 183,988 | 29.99 | 5,516,923 | 5,441 | 38.64 | 210,241 |
| California | 321,729 | 38.61 | 12,422,429 | 48,682 | 48.49 | 2,360,713 |
| Oklahoma | 50,326 | 24.12 | 1,213,970 | 9,584 | 36.53 | 350,107 |
| United States | 13,537,524 | 44.61 | 603,969,442 | 2,086,027 | 53.56 | 111,717,092 |

*Number, average price, and total value of farm animals in the United States on January 1, 1900, by States*—Continued.

| States and Territories. | Milch cows. | | | Other cattle. | | |
|---|---|---|---|---|---|---|
| | Number. | Average price per head. | Value. | Number. | Average price per head. | Value. |
| Maine | 203,814 | $28.90 | $5,890,225 | 112,723 | $26.38 | $2,973,863 |
| New Hampshire | 135,457 | 32.70 | 4,429,444 | 79,221 | 25.57 | 2,025,477 |
| Vermont | 268,886 | 31.90 | 8,577,463 | 132,450 | 23.41 | 3,100,074 |
| Massachusetts | 181,589 | 37.20 | 6,755,111 | 73,378 | 27.12 | 1,990,270 |
| Rhode Island | 25,256 | 39.95 | 1,008,977 | 10,149 | 29.83 | 302,788 |
| Connecticut | 144,529 | 34.80 | 5,029,609 | 66,188 | 30.90 | 2,045,545 |
| New York | 1,487,416 | 35.20 | 52,357,043 | 572,299 | 27.45 | 15,707,884 |
| New Jersey | 223,261 | 39.10 | 8,729,505 | 39,896 | 30.70 | 1,224,982 |
| Pennsylvania | 970,473 | 33.15 | 32,171,180 | 523,653 | 27.34 | 14,314,840 |
| Delaware | 35,730 | 31.50 | 1,125,495 | 22,305 | 28.03 | 625,247 |
| Maryland | 154,712 | 29.80 | 4,610,418 | 102,723 | 25.36 | 2,604,643 |
| Virginia | 242,488 | 24.05 | 5,831,836 | 325,000 | 23.96 | 7,787,812 |
| North Carolina | 243,298 | 18.20 | 4,428,024 | 274,843 | 12.31 | 3,383,726 |
| South Carolina | 122,959 | 19.25 | 2,366,961 | 137,264 | 10.77 | 1,478,267 |
| Georgia | 285,431 | 23.95 | 6,836,072 | 380,716 | 11.07 | 4,216,054 |
| Florida | 113,108 | 16.70 | 1,888,904 | 299,712 | 8.38 | 2,512,036 |
| Alabama | 231,802 | 18.40 | 4,265,157 | 279,278 | 10.96 | 3,061,719 |
| Mississippi | 244,103 | 20.70 | 5,052,932 | 273,706 | 13.59 | 3,719,121 |
| Louisiana | 123,232 | 21.95 | 2,704,942 | 171,729 | 13.37 | 2,296,702 |
| Texas | 693,794 | 25.25 | 17,518,298 | 4,352,541 | 17.86 | 77,736,384 |
| Arkansas | 188,936 | 20.25 | 3,825,954 | 230,486 | 14.04 | 3,235,910 |
| Tennessee | 239,394 | 24.15 | 5,781,365 | 286,841 | 18.79 | 5,390,598 |
| West Virginia | 167,173 | 28.40 | 4,747,713 | 241,025 | 25.15 | 6,061,432 |
| Kentucky | 235,798 | 27.25 | 6,425,496 | 303,651 | 24.52 | 7,446,740 |
| Ohio | 780,939 | 32.30 | 25,224,330 | 674,619 | 30.69 | 20,702,044 |
| Michigan | 463,698 | 32.70 | 15,162,925 | 338,120 | 26.75 | 9,043,695 |
| Indiana | 605,855 | 33.75 | 20,447,606 | 629,075 | 32.65 | 20,536,787 |
| Illinois | 1,021,236 | 36.30 | 37,070,867 | 1,303,018 | 31.62 | 41,197,518 |
| Wisconsin | 1,003,321 | 33.60 | 33,711,586 | 595,208 | 27.33 | 16,267,023 |
| Minnesota | 672,540 | 31.65 | 21,285,891 | 564,463 | 24.27 | 13,700,354 |
| Iowa | 1,263,283 | 34.90 | 44,088,577 | 2,178,729 | 33.47 | 72,930,788 |
| Missouri | 659,731 | 28.60 | 18,868,307 | 1,387,615 | 26.65 | 36,981,329 |
| Kansas | 707,675 | 32.50 | 22,999,438 | 2,159,549 | 28.90 | 62,401,253 |
| Nebraska | 685,338 | 35.50 | 24,329,499 | 1,521,454 | 30.38 | 46,220,249 |
| South Dakota | 398,383 | 33.40 | 13,305,992 | 480,817 | 29.61 | 14,237,235 |
| North Dakota | 176,205 | 31.95 | 5,629,750 | 255,166 | 27.24 | 6,951,242 |
| Montana | 45,314 | 39.25 | 1,778,574 | 914,494 | 27.19 | 24,865,069 |
| Wyoming | 18,104 | 40.55 | 734,117 | 729,722 | 28.10 | 20,505,914 |
| Colorado | 93,499 | 36.20 | 3,384,664 | 1,021,922 | 27.69 | 28,297,538 |
| New Mexico | 19,510 | 31.70 | 618,467 | 659,849 | 18.64 | 12,301,571 |
| Arizona | 19,140 | 32.50 | 622,050 | 362,721 | 16.46 | 5,969,293 |
| Utah | 57,209 | 32.75 | 1,873,595 | 278,867 | 22.93 | 6,396,237 |
| Nevada | 18,250 | 34.10 | 622,325 | 219,831 | 23.06 | 5,068,415 |
| Idaho | 33,075 | 31.90 | 1,055,092 | 364,853 | 23.77 | 8,672,748 |
| Washington | 122,414 | 35.40 | 4,333,456 | 268,030 | 25.21 | 6,757,573 |
| Oregon | 115,415 | 31.05 | 3,583,636 | 522,018 | 23.36 | 12,192,775 |
| California | 308,872 | 33.75 | 10,424,430 | 604,881 | 24.57 | 14,864,947 |
| Oklahoma | 40,715 | 31.90 | 1,298,808 | 283,256 | 25.36 | 7,182,529 |
| United States | 16,292,360 | 31.60 | 514,812,106 | 27,610,054 | 24.97 | 689,486,260 |

*Number, average price, and total value of farm animals in the United States on January 1, 1900, by States*—Continued.

SHEEP.

| States and Territories. | Number. | Average price per head. | Value. |
|---|---|---|---|
| Maine | 254,027 | $3.10 | $787,484 |
| New Hampshire | 79,072 | 3.19 | 252,239 |
| Vermont | 169,259 | 3.61 | 611,363 |
| Massachusetts | 40,194 | 4.55 | 182,883 |
| Rhode Island | 10,608 | 3.86 | 40,974 |
| Connecticut | 31,808 | 3.90 | 124,194 |
| New York | 846,165 | 4.07 | 3,448,122 |
| New Jersey | 42,722 | 4.34 | 185,584 |
| Pennsylvania | 814,322 | 3.60 | 2,928,302 |
| Delaware | 12,592 | 3.67 | 46,269 |
| Maryland | 138,177 | 3.51 | 485,553 |
| Virginia | 376,918 | 3.09 | 1,164,676 |
| North Carolina | 235,260 | 1.62 | 379,945 |
| South Carolina | 61,217 | 1.70 | 104,069 |
| Georgia | 294,826 | 1.76 | 518,893 |
| Florida | 76,074 | 1.69 | 128,870 |
| Alabama | 171,799 | 1.53 | 262,767 |
| Mississippi | 215,748 | 1.56 | 335,490 |
| Louisiana | 113,205 | 1.58 | 179,203 |
| Texas | 2,416,721 | 1.92 | 4,634,063 |
| Arkansas | 108,957 | 1.67 | 181,795 |
| Tennessee | 251,735 | 2.37 | 596,485 |
| West Virginia | 426,814 | 3.19 | 1,363,244 |
| Kentucky | 549,832 | 3.01 | 1,656,094 |
| Ohio | 2,839,690 | 3.71 | 10,535,250 |
| Michigan | 1,389,073 | 3.58 | 4,972,882 |
| Indiana | 677,905 | 4.00 | 2,713,993 |
| Illinois | 637,719 | 3.97 | 2,532,383 |
| Wisconsin | 744,656 | 3.65 | 2,716,505 |
| Minnesota | 419,218 | 3.18 | 1,333,113 |
| Iowa | 619,476 | 4.02 | 2,487,816 |
| Missouri | 597,619 | 3.10 | 1,854,711 |
| Kansas | 275,118 | 3.04 | 835,534 |
| Nebraska | 322,057 | 3.39 | 1,090,807 |
| South Dakota | 381,882 | 3.29 | 1,257,156 |
| North Dakota | 374,110 | 3.16 | 1,183,683 |
| Montana | 3,884,179 | 2.84 | 11,017,474 |
| Wyoming | 2,840,190 | 3.51 | 9,964,806 |
| Colorado | 2,185,327 | 2.86 | 6,250,036 |
| New Mexico | 3,973,439 | 2.17 | 8,622,362 |
| Arizona | 1,024,430 | 2.34 | 2,393,581 |
| Utah | 2,370,983 | 2.59 | 6,150,330 |
| Nevada | 657,773 | 2.91 | 1,914,120 |
| Idaho | 2,658,662 | 2.80 | 7,444,254 |
| Washington | 790,217 | 3.13 | 2,470,218 |
| Oregon | 2,446,695 | 2.67 | 6,532,676 |
| California | 2,001,501 | 2.85 | 5,710,282 |
| Oklahoma | 33,094 | 2.52 | 83,380 |
| United States | 41,883,065 | 2.93 | 122,665,913 |

# IMPORTS AND EXPORTS OF AGRICULTURAL PRODUCTS.

[From Section of Foreign Markets.]

*Agricultural imports of the United States during the five years ended June 30, 1899.*

| Articles imported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| ANIMAL MATTER. | | | | | | | | | | |
| Animals, live: | | | | | | | | | | |
| Cattle ........ number.. | 149,781 | $765,853 | 217,826 | $1,509,856 | 328,977 | $2,589,857 | 291,589 | $2,913,223 | 199,752 | $2,330,362 |
| Horses ........ do.... | 13,098 | 1,055,191 | 9,991 | 662,591 | 6,998 | 464,808 | 3,085 | 414,899 | 3,042 | 551,050 |
| Sheep ........ do.... | 291,461 | 682,618 | 322,692 | 853,530 | 405,633 | 1,019,668 | 392,314 | 1,106,322 | 345,911 | 1,300,081 |
| Other, including fowls ........ | ........ | 233,416 | ........ | 226,500 | ........ | 211,122 | ........ | 239,681 | ........ | 265,032 |
| Total ........ | ........ | 2,737,078 | ........ | 3,252,477 | ........ | 4,285,455 | ........ | 4,674,125 | ........ | 4,336,525 |
| Beeswax ........ pounds.. | 288,001 | 78,776 | 273,464 | 75,970 | 174,017 | 43,339 | 272,097 | 72,473 | 452,016 | 109,957 |
| Bones, hoofs, and horns: | | | | | | | | | | |
| Bones, crude ........ | ........ | 306,049 | ........ | 157,946 | ........ | 224,039 | ........ | 492,544 | ........ | 704,959 |
| Hoofs and horns ........ | ........ | 268,800 | ........ | 568,445 | ........ | 150,134 | | | | |
| Total ........ | ........ | 574,849 | ........ | 726,391 | ........ | 374,173 | ........ | 492,544 | ........ | 704,959 |
| Bristles: | | | | | | | | | | |
| Crude, not sorted, bunched, or prepared ........ pounds.. | 4,741 | 1,802 | 726 | 1,620 | 630 | 385 | 1,203 | 416 | 21,421 | 12,399 |
| Sorted, bunched, or prepared, pounds ........ | 1,296,753 | 1,242,259 | 1,571,804 | 1,433,728 | 1,347,270 | 1,216,794 | 1,533,887 | 1,248,703 | 1,835,156 | 1,445,853 |
| Total ........ pounds.. | 1,301,494 | 1,244,151 | 1,572,530 | 1,435,348 | 1,347,900 | 1,217,179 | 1,535,090 | 1,249,119 | 1,856,577 | 1,458,252 |
| Dairy products: | | | | | | | | | | |
| Butter ........ do.... | 72,148 | 12,930 | 52,067 | 8,533 | 37,963 | 6,077 | 31,984 | 5,474 | 23,700 | 3,962 |
| Cheese ........ do.... | 10,276,293 | 1,450,657 | 10,728,397 | 1,491,338 | 12,319,122 | 1,668,796 | 10,012,188 | 1,343,173 | 11,826,175 | 1,563,128 |
| Milk ........ | ........ | 80,491 | ........ | 62,622 | ........ | 58,467 | ........ | 67,729 | ........ | 52,603 |
| Total ........ | ........ | 1,544,078 | ........ | 1,562,493 | ........ | 1,733,340 | ........ | 1,416,376 | ........ | 1,619,693 |
| Eggs ........ dozens.. | 2,705,502 | 324,136 | 947,132 | 88,682 | 580,681 | 47,760 | 166,319 | 8,078 | 225,180 | 21,300 |
| Egg yolks ........ | ........ | (a) | ........ | (a) | ........ | (a) | ........ | (a) | ........ | 11,322 |
| Feathers and downs, crude ........ | ........ | 1,746,967 | ........ | 2,386,804 | ........ | 2,232,908 | ........ | 2,238,955 | ........ | 1,768,092 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fibers, animal: | | | | | | | | | | |
| Silk— | | | | | | | | | | |
| Cocoons ..................pounds.. | 320,621 | 139,042 | 279,067 | 112,900 | ............ | ............ | 10,492 | 3,999 | 13,537 | 2,288 |
| Raw, or as reeled from cocoon, pounds.................... | 7,974,810 | 22,029,068 | 8,000,621 | 26,246,902 | 6,513,612 | 18,496,944 | 10,315,162 | 31,446,800 | 9,691,145 | 31,827,061 |
| Waste..................pounds.. | 1,021,029 | 457,946 | 1,084,299 | 403,626 | 1,479,832 | 421,339 | 1,762,297 | 659,267 | 1,545,701 | 650,278 |
| Total silk ..................do.... | 9,316,460 | 22,626,056 | 9,363,987 | 26,763,428 | 7,993,444 | 18,918,283 | 12,087,951 | 32,110,066 | 11,250,383 | 32,479,627 |
| Wools, hair of the camel, goat, alpaca, and other like animals— | | | | | | | | | | |
| Class 1, clothing— | | | | | | | | | | |
| In the grease .........pounds.. | 87,151,522 | 13,335,602 | 117,233,440 | 19,448,471 | 176,350,510 | 27,824,507 | 43,061,372 | 7,302,841 | 12,973,444 | 1,948,402 |
| Scoured ..................do.... | | | | | 24,408,569 | 6,457,149 | 2,381,615 | 666,770 | 3,555 | 552 |
| Total class 1 ..............do.... | 87,151,522 | 13,335,602 | 117,233,440 | 19,448,471 | 200,759,079 | 34,281,656 | 45,442,987 | 7,969,611 | 12,976,999 | 1,948,954 |
| Class 2, combing— | | | | | | | | | | |
| In the grease ...........do.... | 13,476,735 | 2,637,581 | 15,756,318 | 3,509,736 | 37,627,967 | 7,119,201 | 4,305,563 | 856,381 | 2,154,232 | 586,865 |
| Scoured..................do.... | | | | | 323,523 | 68,419 | 15,310 | 3,218 | 1,187 | 196 |
| Total class 2 ..............do.... | 13,476,735 | 2,637,581 | 15,756,318 | 3,509,736 | 37,951,490 | 7,187,620 | 4,320,873 | 859,599 | 2,155,419 | 587,061 |
| Class 3, carpet— | | | | | | | | | | |
| In the grease ...........do.... | 105,405,649 | 9,583,238 | 97,921,715 | 9,493,035 | 110,665,432 | 11,599,886 | 83,027,666 | 7,954,159 | 61,578,547 | 5,784,444 |
| Scoured ..................do.... | | | | | 1,476,025 | 174,029 | 3,676 | 323 | 25,244 | 2,438 |
| Total class 3 ..............do.... | 105,405,649 | 9,583,238 | 97,921,715 | 9,493,035 | 112,141,457 | 11,773,915 | 83,031,342 | 7,954,482 | 61,603,791 | 5,786,882 |
| Total wools ................do.... | 206,033,906 | 25,556,421 | 230,911,473 | 32,451,242 | 350,852,026 | 53,243,191 | 132,795,202 | 16,783,692 | 76,736,209 | 8,322,897 |
| Total animal fibers.............. | ............ | 48,182,477 | ............ | 59,214,670 | ............ | 72,161,474 | ............ | 48,893,758 | ............ | 40,802,524 |
| Gelatin .................................. | ............ | (*a*) | ............ | 15,386 | ............ | 5,748 | ............ | 25,907 | ............ | 21,961 |
| Glue ..........................pounds.. | 4,751,048 | 416,394 | 6,276,926 | 555,979 | 4,926,620 | 472,312 | 4,103,814 | 428,507 | 5,358,063 | 479,450 |
| Grease and tallow *b*...................... | ............ | 1,336,388 | ............ | 1,232,001 | ............ | 984,332 | ............ | 593,239 | ............ | 701,870 |
| Gut ...................................... | ............ | 212,645 | ............ | 195,302 | ............ | 180,721 | ............ | 42,879 | ............ | 15,995 |
| Hair...................................... | ............ | 1,165,944 | ............ | 1,244,077 | ............ | 1,330,632 | ............ | 1,839,668 | ............ | 1,814,964 |
| Hide cuttings and other glue stock....... | ............ | 263,175 | ............ | 279,692 | ............ | 289,686 | ............ | 408,262 | ............ | 708,968 |
| Hides and skins, *c* other than furs: | | | | | | | | | | |
| Goatskins....................pounds.. | 54,240,492 | 10,954,827 | 46,747,029 | 10,304,395 | 49,868,020 | 11,328,162 | 64,923,487 | 15,776,601 | 69,728,945 | 18,488,326 |
| Hides of cattle *d*................do.... | 172,335,253 | 15,168,115 | 163,650,982 | 20,215,782 | 156,232,824 | 16,534,864 | 126,243,595 | 13,624,989 | 130,396,020 | 13,621,946 |
| Other.........................do.... | | | | | | | 54,607,534 | 7,667,342 | 66,965,785 | 9,877,771 |
| Total ......................do.... | 226,575,745 | 26,122,942 | 210,398,011 | 30,520,177 | 206,100,844 | 27,863,026 | 245,774,616 | 37,068,932 | 267,090,750 | 41,988,043 |
| Honey.........................gallons.. | 67,444 | 22,993 | 79,985 | 30,609 | 66,432 | 27,599 | 96,604 | 38,153 | 126,217 | 51,599 |

*a* Not stated.

*b* Prior to August 27, 1894, and since July 24, 1897, tallow is included in "Other meat products" (dutiable).

*c* Except sheepskins with the wool on.

*d* Exclusive of hides of cattle from the Hawaiian Islands (free of duty).

*Agricultural imports of the United States during the five years ended June 30, 1899*—Continued.

| Articles imported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| ANIMAL MATTER—continued. | | | | | | | | | | |
| Meat products: | | | | | | | | | | |
| Meat and meat extracts | | $479,336 | | $493,393 | | $601,808 | | $345,108 | | $263,845 |
| Sausage, Bologna ... pounds | (a) | 93,188 | 359,260 | 80,887 | 328,080 | 76,303 | (a) | 82,546 | (a) | 93,714 |
| Sausage casings | | 419,345 | | 588,657 | | 542,817 | | 537,871 | | 622,949 |
| Other | | 5,244 | | 39,129 | | 49,484 | | 80,031 | | 109,647 |
| Total | | 997,113 | | 1,202,066 | | 1,270,412 | | 1,045,556 | | 1,090,155 |
| Oils, animal, not elsewhere specified, except whale and fish ... gallons | 1,464 | 469 | 37,330 | 12,213 | 38,334 | 6,066 | 14,163 | 5,715 | 9,056 | 1,569 |
| Rennets | | 84,415 | | 51,073 | | 60,026 | | 90,757 | | 93,284 |
| Stearin ... pounds | (a) | (a) | 523,341 | 37,020 | (a) | (a) | (a) | (a) | 1,865,977 | 25,546 |
| Total animal matter | | 87,054,990 | | 104,118,490 | | 114,586,188 | | 100,633,008 | | 97,825,938 |
| VEGETABLE MATTER. | | | | | | | | | | |
| Argols, or wine lees ... pounds | 27,911,122 | 1,893,730 | 28,481,665 | 2,724,709 | 23,457,576 | 1,967,042 | 19,202,629 | 1,591,027 | 23,300,762 | 1,914,450 |
| Breadstuffs: | | | | | | | | | | |
| Barley ... bushels | 2,116,816 | 867,743 | 837,384 | 317,209 | 1,271,787 | 394,749 | 124,804 | 43,863 | 110,475 | 53,696 |
| Corn (maize) ... do | 16,575 | 7,552 | 4,338 | 1,877 | 6,284 | 2,070 | 3,417 | 1,479 | 4,171 | 1,618 |
| Oats ... do | 308,308 | 80,901 | 47,506 | 13,039 | 46,459 | 12,071 | 9,098 | 3,368 | 11,500 | 4,432 |
| Oatmeal ... pounds | 396,176 | 21,993 | 343,732 | 19,689 | 1,525,409 | 32,742 | 287,910 | 15,697 | 298,764 | 17,740 |
| Rye ... bushels | 12,918 | 6,272 | 154 | 291 | 72 | 170 | 32,938 | 13,323 | 402 | 982 |
| Wheat ... do | 1,429,993 | 868,965 | 2,110,030 | 1,386,161 | 1,534,117 | 1,176,337 | 2,046,590 | 1,948,289 | 1,871,101 | 1,407,625 |
| Wheat flour ... barrels | 1,868 | 8,295 | 1,394 | 6,848 | 2,250 | 9,914 | 2,744 | 12,230 | 905 | 4,057 |
| Other, and preparations of, used as food | | 998,092 | | 1,035,700 | | 1,146,710 | | 1,113,818 | | 1,054,615 |
| Total | | 2,859,813 | | 2,780,814 | | 2,774,763 | | 3,152,067 | | 2,544,765 |
| Chocolate, other than confectionery and sweetened chocolate ... pounds | 897,637 | 174,805 | 1,145,467 | 198,417 | 1,467,977 | 239,819 | 992,288 | 149,866 | 1,124,515 | 201,439 |
| Cocoa, or cacao: | | | | | | | | | | |
| Crude, and leaves and shells of ... do | 29,307,048 | 3,195,811 | 23,276,597 | 2,387,078 | 31,406,612 | 2,997,866 | 25,717,404 | 3,492,033 | 35,512,364 | 5,064,703 |
| Prepared or manufactured ... do | 1,433,576 | 482,532 | 1,244,309 | 410,249 | 1,495,459 | 443,604 | 815,824 | 290,844 | 926,219 | 295,413 |
| Total ... do | 30,740,624 | 3,678,343 | 24,520,906 | 2,797,327 | 32,902,071 | 3,441,470 | 26,533,228 | 3,782,877 | 36,438,583 | 5,360,116 |
| Coffee ... do | 652,208,975 | 96,130,717 | 580,597,915 | 84,793,124 | 737,645,670 | 81,544,384 | 870,514,455 | 65,067,631 | 831,827,063 | 55,275,470 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coffee substitutes: | | | | | | | | | | |
| Chicory root— | | | | | | | | | | |
| Raw, unground ........... pounds.. | 9,544,186 | 158,142 | 15,841,955 | 210,228 | 16,930,162 | 232,494 | 315,707 | 5,160 | 159,269 | 2,353 |
| Roasted, ground, or otherwise prepared ................. pounds.. | 445,458 | 14,816 | 475,933 | 15,849 | 399,008 | 13,899 | (a) | (a) | 335,347 | 11,061 |
| Total chicory root ......... do.... | 9,989,644 | 172,958 | 16,317,888 | 226,077 | 17,329,170 | 246,393 | (a) | (a) | 494,616 | 13,414 |
| Other ............................ do.... | 2,776,117 | 106,886 | 2,366,962 | 90,532 | 2,373,245 | 87,679 | 857,810 | 29,562 | 992,395 | 36,370 |
| Total coffee substitutes .. do.... | 12,765,761 | 279,844 | 18,684,850 | 316,609 | 19,702,415 | 334,072 | (a) | (a) | 1,487,011 | 49,784 |
| Curry and curry powder ................ | ............. | (a) | ............. | (a) | ............. | (a) | ............. | (a) | ............. | 7,383 |
| Fibers, vegetable: | | | | | | | | | | |
| Cotton ......................... pounds.. | 49,332,022 | 4,714,375 | 55,350,520 | 6,578,212 | 51,898,926 | 5,884,262 | 52,660,363 | 5,019,503 | 50,158,158 | 5,013,146 |
| Flax, and tow of ................. tons.. | 5,008 | 1,008,743 | 6,538 | 1,171,663 | 7,480 | 1,256,717 | 5,529 | 1,193,597 | 6,474 | 1,306,520 |
| Flax, hackled, etc ................. do.... | 2,225 | 1,050,548 | 1,295 | 632,765 | 1,710 | 641,259 | | | | |
| Hemp, and tow of ................. do.... | 6,177 | 754,975 | 8,356 | 1,046,656 | 5,096 | 633,288 | 4,017 | 560,334 | 3,941 | 477,108 |
| Hemp, hackled, etc ................ do.... | 777 | 127,786 | 94 | 22,847 | 24 | 6,569 | | | | |
| Istle, or Tampico fiber ........... do.... | 9,827 | 458,404 | 12,207 | 717,585 | 6,313 | 335,841 | 2,563 | 130,294 | 4,419 | 284,177 |
| Jute and jute butts ............... do.... | 110,671 | 2,752,966 | 88,992 | 2,001,206 | 68,550 | 1,640,484 | 112,306 | 2,543,498 | 83,161 | 2,296,189 |
| Manila hemp ...................... do.... | 50,278 | 4,060,517 | 47,244 | 3,604,585 | 46,260 | 3,408,322 | 50,270 | 3,239,341 | 53,195 | 6,211,475 |
| Sisal grass ........................ do.... | 47,596 | 2,743,396 | 52,130 | 3,412,760 | 63,266 | 3,834,732 | 69,322 | 5,169,900 | 71,898 | 9,211,377 |
| Other ............................. do.... | 6,152 | 324,746 | 6,336 | 260,627 | 8,734 | 579,206 | 9,791 | 609,222 | 7,466 | 513,247 |
| Total ...................................... | ............. | 17,996,456 | ............. | 19,448,906 | ............. | 18,220,680 | ............. | 18,465,689 | ............. | 25,313,239 |
| Flowers, natural, dressed or undressed *b*. | ............. | 10,014 | ............. | 10,386 | ............. | 10,334 | ............. | 11,914 | ............. | 19,392 |
| Fruit juices: | | | | | | | | | | |
| Prune juice or prune wine .. gallons.. | 39,011 | 28,826 | 34,422 | 28,566 | 34,546 | 24,222 | 26,174 | 23,285 | 35,047 | 27,204 |
| Other, including cherry juice .. do.... | (a) | 26,470 | (a) | 47,285 | (a) | 56,767 | 52,968 | 25,879 | 44,841 | 23,173 |
| Total ...................... do.... | (a) | 55,296 | (a) | 75,851 | (a) | 80,989 | 79,142 | 49,164 | 79,888 | 50,377 |
| Fruits and nuts: | | | | | | | | | | |
| Fruits— | | | | | | | | | | |
| Bananas ................................ | ............. | 4,674,861 | ............. | 4,502,746 | ............. | 4,086,320 | ............. | 4,236,418 | ............. | 5,665,588 |
| Currants ................ pounds.. | 16,450,706 | 258,659 | 33,040,846 | 551,072 | 29,265,761 | 596,084 | 25,186,210 | 837,987 | 30,849,253 | 798,357 |
| Dates ........................ do.... | 15,186,789 | 316,592 | 13,680,302 | 273,456 | 11,847,279 | 284,056 | 13,561,434 | 371,992 | 12,943,305 | 324,087 |
| Figs .......................... do.... | 11,855,890 | 587,420 | 11,900,710 | 639,512 | 8,940,762 | 535,380 | 9,628,426 | 509,002 | 7,284,058 | 356,762 |
| Lemons ................................ | ............. | 3,917,326 | ............. | 5,040,344 | ............. | 4,043,822 | ............. | 2,848,130 | ............. | 4,398,004 |
| Oranges ................................ | ............. | 1,997,266 | ............. | 2,694,131 | ............. | 2,324,907 | ............. | 886,722 | ............. | 1,097,596 |
| Plums and prunes ........ pounds.. | 14,352,057 | 527,625 | 483,658 | 68,862 | 710,028 | 73,303 | 303,992 | 39,660 | 600,360 | 63,574 |
| Raisins ...................... do.... | 15,921,278 | 651,420 | 10,826,094 | 460,200 | 12,650,598 | 567,039 | 6,593,833 | 381,889 | 4,933,201 | 282,400 |

*a* Not stated.

*b* Prior to July 24, 1897, exclusive of natural flowers free of duty.

*Agricultural imports of the United States during the five years ended June 30, 1899*—Continued.

| Articles imported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| VEGETABLE MATTER—continued. | | | | | | | | | | |
| Fruits and nuts—Continued. | | | | | | | | | | |
| Fruits—Continued. | | | | | | | | | | |
| Prepared or preserved fruits | | $570,568 | | $598,928 | | $605,053 | | $922,357 | | $1,020,644 |
| Other *a* | | 1,725,342 | | 2,128,056 | | 1,810,807 | | 1,294,855 | | 1,579,652 |
| Total fruits *a* | | 15,227,079 | | 16,957,307 | | 14,926,771 | | 12,329,012 | | 15,586,664 |
| Nuts— | | | | | | | | | | |
| Almonds ...pounds | 7,903,375 | 810,439 | 7,789,681 | 763,594 | 9,644,338 | 880,263 | 5,746,362 | 659,659 | 9,957,427 | 1,222,587 |
| Cocoanuts | | 471,994 | | 442,739 | | 471,387 | | 575,935 | | 625,789 |
| Other *b* | | 730,411 | | 868,799 | | 848,511 | | 1,002,344 | | 879,166 |
| Total nuts *b* | | 2,012,844 | | 2,075,132 | | 2,200,161 | | 2,237,938 | | 2,727,542 |
| Total fruits and nuts | | 17,239,923 | | 19,032,439 | | 17,126,932 | | 14,566,950 | | 18,314,206 |
| Ginger, preserved or pickled...pounds | (*c*) | 15,395 | (*c*) | 23,547 | (*c*) | 7,123 | (*c*) | 14,295 | 142,698 | 6,309 |
| Hay ...tons | 201,900 | 1,433,716 | 302,652 | 2,773,535 | 119,942 | 1,030,497 | 3,887 | 34,659 | 19,872 | 115,409 |
| Hops ...pounds | 3,133,664 | 599,744 | 2,772,045 | 600,419 | 3,017,821 | 629,987 | 2,375,922 | 648,155 | 1,319,319 | 591,755 |
| Indigo ...do | 3,956,986 | 2,015,975 | 3,340,601 | 1,673,170 | 3,522,016 | 1,696,641 | 3,097,340 | 1,815,411 | 3,127,357 | 1,698,583 |
| Malt, barley ...bushels | 11,069 | 7,495 | 5,579 | 4,774 | 11,084 | 9,384 | 4,769 | 4,412 | 4,984 | 4,447 |
| Malt extract, fluid or solid | | 51,501 | | 23,889 | | 11,485 | | 6,917 | | 5,320 |
| Malt liquors: | | | | | | | | | | |
| Bottled ...gallons | 943,939 | 900,037 | 1,038,641 | 1,007,146 | 1,048,994 | 1,025,867 | 733,535 | 695,102 | 918,562 | 917,186 |
| Unbottled ...do | 2,027,737 | 614,808 | 2,244,763 | 657,870 | 1,915,650 | 534,426 | 1,777,202 | 506,428 | 1,928,672 | 570,692 |
| Total ...do | 2,971,676 | 1,514,845 | 3,283,404 | 1,665,016 | 2,964,644 | 1,560,293 | 2,510,737 | 1,201,530 | 2,847,234 | 1,487,878 |
| Nursery stock (plants, trees, shrubs, vines, etc.) *d* | | 632,523 | | 955,307 | | 963,977 | | 762,158 | | 768,982 |
| Oil cake ...pounds | 6,794,531 | 47,774 | 7,473,016 | 45,725 | 3,098,384 | 20,313 | 2,159,809 | 8,799 | 1,885,648 | 9,553 |
| Oil cake (substitute for india rubber) | | (*c*) | | (*c*) | | (*c*) | | (*c*) | | 1,149 |
| Oils, vegetable: | | | | | | | | | | |
| Fixed or expressed— | | | | | | | | | | |
| Olive, salad ...gallons | 775,046 | 952,405 | 942,598 | 1,107,049 | 928,567 | 1,134,677 | 736,877 | 923,804 | 930,042 | 1,090,250 |
| Other | | 2,570,035 | | 2,557,026 | | 2,353,084 | | 2,434,209 | | 2,519,157 |
| Volatile, or essential | | 1,398,956 | | 1,554,289 | | 1,885,523 | | 1,511,078 | | 1,691,257 |
| Total | | 4,921,396 | | 5,218,364 | | 5,372,684 | | 4,869,091 | | 5,300,664 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Opium: | | | | | | | | | | |
| Crude or unmanufactured..pounds.. | 358,455 | 730,669 | 365,514 | 683,347 | 1,072,914 | 2,184,727 | 123,845 | 265,607 | 513,499 | 1,223,951 |
| Prepared......do.... | 139,765 | 920,006 | 98,745 | 735,134 | 157,061 | 1,132,861 | 100,258 | 652,341 | 124,214 | 828,203 |
| Total......do.... | 498,220 | 1,650,675 | 464,259 | 1,418,481 | 1,229,975 | 3,317,588 | 224,103 | 917,948 | 637,713 | 2,052,154 |
| Rice and rice meal: | | | | | | | | | | |
| Rice......pounds.. | 141,301,411 | 2,353,974 | 78,190,334 | 1,274,574 | 133,939,930 | 2,555,960 | 129,810,630 | 2,793,111 | 153,837,026 | 3,152,771 |
| Rice flour, rice meal, and broken rice, pounds...... | 78,262,909 | 1,091,538 | 68,534,273 | 911,005 | 63,876,204 | 961,200 | 60,474,685 | 953,722 | 50,340,267 | 777,378 |
| Total......pounds.. | 219,564,320 | 3,445,512 | 146,724,607 | 2,185,579 | 197,816,134 | 3,517,160 | 190,285,315 | 3,746,833 | 204,177,293 | 3,930,149 |
| Sauerkraut...... | ...... | 25,898 | ...... | 7,895 | ...... | 1,831 | ...... | (c) | ...... | (c) |
| Seeds: | | | | | | | | | | |
| Linseed, or flaxseed......bushels.. | 4,166,222 | 4,554,484 | 754,507 | 812,940 | 105,222 | 108,871 | 136,098 | 150,515 | 81,953 | 87,002 |
| Other...... | ...... | 1,981,096 | ...... | 1,870,214 | ...... | 1,315,055 | ...... | 1,081,251 | ...... | 1,134,243 |
| Total...... | ...... | 6,535,580 | ...... | 2,683,154 | ...... | 1,423,926 | ...... | 1,231,766 | ...... | 1,221,845 |
| Spices: | | | | | | | | | | |
| Unground— | | | | | | | | | | |
| Nutmegs......pounds.. | 1,652,613 | 513,801 | 1,355,420 | 433,436 | 1,669,740 | 451,614 | 1,213,994 | 331,235 | 1,530,102 | 368,765 |
| Pepper, black or white......do.... | 20,501,837 | 791,343 | 16,644,763 | 650,861 | 15,033,452 | 711,453 | 14,080,136 | 909,711 | 12,332,747 | 1,083,100 |
| Other (free of duty)......do.... | 17,879,564 | 1,062,868 | 19,193,589 | 999,226 | 20,411,490 | 1,076,963 | 13,784,689 | 898,992 | 13,851,055 | 997,783 |
| Ground (and other dutiable)..do.... | 2,058,782 | 272,223 | 2,618,214 | 294,996 | 3,030,031 | 336,686 | 2,658,706 | 264,691 | 3,346,925 | 332,653 |
| Total......do.... | 42,092,796 | 2,640,235 | 39,811,986 | 2,378,519 | 40,144,713 | 2,576,716 | 31,737,525 | 2,404,629 | 31,060,829 | 2,782,301 |
| Spirits, distilled: | | | | | | | | | | |
| Of domestic manufacture, returned, proof gallons...... | 770,124 | 670,292 | 1,029,653 | 940,060 | 956,760 | 863,558 | 854,586 | 734,901 | 998,173 | 834,948 |
| Brandy......proof gallons.. | 313,327 | 813,882 | 259,704 | 690,761 | 337,595 | 911,721 | 137,902 | 395,758 | 219,968 | 626,875 |
| Other......do.... | 1,139,710 | 1,246,567 | 1,249,895 | 1,446,873 | 1,727,110 | 2,074,835 | 770,830 | 1,004,135 | 1,227,834 | 1,683,256 |
| Total......do.... | 2,223,161 | 2,730,741 | 2,539,252 | 3,077,694 | 3,021,465 | 3,850,114 | 1,763,318 | 2,134,794 | 2,445,975 | 3,145,079 |
| Starch......pounds.. | 4,265,650 | 82,150 | 3,467,399 | 62,756 | 2,941,253 | 51,812 | 6,120,924 | 108,780 | 8,542,897 | 140,528 |
| Straw......tons.. | 7,745 | 24,544 | 7,879 | 31,140 | 9,386 | 31,768 | 1,448 | 4,463 | 2,075 | 4,564 |
| Sugar and molasses: | | | | | | | | | | |
| Molasses......gallons.. | 15,075,879 | 1,295,146 | 4,687,664 | 737,265 | 3,702,471 | 586,513 | 3,603,547 | 544,016 | 5,821,556 | 789,576 |
| Sugar— | | | | | | | | | | |
| Not above No. 16 Dutch standard— | | | | | | | | | | |
| Beet sugar......pounds.. | 347,376,732 | 6,993,282 | 604,686,985 | 14,048,914 | 1,865,577,495 | 33,689,158 | 140,641,485 | 2,717,955 | 723,336,352 | 15,269,397 |
| Other......do.... | 3,168,781,436 | 67,836,512 | 3,104,187,781 | 69,817,286 | 2,854,192,069 | 60,448,873 | 2,448,190,703 | 55,319,873 | 3,194,168,454 | 78,001,772 |
| Above No. 16 Dutch standard, pounds...... | 58,352,286 | 1,633,042 | 187,463,791 | 5,353,573 | 199,136,169 | 4,928,150 | 101,088,663 | 2,434,921 | 62,745,763 | 1,692,951 |
| Total sugar......pounds.. | 3,574,510,454 | 76,462,836 | 3,896,338,557 | 89,219,773 | 4,918,905,733 | 99,066,181 | 2,689,920,851 | 60,472,749 | 3,980,250,569 | 94,964,120 |
| Total sugar and molasses...... | ...... | 77,757,982 | ...... | 89,957,038 | ...... | 99,652,694 | ...... | 61,016,765 | ...... | 95,753,696 |
| Tea......pounds.. | 97,253,458 | 13,171,379 | 93,998,372 | 12,704,440 | 113,347,175 | 14,835,862 | 71,957,715 | 10,054,283 | 74,089,899 | 9,675,081 |

a Including nuts free of duty, except cocoanuts.
b Exclusive of nuts free of duty, except cocoanuts.
c Not stated.
d Apparently including natural flowers free of duty from August 27, 1894, to July 24, 1897.

*Agricultural imports of the United States during the five years ended June 30, 1899*—Continued.

| Articles imported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| VEGETABLE MATTER—continued. | | | | | | | | | | |
| Tobacco, leaf: | | | | | | | | | | |
| Suitable for cigar wrappers..pounds.. | 5,679,252 | $7,219,877 | 5,211,852 | $5,596,778 | 6,057,268 | $5,663,214 | 3,988,561 | $3,913,294 | 4,147,048 | $4,349,034 |
| Other (including stems)........do.... | 20,989,009 | 7,525,843 | 27,713,114 | 10,906,352 | 7,747,959 | 3,920,941 | 6,488,547 | 3,575,314 | 9,888,781 | 5,551,219 |
| Total....................do.... | 26,668,261 | 14,745,720 | 32,924,966 | 16,503,130 | 13,805,227 | 9,584,155 | 10,477,108 | 7,488,608 | 14,035,829 | 9,900,253 |
| Vanilla beans....................do.... | 137,296 | 495,273 | 235,763 | 1,013,608 | 165,001 | 884,865 | 63,997 | 279,755 | 272,174 | 1,235,412 |
| Vegetables: | | | | | | | | | | |
| Beans and peas..............bushels.. | 1,535,960 | 1,548,767 | 613,801 | 658,320 | 482,984 | 489,274 | 163,560 | 149,227 | 184,499 | 165,830 |
| Cabbages ...................number.. | (*a*) | (*a*) | 1,261,696 | 55,644 | 711,033 | 38,906 | ............ | (*a*) | ............ | (*a*) |
| Onions......................bushels.. | (*a*) | (*a*) | (*a*) | (*a*) | 560,138 | 627,273 | 488,853 | 429,173 | 771,960 | 499,520 |
| Potatoes ....................do.... | 1,341,533 | 603,554 | 175,240 | 127,595 | 246,178 | 145,584 | 1,171,378 | 473,154 | 530,420 | 294,391 |
| Pickles and sauces .................. | ............ | 321,632 | ............ | 324,377 | ............ | 332,243 | ............ | 243,354 | ............ | 352,022 |
| Other— | | | | | | | | | | |
| In their natural state............ | ............ | 679,894 | ............ | 683,117 | ............ | 256,752 | ............ | 239,733 | ............ | 312,673 |
| Prepared or preserved ............ | ............ | 817,689 | ............ | 727,797 | ............ | 720,822 | ............ | 499,959 | ............ | 554,302 |
| Total vegetables ................ | ............ | 3,971,536 | ............ | 2,576,850 | ............ | 2,610,854 | ............ | 2,034,600 | ............ | 2,178,738 |
| Vinegar.....................gallons.. | 75,108 | 19,823 | 81,075 | 24,552 | 76,123 | 20,519 | 85,556 | 22,313 | 93,443 | 23,534 |
| Wafers, unmedicated .................. | ............ | 21,105 | ............ | 16,748 | ............ | 20,082 | ............ | 11,797 | ............ | 14,733 |
| Wines: | | | | | | | | | | |
| Champagne and other sparking, dozen bottles.................. | 257,757 | 3,807,961 | 246,393 | 3,628,319 | 228,628 | 3,348,004 | 223,827 | 3,264,323 | 262,371 | 3,668,791 |
| Still wines— | | | | | | | | | | |
| Bottled............dozen bottles.. | 296,779 | 1,430,229 | 314,190 | 1,527,916 | 309,281 | 1,475,211 | 268,921 | 1,312,147 | 274,873 | 1,347,842 |
| Unbottled ..............gallons.. | 2,789,153 | 1,945,347 | 2,834,898 | 1,950,770 | 2,997,952 | 2,039,250 | 1,930,870 | 1,392,710 | 2,253,226 | 1,573,573 |
| Total ........................ | ............ | 7,183,537 | ............ | 7,107,005 | ............ | 6,862,465 | ............ | 5,969,180 | ............ | 6,590,206 |
| Total vegetable matter.......... | ............ | 286,060,995 | ............ | 286,910,917 | ............ | 286,285,280 | ............ | 213,658,788 | ............ | 257,688,943 |
| Total agricultural imports ..... | ............ | 373,115,985 | ............ | 391,029,407 | ............ | 400,871,468 | ............ | 314,291,796 | ............ | 355,514,881 |

*a* Not stated.

*Agricultural exports (domestic) of the United States during the five years ended June 30, 1899.*

| Articles exported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| ANIMAL MATTER. | | | | | | | | | | |
| Animals, live: | | | | | | | | | | |
| Cattle ........number.. | 331,722 | $30,603,796 | 372,461 | $34,560,672 | 392,190 | $36,357,451 | 439,255 | $37,827,500 | 389,490 | $30,516,833 |
| Hogs ........do.... | 7,130 | 72,424 | 21,049 | 227,297 | 28,751 | 295,998 | 14,411 | 110,487 | 33,031 | 227,241 |
| Horses ........do.... | 13,984 | 2,209,298 | 25,126 | 3,530,703 | 39,532 | 4,769,265 | 51,150 | 6,176,569 | 45,778 | 5,444,342 |
| Mules ........do.... | 2,515 | 186,452 | 5,918 | 406,161 | 7,473 | 545,331 | 8,098 | 664,789 | 6,755 | 516,908 |
| Sheep ........do.... | 405,748 | 2,630,686 | 491,565 | 3,076,384 | 244,120 | 1,531,645 | 199,690 | 1,213,886 | 143,286 | 853,555 |
| Other, including fowls ........ | ........ | 51,389 | ........ | 39,752 | ........ | 68,771 | ........ | 250,175 | ........ | 322,037 |
| Total ........ | ........ | 35,754,045 | ........ | 41,840,969 | ........ | 43,568,461 | ........ | 46,243,406 | ........ | 37,880,916 |
| Beeswax ........pounds.. | 309,212 | 90,875 | 222,612 | 65,844 | 195,048 | 56,462 | 151,094 | 41,827 | 152,494 | 41,916 |
| Bones, hoofs, horns and horn tips, strips, and waste ........ | ........ | 288,084 | ........ | 321,680 | ........ | 280,140 | ........ | 174,861 | ........ | 195,759 |
| Bristles ........ | ........ | 3,901 | ........ | (*a*) | ........ | 415 | ........ | (*a*) | ........ | (*a*) |
| Dairy products: | | | | | | | | | | |
| Butter ........pounds.. | 5,598,812 | 915,533 | 19,373,913 | 2,937,203 | 31,345,224 | 4,493,364 | 25,690,025 | 3,864,765 | 20,247,997 | 3,263,951 |
| Cheese ........do.... | 60,448,421 | 5,497,539 | 36,777,291 | 3,091,914 | 50,944,617 | 4,636,063 | 53,167,280 | 4,559,324 | 38,198,753 | 3,316,049 |
| Milk ........ | ........ | 219,785 | ........ | 270,453 | ........ | 524,968 | ........ | 671,670 | ........ | 1,049,211 |
| Total ........ | ........ | 6,632,857 | ........ | 6,299,570 | ........ | 9,654,395 | ........ | 9,095,759 | ........ | 7,629,211 |
| Eggs ........dozens.. | 151,007 | 25,317 | 328,485 | 48,339 | 1,300,183 | 180,954 | 2,754,810 | 448,370 | 3,693,611 | 641,385 |
| Egg yolks ........ | ........ | 2,255 | ........ | 556 | ........ | (*a*) | ........ | (*a*) | ........ | 10,379 |
| Feathers: | | | | | | | | | | |
| Ostrich ........ | ........ | 9 | ........ | 250 | ........ | 5,679 | | | | |
| Other ........pounds.. | *b*1,284,895 | *b*215,681 | 1,165,658 | 193,046 | 1,142,632 | 112,714 | (*a*) | 157,553 | (*a*) | 212,374 |
| Total ........ | ........ | 215,690 | ........ | 193,296 | ........ | 118,393 | ........ | 157,553 | ........ | 212,374 |
| Fertilizer (refuse skins) ........ | ........ | (*a*) | ........ | (*a*) | ........ | (*a*) | ........ | (*a*) | ........ | 1,062 |
| Glue ........pounds.. | 1,178,328 | 114,493 | 1,760,470 | 166,930 | 1,400,863 | 132,581 | 2,318,711 | 209,441 | 2,368,087 | 222,072 |
| Grease, grease scraps, and other soap stock ........ | ........ | 904,071 | ........ | 1,516,763 | ........ | 2,070,111 | ........ | 1,964,565 | ........ | 2,576,507 |
| Hair (including manufactures of) ........ | ........ | 505,029 | ........ | 455,880 | ........ | 517,469 | ........ | 635,716 | ........ | 503,712 |
| Hides and skins, other than furs. pounds.. | 36,002,859 | 2,310,323 | 39,545,324 | 3,858,946 | 31,119,166 | 2,388,530 | 11,536,073 | 1,015,032 | 10,140,840 | 929,117 |
| Honey ........ | ........ | 118,873 | ........ | 90,969 | ........ | 22,368 | ........ | 98,504 | ........ | 55,900 |

*a* Not stated.

*b* Exclusive of egret feathers.

*Agricultural exports (domestic) of the United States during the five years ended June 30, 1899*—Continued.

| Articles exported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| ANIMAL MATTER—continued. | | | | | | | | | | |
| Meat products: | | | | | | | | | | |
| Beef products— | | | | | | | | | | |
| Beef, canned ............pounds.. | 64,102,263 | $5,720,933 | 63,698,180 | $5,636,953 | 54,019,772 | $4,656,308 | 37,109,570 | $3,279,657 | 38,385,472 | $3,503,293 |
| Beef, fresh ............do.... | 191,338,487 | 16,832,860 | 224,783,225 | 18,974,107 | 290,395,930 | 22,653,742 | 274,768,074 | 22,966,556 | 282,139,974 | 23,545,185 |
| Beef, salted or pickled......do.... | 62,473,325 | 3,558,230 | 70,709,209 | 3,975,113 | 67,712,940 | 3,514,126 | 44,314,479 | 2,368,467 | 46,564,876 | 2,525,784 |
| Beef, other cured ..........do.... | 821,673 | 73,569 | 514,303 | 59,371 | 939,448 | 83,701 | 1,589,052 | 150,051 | 1,579,313 | 145,996 |
| Tallow ............do.... | 25,864,300 | 1,293,059 | 52,759,212 | 2,323,764 | 75,108,834 | 2,782,595 | 81,744,809 | 3,141,653 | 107,361,009 | 4,367,356 |
| Total beef products. .....do.... | 344,600,048 | 27,478,651 | 412,464,129 | 30,969,308 | 488,176,924 | 33,690,472 | 439,525,984 | 31,906,384 | 476,030,644 | 34,087,614 |
| Hog products— | | | | | | | | | | |
| Bacon ............do.... | 452,549,976 | 37,776,293 | 425,352,187 | 33,442,847 | 500,399,448 | 34,187,147 | 650,108,933 | 46,380,918 | 562,651,480 | 41,557,067 |
| Hams............do.... | 105,494,123 | 10,960,567 | 129,036,351 | 12,669,763 | 165,247,302 | 15,970,021 | 200,185,861 | 18,987,525 | 225,846,750 | 20,774,084 |
| Pork, fresh............do.... | 818,581 | 60,660 | 744,656 | 43,739 | 1,306,424 | 94,816 | 12,224,285 | 815,075 | 41,310,384 | 2,722,661 |
| Pork, salted or pickled .....do.... | 58,266,893 | 4,138,400 | 69,498,373 | 3,973,461 | 66,768,920 | 3,297,214 | 88,133,078 | 4,906,961 | 137,197,200 | 7,917,066 |
| Lard ............do.... | 474,895,274 | 36,821,508 | 509,534,256 | 33,589,851 | 568,315,640 | 29,126,485 | 709,344,045 | 39,710,672 | 711,259,851 | 42,208,465 |
| Total hog products.......do.... | 1,092,024,847 | 89,757,428 | 1,134,165,823 | 83,719,661 | 1,302,037,734 | 82,675,683 | 1,659,996,202 | 110,801,151 | 1,678,265,645 | 115,179,343 |
| Mutton............do.... | 591,449 | 47,832 | 422,950 | 31,793 | 361,955 | 28,341 | 329,169 | 27,961 | 379,110 | 29,427 |
| Oleo and oleomargarin— | | | | | | | | | | |
| Oleo-oil............do.... | 78,098,878 | 7,107,018 | 103,276,756 | 8,087,905 | 113,506,152 | 6,742,061 | 132,579,277 | 7,904,413 | 142,390,492 | 9,183,659 |
| Oleomargarin (imitation butter), pounds............ | 10,100,897 | 992,464 | 6,063,699 | 587,269 | 4,864,351 | 472,856 | 4,328,536 | 386,297 | 5,549,322 | 509,703 |
| Total oleo and oleomargarin, pounds............ | 88,199,775 | 8,099,482 | 109,340,455 | 8,675,174 | 118,370,503 | 7,214,917 | 136,907,813 | 8,290,710 | 147,939,814 | 9,693,362 |
| Poultry and game............ | ............ | 17,898 | ............ | 40,647 | ............ | 72,082 | ............ | 85,739 | ............ | 183,503 |
| Sausage casings............ | ............ | 1,581,891 | ............ | 1,771,680 | ............ | 1,514,651 | ............ | 1,821,519 | ............ | 1,671,052 |
| Other meat products ............ | ............ | 1,600,231 | ............ | 1,767,437 | ............ | 2,944,486 | ............ | 4,193,078 | ............ | 5,834,865 |
| Total meat products ............ | ............ | 128,583,413 | ............ | 126,975,700 | ............ | 128,140,632 | ............ | 157,126,542 | ............ | 166,679,166 |
| Oils, animal, not elsewhere specified: | | | | | | | | | | |
| Lard oil ............gallons.. | 553,421 | 304,093 | 833,935 | 426,401 | 961,407 | 419,803 | 775,102 | 305,825 | 917,007 | 412,447 |
| Other, except whale and fish...do.... | 144,556 | 75,585 | 100,934 | 50,839 | 112,555 | 47,836 | 123,711 | 50,587 | 166,372 | 64,368 |
| Total ............do.... | 697,977 | 379,678 | 934,869 | 477,240 | 1,073,962 | 467,639 | 898,813 | 356,412 | 1,083,379 | 476,815 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Quills | | 13,653 | | 27,950 | | 19,264 | | 14,413 | | 12,213 |
| Rennets, prepared | | 1,801 | | 815 | | 735 | | (a) | | (a) |
| Silk noils | | (a) | | 1,958 | | (a) | | (a) | | (a) |
| Silk waste ... pounds | 65,673 | 23,391 | 102,624 | 31,163 | 54,060 | 13,181 | 153,886 | 19,002 | 128,698 | 16,075 |
| Silkworm eggs | | 2,850 | | 25 | | 25 | | (a) | | (a) |
| Stearin ... pounds | 36,429 | 2,157 | 668,585 | 34,259 | 1,388,555 | 70,534 | 3,987,258 | 188,579 | 1,174,167 | 55,821 |
| Wool ... do | 4,279,109 | 484,463 | 6,945,981 | 855,950 | 5,271,535 | 619,932 | 121,139 | 18,071 | 1,683,419 | 237,350 |
| Total animal matter | | 176,457,219 | | 183,264,812 | | 188,322,221 | | 217,808,053 | | 218,377,750 |
| VEGETABLE MATTER. | | | | | | | | | | |
| Breadstuffs: | | | | | | | | | | |
| Barley ... bushels | 1,563,754 | 767,228 | 7,680,331 | 3,100,311 | 20,030,301 | 7,646,384 | 11,237,077 | 5,542,040 | 2,267,403 | 1,375,274 |
| Bran, middlings, and mill feed ... tons | (a) | (a) | (a) | (a) | (a) | (a) | 91,189 | 1,329,519 | 127,953 | 2,002,588 |
| Bread and biscuit ... pounds | 14,206,314 | 634,600 | 15,426,601 | 694,323 | 15,214,619 | 697,695 | 15,990,558 | 788,264 | 16,447,430 | 809,993 |
| Buckwheat ... bushels | (a) | (a) | (a) | (a) | 1,677,102 | 678,959 | 1,370,403 | 580,285 | 1,533,980 | 846,028 |
| Corn (maize) ... do | 27,691,137 | 14,650,767 | 99,992,835 | 37,836,862 | 176,916,365 | 54,087,152 | 208,744,939 | 74,196,850 | 174,089,094 | 68,977,448 |
| Corn meal ... barrels | 223,567 | 648,844 | 276,885 | 654,121 | 475,263 | 902,061 | 827,651 | 1,766,068 | 791,488 | 1,775,868 |
| Oats ... bushels | 569,077 | 200,793 | 13,012,590 | 3,497,611 | 35,096,736 | 8,756,207 | 69,130,288 | 20,632,914 | 30,309,778 | 9,787,540 |
| Oatmeal ... pounds | 20,499,253 | 566,321 | 38,592,504 | 939,502 | 47,310,251 | 1,071,340 | 85,500,350 | 1,757,978 | 58,042,505 | 1,295,988 |
| Rye ... bushels | 9,437 | 5,340 | 988,466 | 445,075 | 8,560,271 | 3,667,505 | 15,541,575 | 8,825,769 | 10,140,866 | 5,936,078 |
| Rye flour ... barrels | 3,768 | 12,062 | 3,777 | 11,163 | 2,566 | 7,366 | 3,410 | 11,815 | 4,826 | 15,015 |
| Wheat ... bushels | 76,102,704 | 43,805,663 | 60,650,080 | 39,709,868 | 79,562,020 | 59,920,178 | 148,231,261 | 145,684,659 | 139,432,815 | 104,269,169 |
| Wheat flour ... barrels | 15,268,892 | 51,651,928 | 14,620,864 | 52,025,217 | 14,569,545 | 55,914,347 | 15,349,943 | 69,263,718 | 18,485,690 | 73,093,870 |
| Preparations of, for table food } Other } | | 1,661,234 | | 2,442,940 | | 4,508,025 | | 1,765,207 | | 2,133,110 |
| | | | | | | | | 1,743,033 | | 1,681,725 |
| Total | | 114,604,780 | | 141,356,993 | | 197,857,219 | | 333,897,119 | | 273,999,699 |
| Broom corn | | 169,503 | | 181,853 | | 136,007 | | 163,066 | | 185,902 |
| Broom root (rice root) | | (a) | | (a) | | (a) | | (a) | | 10,975 |
| Cider ... gallons | 669,745 | 85,675 | 372,986 | 47,670 | 637,672 | 77,695 | 465,873 | 60,063 | 490,803 | 64,500 |
| Coffee and cocoa, ground or prepared, and chocolate | | 104,317 | | 107,740 | | 128,078 | | 137,369 | | 192,863 |
| Cotton: | | | | | | | | | | |
| In bales—b | | | | | | | | | | |
| Sea-island ... bales | 39,333 | 2,782,639 | 49,651 | 3,816,216 | 55,347 | 4,078,044 | 40,037 | 2,767,291 | 36,213 | 2,361,697 |
| pounds | 15,261,322 | | 19,159,469 | | 21,585,360 | | 15,610,302 | | 14,142,052 | |
| Other ... bales | 6,926,025 | 202,118,351 | 4,610,114 | 186,240,244 | 6,121,018 | 226,812,927 | 7,540,967 | 227,674,924 | 7,337,169 | 207,203,077 |
| pounds | 3,502,171,787 | | 2,316,066,916 | | 3,082,169,589 | | 3,834,653,993 | | 3,759,268,241 | |
| Total in bales ... bales | 6,965,358 | 204,900,990 | 4,659,765 | 190,056,460 | 6,176,365 | 230,890,971 | 7,581,004 | 230,442,215 | 7,373,382 | 209,564,774 |
| pounds | 3,517,433,109 | | 2,335,226,385 | | 3,103,754,949 | | 3,850,264,295 | | 3,773,410,293 | |
| Waste cotton ... pounds | (a) | (a) | (a) | (a) | (a) | (a) | 12,521,574 | 511,004 | 14,308,829 | 524,802 |
| Total cotton ... pounds | 3,517,433,109 | 204,900,990 | 2,335,226,385 | 190,056,460 | 3,103,754,949 | 230,890,971 | 3,862,785,869 | 230,953,219 | 3,787,719,122 | 210,089,576 |
| Cotton-seed hulls | | 235 | | (a) | | (a) | | (a) | | (a) |

a Not stated.

b Probably including waste cotton prior to 1898.

*Agricultural exports (domestic) of the United States during the five years ended June 30, 1899*—Continued.

| Articles exported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| VEGETABLE MATTER—continued. | | | | | | | | | | |
| Cotton-seed meats | | (a) | | (a) | | $37,970 | | (a) | | (a) |
| Flax | | $906 | | (a) | | (a) | | (a) | | (a) |
| Flowers, cut | | 2,521 | | $798 | | 1,429 | | $2,967 | | $2,355 |
| Fruits and nuts: | | | | | | | | | | |
| Fruits— | | | | | | | | | | |
| Apples, dried ... pounds | 7,085,946 | 461,214 | 26,691,963 | 1,340,507 | 30,775,401 | 1,340,159 | 31,031,254 | 1,897,725 | 19,305,739 | 1,245,733 |
| Apples, green or ripe ... barrels | 818,711 | 1,954,318 | 360,002 | 930,289 | 1,503,981 | 2,371,143 | 605,390 | 1,684,717 | 380,222 | 1,210,459 |
| Oranges | | (a) | | (a) | | (a) | | 339,396 | | 282,313 |
| Prunes ... pounds | (a) | (a) | (a) | (a) | (a) | (a) | 15,940,791 | 1,021,888 | 5,615,565 | 380,847 |
| Raisins ... do | (a) | (a) | (a) | (a) | (a) | (a) | 3,109,639 | 167,062 | 4,659,807 | 242,620 |
| Other green, ripe, or dried | | 1,522,100 | | 1,868,353 | | 2,172,199 | | 2,033,845 | | 1,997,649 |
| Preserved— | | | | | | | | | | |
| Canned | | 871,465 | | 1,376,281 | | 1,686,723 | | 1,624,741 | | 2,330,715 |
| Other | | 47,420 | | 70,353 | | 43,276 | | 82,504 | | 66,899 |
| Total fruits | | 4,856,517 | | 5,585,783 | | 7,613,500 | | 8,851,878 | | 7,757,235 |
| Nuts | | 115,274 | | 93,283 | | 125,805 | | 161,432 | | 140,250 |
| Total fruits and nuts | | 4,971,791 | | 5,679,066 | | 7,739,305 | | 9,013,310 | | 7,897,485 |
| Ginseng ... pounds | 233,236 | 826,713 | 199,436 | 770,673 | 179,573 | 840,686 | 174,063 | 638,446 | 196,196 | 782,545 |
| Glucose, or grape sugar ... do | 133,808,329 | 2,567,784 | 171,231,650 | 2,772,335 | 194,419,250 | 2,736,674 | 196,864,605 | 2,871,839 | 229,003,571 | 3,624,890 |
| Grasses, dried | | 19,781 | | 44,583 | | 17,766 | | 26,499 | | 26,063 |
| Hay ... tons | 47,117 | 699,029 | 59,052 | 874,048 | 61,658 | 845,590 | 81,827 | 1,151,273 | 64,916 | 858,992 |
| Hops ... pounds | 17,523,388 | 1,872,597 | 16,765,254 | 1,478,919 | 11,426,241 | 1,304,183 | 17,161,669 | 2,642,779 | 21,145,512 | 3,626,144 |
| Lard substitutes, n. e. s. (cottolene, lardine, etc.) ... pounds | 503,859 | 38,122 | 1,709,923 | 102,279 | 16,261,991 | 857,708 | 21,343,028 | 1,118,659 | 22,144,717 | 1,200,231 |
| Malt ... bushels | 162,006 | 110,323 | 200,042 | 126,942 | 289,543 | 177,292 | 406,702 | 287,473 | 453,038 | 324,145 |
| Malt sprouts | | (a) | | (a) | | (a) | | 15,124 | | 55,177 |
| Malt liquors: | | | | | | | | | | |
| Bottled ... dozen bottles | 426,777 | 492,448 | 492,055 | 590,116 | 549,910 | 636,837 | 406,231 | 497,031 | 1,433,799 | 1,733,373 |
| Unbottled ... gallons | 258,620 | 66,322 | 290,383 | 69,759 | 390,048 | 87,112 | 391,802 | 88,548 | 602,055 | 154,751 |
| Total | | 558,770 | | 659,875 | | 723,949 | | 585,579 | | 1,888,124 |
| Must | | 16,000 | | 18,500 | | (a) | | (a) | | (a) |
| Nursery stock | | 129,551 | | 133,735 | | 135,047 | | 96,330 | | 134,929 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Oil cake and oil-cake meal: | | | | | | | | | | |
| Corn ........ pounds.. | (a) | (a) | (a) | (a) | (a) | (a) | 2,202,680 | 20,286 | 1,922,264 | 17,623 |
| Cotton-seed ........ do.... | 489,716,053 | 4,310,128 | 404,937,291 | 3,740,232 | 623,386,638 | 5,515,800 | 919,727,701 | 8,040,710 | 1,079,993,479 | 9,253,398 |
| Flaxseed, or linseed ........ do.... | 243,936,442 | 2,855,459 | 393,429,432 | 4,209,415 | 433,106,448 | 4,095,244 | 436,206,321 | 4,540,824 | 487,177,390 | 5,277,744 |
| Total *b* ........ do.... | 733,652,495 | 7,165,587 | 798,366,723 | 7,949,647 | 1,056,493,086 | 9,611,044 | 1,358,136,702 | 12,601,820 | 1,569,093,133 | 14,548,765 |
| Oils, vegetable: | | | | | | | | | | |
| Corn ........ gallons.. | (a) | (a) | (a) | (a) | (a) | (a) | 2,646,560 | 575,646 | 2,360,623 | 565,293 |
| Cotton-seed ........ do.... | 21,187,728 | 6,813,313 | 19,445,848 | 5,476,510 | 27,198,882 | 6,897,361 | 40,230,784 | 10,137,619 | 50,627,219 | 12,077,519 |
| Linseed ........ do.... | 62,718 | 37,363 | 67,159 | 33,260 | 111,262 | 42,700 | 90,074 | 38,439 | 107,000 | 47,681 |
| Volatile, or essential— | | | | | | | | | | |
| Peppermint ........ pounds.. | 87,633 | 194,616 | 85,290 | 174,810 | 162,492 | 257,484 | 145,375 | 180,811 | 117,462 | 118,227 |
| Other ........ | ........ | 190,798 | ........ | 102,487 | ........ | 146,569 | ........ | 201,497 | ........ | 162,358 |
| All other ........ | ........ | 106,022 | ........ | 309,955 | ........ | 1,167,504 | ........ | 885,057 | ........ | 838,257 |
| Total ........ | ........ | 7,342,112 | ........ | 6,097,022 | ........ | 8,511,618 | ........ | 12,019,069 | ........ | 13,809,335 |
| Rice and rice meal: | | | | | | | | | | |
| Rice ........ pounds.. | 124,296 | 4,687 | 1,346,876 | 14,117 | 387,288 | 14,617 | 637,146 | 27,501 | 852,704 | 38,511 |
| Rice bran, meal, and polish ..... do.... | 1,499,040 | 11,767 | 13,684,678 | 79,637 | 3,518,466 | 20,113 | 5,563,841 | 35,498 | 14,481,985 | 80,298 |
| Total ........ do.... | 1,623,336 | 16,454 | 15,031,554 | 93,754 | 3,905,754 | 34,730 | 6,200,987 | 62,999 | 15,334,689 | 118,809 |
| Rice root. (*See* Broom root.) | | | | | | | | | | |
| Roots, herbs, and barks, n. e. s. ........ | ........ | 232,095 | ........ | 153,896 | ........ | 154,347 | ........ | 147,839 | ........ | 169,828 |
| Seeds: | | | | | | | | | | |
| Cotton ........ pounds.. | 11,051,812 | 86,695 | 26,980,110 | 179,621 | 26,566,024 | 170,604 | 32,764,781 | 197,258 | 34,443,806 | 197,023 |
| Flaxseed, or linseed ........ bushels.. | 1,224 | 1,433 | 80,453 | 73,207 | 4,713,747 | 3,850,835 | 257,228 | 231,237 | 2,830,991 | 2,815,449 |
| Grass seed— | | | | | | | | | | |
| Clover ........ pounds.. | 22,900,672 | 2,124,997 | 5,539,787 | 437,493 | 13,042,994 | 1,003,157 | 31,155,381 | 1,892,101 | 19,980,434 | 1,264,922 |
| Timothy ........ do.... | 4,939,237 | 277,160 | 11,894,536 | 518,755 | 16,733,993 | 574,457 | 10,238,780 | 317,173 | 16,149,611 | 492,710 |
| Other ........ | ........ | (a) | ........ | (a) | ........ | (a) | ........ | 167,109 | ........ | 156,200 |
| Total grass seed ........ | ........ | (a) | ........ | (a) | ........ | (a) | ........ | 2,376,383 | ........ | 1,913,832 |
| All other seeds ........ | ........ | 358,860 | ........ | 382,941 | ........ | 429,379 | ........ | 149,845 | ........ | 153,092 |
| Total seeds ........ | ........ | 2,849,145 | ........ | 1,592,017 | ........ | 6,028,432 | ........ | 2,954,723 | ........ | 5,079,396 |
| Spices ........ | ........ | 871 | ........ | 1,367 | ........ | 77½ | ........ | 3,841 | ........ | 2,257 |
| Spirits, distilled: | | | | | | | | | | |
| Alcohol, including cologne spirits, proof gallons ........ | *c* 676,832 | *c* 181,393 | *c* 331,407 | *c* 85,292 | *c* 416,725 | *c* 140,046 | 1,619,230 | 463,616 | 1,476,028 | 427,288 |
| Brandy ........ proof gallons.. | 100,719 | 94,924 | 89,259 | 87,294 | 11,815 | 12,640 | 24,886 | 39,455 | 20,944 | 29,289 |
| Rum ........ do.... | 879,153 | 1,134,965 | 865,643 | 1,174,093 | 808,393 | 1,102,267 | 607,634 | 845,673 | 850,719 | 1,175,306 |

*a* Not stated. *b* Prior to 1898 exclusive of corn oil cake, of which the exports were inconsiderable. *c* Including wood alcohol.

*Agricultural exports (domestic) of the United States during the five years ended June 30, 1899*—Continued.

| Articles exported. | 1895. | | 1896. | | 1897. | | 1898. | | 1899. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. | Quantities. | Values. |
| VEGETABLE MATTER—continued. | | | | | | | | | | |
| Spirits, distilled—Continued. | | | | | | | | | | |
| Whisky— | | | | | | | | | | |
| Bourbon..........proof gallons.. | 1,442,685 | $1,485,525 | 139,866 | $187,336 | 569,413 | $422,451 | 286,599 | $241,066 | 224,918 | $267,865 |
| Rye........................do.... | 17,672 | 34,755 | 26,630 | 45,268 | 21,282 | 38,402 | 17,495 | 31,164 | 99,884 | 156,617 |
| Other........................do.... | 154,703 | 60,124 | 336,424 | 151,521 | 500,338 | 225,897 | 36,869 | 30,149 | 19,536 | 24,372 |
| Total..................do.... | 3,271,764 | 2,991,686 | 1,789,220 | 1,730,804 | 2,327,966 | 1,941,703 | 2,592,713 | 1,651,123 | 2,692,029 | 2,080,737 |
| Starch........................pounds.. | 11,788,990 | 366,800 | 31,829,435 | 885,198 | 79,088,876 | 1,665,926 | 72,806,313 | 1,371,549 | 110,193,776 | 2,292,843 |
| Straw.................................. | ............ | 3,639 | ............ | 5,293 | ............ | 5,659 | ............ | 5,907 | ............ | 4,737 |
| Sugar and molasses: | | | | | | | | | | |
| Molasses and sirup— | | | | | | | | | | |
| Molasses..............gallons.. | 9,148,711 | 850,400 | 6,953,307 | 737,870 | 8,913,830 | 788,323 | 3,817,829 | 267,202 | 5,682,080 | 444,392 |
| Sirup........................do.... | | | | | | | 7,573,541 | 794,727 | 10,070,650 | 1,465,849 |
| Total molasses and sirup.do.... | 9,148,711 | 850,400 | 6,953,307 | 737,870 | 8,913,830 | 788,323 | 11,391,370 | 1,061,929 | 15,752,730 | 1,910,241 |
| Sugar— | | | | | | | | | | |
| Brown..................pounds.. | 695,486 | 22,052 | 296,265 | 10,389 | 1,107,864 | 35,367 | 460,682 | 17,353 | 403,119 | 14,275 |
| Refined....................do.... | 8,833,522 | 406,924 | 9,106,259 | 450,753 | 7,197,355 | 341,641 | 6,047,608 | 301,511 | 9,462,228 | 426,202 |
| Total sugar...............do.... | 9,529,008 | 428,976 | 9,402,524 | 461,142 | 8,305,219 | 377,008 | 6,508,290 | 318,864 | 9,865,347 | 440,477 |
| Total sugar and molasses........ | ............ | 1,279,376 | ............ | 1,199,012 | ............ | 1,165,331 | ............ | 1,380,793 | ............ | 2,350,718 |
| Sugar meal....................pounds.. | (*a*) | (*a*) | 3,930,412 | 66,935 | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) |
| Teazels.................................. | ............ | 1,281 | ............ | 6,287 | ............ | 3,336 | ............ | 13,290 | ............ | 19,466 |
| Tobacco: | | | | | | | | | | |
| Leaf........................pounds.. | 293,805,855 | 25,622,776 | 287,700,301 | 24,405,245 | 305,978,292 | 24,513,567 | 252,258,902 | 21,924,337 | 272,421,295 | 25,170,771 |
| Stems and trimmings..........do.... | 7,186,075 | 176,192 | 7,839,011 | 166,117 | 8,953,399 | 197,879 | 10,761,312 | 247,243 | 11,191,827 | 296,447 |
| Total..................do.... | 300,991,930 | 25,798,968 | 295,539,312 | 24,571,362 | 314,931,691 | 24,711,446 | 263,020,214 | 22,171,580 | 283,613,122 | 25,467,218 |
| Vegetables: | | | | | | | | | | |
| Beans and peas..............bushels.. | 242,680 | 429,002 | 473,975 | 632,073 | 900,219 | 1,110,387 | 854,284 | 1,094,094 | 883,201 | 1,269,812 |
| Onions........................do.... | 53,335 | 46,703 | 82,916 | 61,181 | 73,511 | 60,088 | 100,148 | 90,832 | 164,902 | 134,250 |
| Potatoes......................do.... | 572,957 | 418,221 | 680,049 | 371,485 | 926,646 | 515,067 | 605,187 | 460,666 | 579,833 | 450,739 |
| Vegetables, canned.................. | ............ | 441,388 | ............ | 407,506 | ............ | 408,840 | ............ | 386,039 | ............ | 555,691 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Other, including pickles and sauces | ............ | 208,144 | ............ | 182,805 | ............ | 243,542 | ............ | 350,157 | ............ | 388,908 |
| Total | ............ | 1,543,458 | ............ | 1,655,050 | ............ | 2,337,924 | ............ | 2,381,788 | ............ | 2,799,400 |
| Vinegar ......gallons | 80,234 | 11,273 | 123,163 | 16,975 | 93,969 | 11,572 | 108,657 | 12,939 | 107,317 | 13,488 |
| Wines: | | | | | | | | | | |
| Bottled ......dozen bottles | 13,919 | 56,202 | 17,147 | 69,460 | 16,794 | 69,444 | 9,672 | 46,721 | 10,973 | 52,015 |
| Unbottled ......gallons | 1,125,297 | 545,708 | 1,339,090 | 581,827 | 1,389,375 | 629,270 | 1,623,103 | 682,028 | 1,498,078 | 624,315 |
| Total | ............ | 601,910 | ............ | 651,287 | ............ | 698,714 | ............ | 728,749 | ............ | 676,330 |
| Yeast | ............ | 44,509 | ............ | 45,077 | ............ | 42,849 | ............ | 41,770 | ............ | 36,061 |
| Total vegetable matter | ............ | 381,928,642 | ............ | 391,133,452 | ............ | 501,432,972 | ............ | 641,210,893 | ............ | 574,433,983 |
| Total agricultural exports | ............ | 558,385,861 | ............ | 574,398,264 | ............ | 689,755,193 | ............ | 859,018,946 | ............ | 792,811,733 |

*a* Not stated.

## AVERAGE PRICES FOR IMPORTS AND EXPORTS.

[From Section of Foreign Markets.]

*Average import price of agricultural products imported into the United States during each of the five fiscal years 1895–1899.*

[The import prices of merchandise here given represent "the actual market value or wholesale price of such merchandise as bought and sold in usual wholesale quantities, at the time of exportation to the United States, in the principal markets of the country from whence imported, and in the condition in which such merchandise is there bought and sold for exportation to the United States, or consigned to the United States for sale, including the value of all cartons, cases, crates, boxes, sacks, and coverings of any kind, and all costs, charges, and expenses incident to placing the merchandise in condition, packed ready for shipment to the United States." (Act of June 10, 1890.)

The export prices are the actual market values in the port of shipment.]

| Articles imported. | Years ended June 30— | | | | |
|---|---|---|---|---|---|
| | 1895. | 1896. | 1897. | 1898. | 1899. |
| ANIMAL MATTER. | | | | | |
| Cattle, free of duty ........head.. | $6.63 | $20.56 | $119.41 | $132.81 | $152.81 |
| Cattle, dutiable ........do.... | 4.95 | 6.89 | 7.80 | 9.75 | 11.17 |
| Total cattle ........do.... | 5.11 | 6.93 | 7.87 | 9.99 | 11.62 |
| Horses, free of duty ........do.... | 330.17 | 196.34 | 138.85 | 181.82 | 277.65 |
| Horses, dutiable ........do.... | 53.88 | 50.72 | 58.38 | 117.92 | 129.01 |
| Total horses ........do.... | 80.56 | 66.32 | 66.42 | 134.49 | 181.15 |
| Sheep, free of duty ........do.... | 15.90 | 10.85 | 13.70 | 14.05 | 19.25 |
| Sheep, dutiable ........do.... | 2.25 | 2.54 | 2.45 | 2.73 | 3.36 |
| Total sheep ........do.... | 2.34 | 2.65 | 2.51 | 2.82 | 3.47 |
| Beeswax ........pound.. | .274 | .278 | .249 | .266 | .243 |
| Bristles, crude, not sorted, bunched or prepared ........pound.. | .399 | 2.23 | .611 | .346 | .579 |
| Bristles, sorted, bunched, or prepared ......do.... | .958 | .912 | .903 | .814 | .788 |
| Total bristles ........do.... | .956 | .913 | .903 | .814 | .785 |
| Butter ........do.... | .179 | .164 | .160 | .171 | .167 |
| Cheese ........do.... | .141 | .139 | .135 | .134 | .132 |
| Eggs ........dozen.. | .120 | .094 | .082 | .049 | .095 |
| Silk: | | | | | |
| Cocoons ........pound.. | .434 | .405 | ........ | .381 | .169 |
| Raw, or as reeled from the cocoon......do.... | 2.76 | 3.28 | 2.84 | 3.05 | 3.28 |
| Waste ........do.... | .449 | .372 | .285 | .374 | .421 |
| Total silk ........do.... | 2.43 | 2.86 | 2.37 | 2.66 | 2.89 |
| Wool, class 1, clothing: | | | | | |
| In the grease ........pound.. | ........ | ........ | .158 | .170 | .150 |
| Scoured ........do.... | ........ | ........ | .265 | .280 | .155 |
| Total wool, class 1 ........do.... | .153 | .166 | .171 | .175 | .150 |
| Wool, class 2, combing: | | | | | |
| In the grease ........do.... | ........ | ........ | .189 | .199 | .272 |
| Scoured ........do.... | ........ | ........ | .211 | .210 | .165 |
| Total wool, class 2 ........do.... | .196 | .223 | .189 | .199 | .272 |
| Wool, class 3, carpet: | | | | | |
| In the grease ........do.... | ........ | ........ | .105 | .096 | .094 |
| Scoured ........do.... | ........ | ........ | .118 | .088 | .097 |
| Total wool, class 3 ........do.... | .091 | .097 | .105 | .096 | .094 |
| Total wools ........do.... | .124 | .141 | .152 | .126 | .108 |
| Glue ........do.... | .088 | .089 | .096 | .104 | .089 |
| Hides and skins, other than furs: | | | | | |
| Goatskins ........do.... | .202 | .220 | .227 | .243 | .265 |
| Hides of cattle ........do.... | .088 | .124 | .106 | .108 | .104 |
| Other ........do.... | | | | .140 | .148 |
| Total hides and skins ........do.... | .115 | .145 | .135 | .151 | .157 |
| Honey ........gallon.. | .341 | .383 | .415 | .395 | .409 |
| Sausage, Bologna ........pound.. | ........ | .225 | .233 | ........ | ........ |
| Oils, animal, n.e.s., except whale and fish .gallon.. | .320 | .327 | .158 | .404 | .173 |
| Stearin ........pound.. | ........ | .071 | ........ | ........ | .014 |
| VEGETABLE MATTER. | | | | | |
| Argols, or wine lees ........pound.. | .068 | .096 | .084 | .083 | .082 |
| Barley ........bushel.. | .410 | .379 | .310 | .351 | .486 |
| Corn (maize) ........do.... | .456 | .433 | .329 | .433 | .388 |
| Oats ........do.... | .262 | .274 | .260 | .370 | .385 |
| Oatmeal ........pound.. | .056 | .057 | .021 | .055 | .059 |
| Rye ........bushel.. | .486 | 1.89 | 2.36 | .404 | 2.44 |
| Wheat ........do.... | .608 | .657 | .767 | .952 | 7.52 |
| Wheat flour ........barrel.. | 4.44 | 4.91 | 4.41 | 4.46 | 4.48 |
| Chocolate, other than confectionery and sweetened chocolate ........pound.. | .195 | .173 | .163 | .151 | 1.79 |
| Cocoa, or cacao, crude, and leaves and shells of, pound ........ | .109 | .103 | .095 | .136 | .143 |
| Cocoa, or cacao, prepared or manufactured, pound ........ | .337 | .330 | .297 | .357 | .319 |
| Total cocoa, or cacao ........pound.. | .120 | .114 | .105 | .143 | .147 |
| Coffee ........do.... | .147 | .146 | .111 | .075 | .066 |

*Average import price of agricultural products imported into the United States during each of the five fiscal years 1895–1899*—Continued.

| Articles imported. | Years ended June 30— 1895. | 1896. | 1897. | 1898. | 1899. |
|---|---|---|---|---|---|
| VEGETABLE MATTER—continued. | | | | | |
| Chicory root, raw, unground ............pound.. | $0.017 | $0.013 | $0.014 | $0.016 | $0.015 |
| Chicory root, roasted, ground, or otherwise prepared ............pound.. | .033 | .033 | .035 | ............ | .033 |
| Total chicory root ............do.... | .017 | .014 | .014 | .016 | .027 |
| Coffee substitutes, n. e. s............do.... | .039 | .038 | .037 | .034 | .037 |
| Total coffee substitutes ............do.... | .022 | .017 | .017 | .030 | .033 |
| Cotton............do.... | .096 | .119 | .113 | .095 | .100 |
| Flax, and tow of ............ton.. | 201.43 | 179.21 | 168.01 | 215.88 | 201.81 |
| Flax, hackled, etc ............do.... | 472.16 | 488.62 | 375.01 | | |
| Hemp, and tow of............do.... | 122.22 | 125.26 | 124.27 | 139.49 | 121.06 |
| Hemp, hackled, etc ............do.... | 164.46 | 243.05 | 273.71 | | |
| Istle, or Tampico fiber............do.... | 46.65 | 58.78 | 53.20 | 50.84 | 64.31 |
| Jute and jute butts ............do.... | 24.88 | 22.49 | 23.93 | 22.65 | 27.61 |
| Manila hemp............do.... | 80.76 | 76.30 | 73.68 | 64.44 | 116.77 |
| Sisal grass ............do.... | 57.64 | 65.47 | 60.61 | 74.58 | 128.12 |
| Fibers, vegetable, n. e. s............do.... | 52.79 | 41.13 | 66.32 | 62.22 | 68.74 |
| Fruit juices: | | | | | |
| Prune juice or prune wine ............gallon.. | .739 | .830 | .701 | .890 | .776 |
| Other, including cherry juice............do.... | ............ | ............ | ............ | .489 | .517 |
| Total fruit juices............do.... | ............ | ............ | ............ | .621 | .631 |
| Currants............pound.. | .016 | .017 | .020 | .033 | .026 |
| Dates............do.... | .021 | .020 | .024 | .027 | .025 |
| Figs ............do.... | .050 | .054 | .060 | .053 | .049 |
| Plums and prunes............do.... | .037 | .142 | .103 | .130 | .106 |
| Raisins............do.... | .041 | .043 | .045 | .058 | .057 |
| Almonds ............do.... | .103 | .098 | .091 | .115 | .123 |
| Ginger, preserved or pickled............do.... | ............ | ............ | ............ | ............ | .044 |
| Hay ............ton.. | 7.10 | 9.16 | 8.59 | 8.92 | 5.81 |
| Hops ............pound.. | .191 | .217 | .209 | .273 | .449 |
| Indigo............do.... | .509 | .501 | .482 | .586 | .543 |
| Malt, barley ............bushel.. | .677 | .856 | .847 | .925 | .892 |
| Malt liquors, bottled ............gallon.. | .953 | .970 | .978 | .948 | .999 |
| Malt liquors, unbottled ............do.... | .303 | .293 | .279 | .285 | .296 |
| Total malt liquors ............do.... | .510 | .507 | .526 | .479 | .523 |
| Oil cake............pound.. | .007 | .006 | .007 | .004 | .005 |
| Olive oil, salad ............gallon.. | 1.23 | 1.17 | 1.22 | 1.25 | 1.17 |
| Opium, crude or unmanufactured ......pound.. | 2.04 | 1.87 | 2.04 | 2.14 | 2.38 |
| Opium, prepared ............do.... | 6.58 | 7.44 | 7.21 | 6.51 | 6.67 |
| Total opium ............do.... | 3.31 | 3.06 | 2.70 | 4.10 | 3.22 |
| Rice............do.... | .017 | .016 | .019 | .022 | .020 |
| Rice flour, rice meal, and broken rice......do.... | .014 | .013 | .015 | .016 | .015 |
| Total rice and rice meal............do.... | .016 | .015 | .018 | .020 | .019 |
| Linseed, or flaxseed............bushel.. | 1.09 | 1.08 | 1.03 | 1.11 | 1.07 |
| Spices, unground: | | | | | |
| Nutmegs ............pound.. | .311 | .320 | .270 | .273 | .241 |
| Pepper, black or white............do.... | .039 | .039 | .047 | .065 | .088 |
| Other (free of duty)............do.... | .059 | .052 | .053 | .065 | .072 |
| Spices, ground (and other dutiable)......do.... | .132 | .113 | .111 | .100 | .099 |
| Total spices............do.... | .063 | .060 | .064 | .076 | .090 |
| Spirits, distilled: | | | | | |
| Of domestic manufacture, returned, proof gallon............ | .870 | .913 | .903 | .860 | .836 |
| Brandy............proof gallon.. | 2.60 | 2.66 | 2.70 | 2.87 | 2.85 |
| Other ............do.... | 1.09 | 1.16 | 1.20 | 1.30 | 1.37 |
| Total distilled spirits............do.... | 1.23 | 1.21 | 1.27 | 1.21 | 1.29 |
| Starch ............pound.. | .019 | .018 | .018 | .017 | .016 |
| Straw ............ton.. | 3.17 | 3.95 | 3.38 | 3.08 | 2.20 |
| Molasses ............gallon.. | .086 | .157 | .158 | .151 | .136 |
| Beet sugar not above No. 16 Dutch standard, pound............ | .020 | .023 | .018 | .019 | .021 |
| Sugar, other than beet, not above No. 16 Dutch standard............pound.. | .021 | .022 | .021 | .023 | .024 |
| Sugar above No. 16 Dutch standard ......do.... | .028 | .029 | .025 | .024 | .027 |
| Total sugar ............do.... | .021 | .023 | .020 | .022 | .024 |
| Tea ............do.... | .135 | .135 | .131 | .140 | .131 |
| Tobacco, leaf: | | | | | |
| Suitable for cigar wrappers ............do.... | 1.27 | 1.07 | .935 | .931 | 1.05 |
| Other (including stems)............do.... | .359 | .394 | .506 | .551 | .561 |
| Total leaf tobacco ............do.... | .553 | .501 | .694 | .715 | .705 |
| Vanilla beans ............do.... | 3.61 | 4.30 | 5.36 | 4.37 | 4.54 |
| Beans and peas............bushel.. | 1.01 | 1.07 | 1.01 | .912 | .899 |
| Cabbages ............number.. | ............ | .044 | .055 | ............ | ............ |
| Onions............bushel.. | ............ | ............ | 1.12 | .878 | .647 |
| Potatoes ............do.... | .450 | .728 | .591 | .404 | .555 |
| Vinegar............gallon.. | .264 | .303 | .270 | .261 | .252 |
| Champagne and other sparkling wines, dozen bottles............ | 14.77 | 14.73 | 14.64 | 14.58 | 13.98 |
| Still wines, bottled............dozen bottles.. | 4.82 | 4.86 | 4.77 | 4.88 | 4.90 |
| Still wines, unbottled............gallon.. | .697 | .688 | .680 | .721 | .698 |

*Average export price of agricultural products exported from the United States during each of the five fiscal years 1895–1899.*

| Articles exported. | Years ended June 30— | | | | |
|---|---|---|---|---|---|
| | 1895. | 1896. | 1897. | 1898. | 1899. |
| ANIMAL MATTER. | | | | | |
| Cattle ........ head | $92.26 | $92.79 | $92.70 | $86.12 | $78.35 |
| Hogs ........ do | 10.16 | 10.80 | 10.30 | 7.67 | 6.88 |
| Horses ........ do | 157.99 | 140.52 | 120.64 | 120.75 | 118.93 |
| Mules ........ do | 74.14 | 68.63 | 72.97 | 82.09 | 76.52 |
| Sheep ........ do | 6.48 | 6.26 | 6.27 | 6.08 | 5.96 |
| Beeswax ........ pound | .294 | .296 | .289 | .277 | .275 |
| Butter ........ do | .164 | .152 | .143 | .150 | .161 |
| Cheese ........ do | .091 | .084 | .091 | .086 | .087 |
| Eggs ........ dozen | .168 | .147 | .139 | .163 | .174 |
| Feathers, other than ostrich ........ pound | *a* .168 | .166 | .099 | ........ | ........ |
| Glue ........ do | .097 | .095 | .095 | .090 | .094 |
| Hides and skins, other than furs ........ do | .064 | .098 | .077 | .088 | .092 |
| Beef, canned ........ do | .089 | .088 | .086 | .088 | .091 |
| Beef, fresh ........ do | .088 | .084 | .078 | .084 | .083 |
| Beef, salted or pickled ........ do | .057 | .056 | .052 | .053 | .054 |
| Beef, other cured ........ do | .090 | .115 | .089 | .094 | .092 |
| Tallow ........ do | .050 | .044 | .037 | .038 | .041 |
| Bacon ........ do | .083 | .079 | .068 | .071 | .074 |
| Hams ........ do | .104 | .098 | .097 | .095 | .092 |
| Pork, fresh ........ do | .074 | .059 | .073 | .067 | .066 |
| Pork, salted or pickled ........ do | .071 | .057 | .049 | .056 | .058 |
| Lard ........ do | .078 | .066 | .051 | .056 | .059 |
| Mutton ........ do | .081 | .075 | .078 | .085 | .078 |
| Oleo-oil ........ do | .091 | .078 | .059 | .060 | .064 |
| Oleomargarin (imitation butter) ........ do | .098 | .097 | .097 | .089 | .092 |
| Lard oil ........ gallon | .549 | .511 | .437 | .395 | .450 |
| Other animal oils, except whale and fish ..do | .523 | .504 | .425 | .409 | .387 |
| Total animal oils, except whale and fish ..do | .544 | .510 | .435 | .397 | .440 |
| Silk waste ........ pound | .356 | .304 | .244 | .123 | .125 |
| Stearin ........ do | .059 | .051 | .051 | .047 | .048 |
| Wool ........ do | .113 | .123 | .118 | .149 | .141 |
| VEGETABLE MATTER. | | | | | |
| Barley ........ bushel | .491 | .404 | .382 | .493 | .607 |
| Bran, middlings, and mill feed ........ ton | ........ | ........ | ........ | 14.58 | 15.65 |
| Bread and biscuit ........ pound | .045 | .045 | .046 | .049 | .049 |
| Buckwheat ........ bushel | ........ | ........ | .405 | .430 | .552 |
| Corn (maize) ........ do | .529 | .378 | .306 | .355 | .396 |
| Corn meal ........ barrel | 2.90 | 2.36 | 1.90 | 2.13 | 2.24 |
| Oats ........ bushel | .352 | .260 | .249 | .298 | .323 |
| Oatmeal ........ pound | .028 | .024 | .023 | .021 | .022 |
| Rye ........ bushel | .566 | .450 | .428 | .568 | .585 |
| Rye flour ........ barrel | 3.20 | 2.96 | 2.87 | 3.46 | 3.11 |
| Wheat ........ bushel | .576 | .655 | .753 | .983 | .748 |
| Wheat flour ........ barrel | 3.38 | 3.56 | 3.84 | 4.51 | 3.95 |
| Cider ........ gallon | .128 | .128 | .122 | .129 | .131 |
| Cotton, sea-island ........ pound | .182 | .199 | .189 | .177 | .167 |
| Cotton, other than sea-island ........ do | .058 | .080 | .074 | .059 | .055 |
| Total cotton in bales ........ do | .058 | .081 | .074 | .060 | .056 |
| Waste cotton ........ do | ........ | ........ | ........ | .041 | .037 |
| Total cotton ........ do | .058 | .081 | .074 | .060 | .055 |
| Apples, dried ........ do | .065 | .050 | .044 | .061 | .065 |
| Apples, green or ripe ........ barrel | 2.39 | 2.58 | 1.58 | 2.78 | 3.18 |
| Prunes ........ pound | ........ | ........ | ........ | .064 | .068 |
| Raisins ........ do | ........ | ........ | ........ | .054 | .052 |
| Ginseng ........ do | 3.54 | 3.86 | 4.68 | 3.67 | 3.99 |
| Glucose, or grape sugar ........ do | .019 | .016 | .014 | .015 | .016 |
| Hay ........ ton | 14.84 | 14.80 | 13.71 | 14.07 | 13.23 |
| Hops ........ pound | .107 | .088 | .114 | .154 | .171 |
| Lard substitutes, n. e. s. (cottolene, lardine, etc.) pound | .076 | .060 | .053 | .052 | .054 |
| Malt ........ bushel | .681 | .635 | .612 | .707 | .715 |
| Malt liquors, bottled ........ dozen bottles | 1.15 | 1.20 | 1.16 | 1.22 | 1.21 |
| Malt liquors, unbottled ........ gallon | .256 | .240 | .223 | .226 | .257 |
| Corn oil cake ........ pound | ........ | ........ | ........ | .009 | .009 |
| Oil cake and oil-cake meal, cotton-seed ........ do | .009 | .009 | .009 | .009 | .009 |
| Oil cake and oil-cake meal, flaxseed, or linseed, pound | .012 | .011 | .009 | .010 | .011 |
| Total oil cake and oil-cake meal ........ pound | .010 | .010 | .009 | .009 | .009 |
| Corn oil ........ gallon | ........ | ........ | ........ | .218 | .239 |
| Cotton-seed oil ........ do | .322 | .282 | .254 | .252 | .239 |
| Linseed oil ........ do | .596 | .495 | .384 | .427 | .446 |
| Peppermint oil ........ pound | 2.22 | 2.05 | 1.58 | 1.24 | 1.01 |
| Rice ........ do | .038 | .010 | .038 | .043 | .045 |
| Rice bran, meal, and polish ........ do | .008 | .006 | .006 | .006 | .006 |
| Total rice and rice meal ........ do | .010 | .006 | .009 | .010 | .008 |
| Cotton seed ........ do | .008 | .007 | .006 | .006 | .006 |

*a* Exclusive of egret feathers.

*Average export price of agricultural products exported from the United States during each of the five fiscal years 1895–1899*—Continued.

| Articles exported. | Years ended June 30— | | | | |
|---|---|---|---|---|---|
| | 1895. | 1896. | 1897. | 1898. | 1899. |
| VEGETABLE MATTER—continued. | | | | | |
| Flaxseed, or linseed ........ bushel.. | $1.17 | $0.910 | $0.820 | $0.899 | $0.995 |
| Clover seed ........ pound.. | .093 | .079 | .077 | .061 | .063 |
| Timothy seed ........ do.... | .056 | .044 | .034 | .031 | .031 |
| Alcohol, including cologne spirits.. proof gallon.. | *a* .268 | *a* .257 | *a* .336 | .286 | .289 |
| Brandy ........ do.... | .942 | .978 | 1.07 | 1.59 | 1.40 |
| Rum ........ do.... | 1.29 | 1.36 | 1.36 | 1.39 | 1.38 |
| Bourbon whisky ........ do.... | 1.03 | 1.34 | .742 | .841 | 1.19 |
| Rye whisky ........ do.... | 1.97 | 1.70 | 1.80 | 1.78 | 1.57 |
| Distilled spirits, n. e. s ........ do.... | .389 | .450 | .451 | .818 | 1.25 |
| Total distilled spirits ........ do.... | .914 | .967 | .834 | .637 | .773 |
| Starch ........ pound.. | .031 | .028 | .021 | .019 | .021 |
| Molasses ........ gallon.. | ........ | ........ | ........ | .070 | .078 |
| Sirup ........ do.... | ........ | ........ | ........ | .105 | .146 |
| Total molasses and sirup ........ do.... | .093 | .106 | .088 | .093 | .121 |
| Sugar, brown ........ pound.. | .032 | .035 | .032 | .038 | .035 |
| Sugar, refined ........ do.... | .046 | .049 | .047 | .050 | .045 |
| Total sugar ........ do.... | .045 | .049 | .045 | .049 | .045 |
| Sugar meal ........ do.... | ........ | .017 | ........ | ........ | ........ |
| Tobacco, leaf ........ do.... | .087 | .085 | .080 | .087 | .092 |
| Tobacco, stems and trimmings ........ do.... | .025 | .021 | .022 | .023 | .026 |
| Total tobacco ........ do.... | .086 | .083 | .078 | .084 | .090 |
| Beans and peas ........ bushel.. | 1.77 | 1.33 | 1.23 | 1.28 | 1.44 |
| Onions ........ do.... | .876 | .738 | .817 | .907 | .814 |
| Potatoes ........ do.... | .730 | .546 | .556 | .761 | .777 |
| Vinegar ........ gallon.. | .141 | .138 | .123 | .119 | .126 |
| Wines, bottled ........ dozen bottles.. | 4.04 | 4.05 | 4.14 | 4.83 | 4.74 |
| Wines, unbottled ........ gallon.. | .485 | .434 | .453 | .420 | .417 |

*a* Including wood alcohol.

## SUGAR STATISTICS.

[From Section of Foreign Markets.]

*Quantity of sugar imported into the United States from the principal countries of supply during each fiscal year from 1895 to 1899, inclusive.*

| Countries from which imported. | Years ended June 30— | | | | | Annual average, 1895–1899. | |
|---|---|---|---|---|---|---|---|
| | 1895. | 1896. | 1897. | 1898. | 1899. | | |
| | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Per ct.* |
| Cuba ........ | 1,845,763,398 | 1,093,171,312 | 577,790,173 | 440,225,111 | 663,543,657 | 924,098,730 | 24.24 |
| Germany ........ | 311,182,968 | 525,991,657 | 1,604,233,071 | 175,275,440 | 667,127,773 | 656,762,182 | 17.23 |
| Dutch East Indies ........ | 280,464,270 | 567,670,780 | 634,171,629 | 621,731,462 | 986,438,330 | 618,095,294 | 16.21 |
| Hawaiian Islands ........ | 274,385,228 | 352,175,269 | 431,217,116 | 499,776,895 | 462,423,600 | 403,995,622 | 10.60 |
| British West Indies ........ | 193,498,237 | 217,421,118 | 322,103,866 | 231,401,746 | 267,565,738 | 246,398,141 | 6.46 |
| British Guiana | 110,848,960 | 146,433,256 | 175,639,179 | 139,145,529 | 138,152,464 | 142,043,878 | 3.73 |
| Brazil ........ | 180,262,039 | 191,457,878 | 140,773,692 | 139,426,285 | 41,222,162 | 138,628,411 | 3.64 |
| Santo Domingo | 66,492,169 | 116,972,841 | 131,279,582 | 94,336,444 | 112,213,037 | 104,258,815 | 2.74 |
| Egypt ........ | 23,250,815 | 100,335,317 | 124,055,211 | 52,354,144 | 141,940,690 | 88,387,236 | 2.32 |
| Puerto Rico ........ | 56,352,954 | 81,582,810 | 86,607,317 | 98,452,421 | 107,208,014 | 86,040,703 | 2.26 |
| Philippine Islands ........ | 68,770,492 | 145,075,344 | 72,463,577 | 29,489,600 | 51,625,280 | 73,484,859 | 1.93 |
| Belgium ........ | 24,338,139 | 72,721,186 | 130,423,987 | 1,366,370 | 30,000 | 45,775,937 | 1.20 |
| Austria-Hungary ........ | 7,411,234 | 40,703,929 | 105,138,128 | 2,788,767 | 69,397,343 | 45,087,880 | 1.18 |
| United Kingdom ........ | 40,610,295 | 56,992,162 | 68,250,019 | 21,106,706 | 16,685,790 | 40,728,995 | 1.07 |
| Netherlands ........ | 12,600,203 | 40,965,863 | 82,248,664 | 38,659,827 | 6,894,728 | 36,273,857 | .95 |
| France ........ | 35,832 | 34,810,370 | 92,169,241 | 17,781 | 66,007 | 25,419,846 | .67 |
| British Africa. | 3,776,030 | 26,564,115 | 25,895,460 | 12,081,142 | 55,075,128 | 24,678,375 | .65 |
| Dutch Guiana . | 8,794,544 | 12,299,609 | 18,043,833 | 25,636,341 | 38,124,370 | 20,579,739 | .54 |
| China ........ | 23,696,923 | 31,827,859 | 11,437,760 | 7,161,664 | 10,758,164 | 16,976,474 | .45 |
| Danish West Indies ........ | 9,131,589 | 12,202,619 | 16,999,347 | 14,832,991 | 22,711,543 | 15,175,618 | .40 |
| Argentina ........ | ........ | 6,341,221 | 46,940,759 | 12,428,502 | ........ | 13,142,096 | .34 |
| British East Indies ........ | 8,908,277 | 2,565,592 | 11,173,293 | 9,381,265 | 29,599,283 | 12,325,542 | .32 |
| Peru ........ | ........ | ........ | 2,863,350 | 8,544,857 | 50,080,303 | 12,207,702 | .32 |
| Hongkong ........ | 8,351,495 | 12,046,973 | 3,243,630 | 4,183,246 | 5,084,695 | 6,582,008 | .17 |

*Quantity of sugar imported into the United States from the principal countries of supply during each fiscal year from 1895 to 1899, inclusive*—Continued.

| Countries from which imported. | Year ended June 30— 1895. | 1896. | 1897. | 1898. | 1899. | Annual average, 1895-1899. | |
|---|---|---|---|---|---|---|---|
| | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Per ct.* |
| Russia, European | ------------ | ------------ | 815,702 | 242,575 | 14,800,295 | 3,171,714 | 0.08 |
| Mexico | 3,021,232 | 4,006,707 | -1,412,255 | 3,059,018 | 3,088,609 | 2,917,564 | .08 |
| Canada | 8,329,961 | 1,304,887 | 1,098,330 | 717,532 | 2,020,001 | 2,694,142 | .07 |
| Guatemala | 577,650 | ------------ | ------------ | 4,921,135 | 4,477,566 | 1,995,270 | .05 |
| Dutch West Indies | ------------ | 1,972,828 | 86,652 | 277,260 | 5,085,441 | 1,484,436 | .04 |
| Turkey, Asiatic | ------------ | ------------ | ------------ | ------------ | 3,361,397 | 672,279 | .02 |
| Salvador | ------------ | ------------ | ------------ | ------------ | 2,471,012 | 494,202 | .01 |
| Other countries | 3,655,520 | 725,055 | 330,910 | 898,795 | 978,149 | 1,317,686 | .03 |
| Total | 3,574,510,454 | 3,896,338,557 | 4,918,905,733 | 2,689,920,851 | 3,980,250,569 | 3,811,985,233 | 100.00 |

*Value of sugar imported into the United States from the principal countries of supply during each fiscal year from 1895 to 1899, inclusive.*

| Countries from which imported. | Years ended June 30— 1895. | 1896. | 1897. | 1898. | 1899. | Annual average, 1895-1899. | |
|---|---|---|---|---|---|---|---|
| | *Dollars.* | *Dollars.* | *Dollars.* | *Dollars.* | *Dollars.* | *Dollars.* | *Per ct.* |
| Cuba | 40,100,204 | 24,102,835 | 11,982,473 | 9,828,607 | 16,412,088 | 20,485,241 | 24.38 |
| Germany | 6,332,916 | 12,528,755 | 29,844,019 | 3,520,796 | 14,095,417 | 13,264,380 | 15.78 |
| Hawaiian Islands | 7,403,658 | 11,336,796 | 13,165,084 | 16,660,412 | 17,292,723 | 13,171,735 | 15.67 |
| Dutch East Indies | 5,759,436 | 11,388,487 | 13,090,323 | 11,250,181 | 19,817,646 | 12,261,215 | 14.59 |
| British West Indies | 3,989,614 | 4,700,527 | 5,893,877 | 4,552,454 | 6,049,479 | 5,037,190 | 5.99 |
| British Guiana | 2,517,726 | 3,414,368 | 3,657,025 | 3,045,666 | 3,461,889 | 3,219,335 | 3.83 |
| Brazil | 2,701,287 | 3,776,486 | 2,136,989 | 2,317,990 | 810,276 | 2,348,606 | 2.79 |
| Egypt | 596,277 | 2,657,425 | 2,616,423 | 1,230,071 | 3,570,343 | 2,134,108 | 2.54 |
| Santo Domingo | 1,188,951 | 2,459,302 | 2,059,169 | 2,030,239 | 2,659,456 | 2,079,423 | 2.47 |
| Puerto Rico | 994,084 | 1,707,318 | 1,577,911 | 1,913,742 | 2,495,849 | 1,737,781 | 2.07 |
| Philippine Islands | 1,111,006 | 2,270,902 | 1,199,202 | 381,279 | 969,323 | 1,186,342 | 1.41 |
| United Kingdom | 976,266 | 1,402,694 | 1,452,004 | 504,714 | 434,237 | 953,983 | 1.14 |
| Austria-Hungary | 178,472 | 958,402 | 1,957,027 | 67,831 | 1,485,037 | 929,354 | 1.11 |
| Belgium | 458,779 | 1,771,980 | 2,311,309 | 31,909 | 788 | 914,953 | 1.09 |
| Netherlands | 296,761 | 1,182,605 | 1,916,933 | 957,908 | 176,014 | 906,044 | 1.08 |
| Dutch Guiana | 195,589 | 289,243 | 380,959 | 585,326 | 953,047 | 480,833 | .57 |
| China | 668,287 | 920,301 | 313,803 | 176,751 | 296,574 | 475,143 | .57 |
| France | 1,412 | 859,359 | 1,421,317 | 480 | 2,506 | 457,015 | .54 |
| British Africa | 49,725 | 461,054 | 417,850 | 131,469 | 835,950 | 379,210 | .45 |
| Danish West Indies | 205,333 | 261,728 | 316,781 | 312,446 | 556,562 | 330,570 | .39 |
| Argentina | ------------ | 159,108 | 917,457 | 260,957 | ------------ | 267,504 | .32 |
| Peru | ------------ | ------------ | 56,969 | 148,599 | 921,430 | 225,400 | .27 |
| British East Indies | 94,957 | 32,839 | 174,531 | 134,838 | 566,297 | 200,692 | .24 |
| Hongkong | 236,292 | 353,610 | 87,465 | 107,295 | 141,767 | 185,286 | .22 |
| Canada | 289,060 | 92,692 | 74,191 | 32,589 | 139,023 | 125,511 | .15 |
| Russia, European | ------------ | ------------ | 14,927 | 5,736 | 340,815 | 72,296 | .09 |
| Guatemala | 6,618 | ------------ | ------------ | 212,637 | 118,262 | 67,503 | .08 |
| Mexico | 55,112 | 63,572 | 19,111 | 48,682 | 52,995 | 47,894 | .06 |
| Dutch West Indies | ------------ | 48,974 | 1,761 | 4,811 | 136,893 | 38,488 | .05 |
| Turkey, Asiatic | ------------ | ------------ | ------------ | ------------ | 85,226 | 17,045 | .02 |
| Salvador | ------------ | ------------ | ------------ | ------------ | 63,459 | 12,692 | .01 |
| Other countries | 55,014 | 18,411 | 9,291 | 16,334 | 22,749 | 24,360 | .03 |
| Total | 76,462,836 | 89,219,773 | 99,066,181 | 60,472,749 | 94,964,120 | 84,037,132 | 100.00 |

## TRANSPORTATION RATES.

*Grain; average rates, in cents per bushel, from St. Louis to New Orleans by river.*

[Compiled from reports of the St. Louis Merchants' Exchange; reprinted from Bulletin No. 15, Miscellaneous Series, Division of Statistics.]

| Year. | Grain in sacks per 100 pounds. | Per bushel. | | |
|---|---|---|---|---|
| | | Wheat in bulk. | Corn and rye. | |
| | | | High water. | Low water. |
| 1866 *a* | | | 9.05 | 10.93 |
| 1867 *a* | | | 11.09 | 14.83 |
| 1868 *a* | | | 6.23 | 9.84 |
| 1869 *a* | | | 6.32 | 8.42 |
| 1870 *a* | | | 9.23 | 13.66 |
| 1871 *a* | | | 6.71 | 16.29 |
| 1872 *a* | | | 9.79 | 19.04 |
| 1873 *a* | | | 6.15 | 9.67 |
| 1874 *a* | | | 4.95 | 8.09 |
| 1875 *a* | | | 4.87 | 10.01 |
| 1876 *a* | | | 5.02 | 11.30 |
| 1877 *a* | 20.04 | 8.11 | 7.63 | 8.59 |
| 1878 *a* | 17.36 | 7.19 | 4.96 | 8.93 |
| 1879 | 18 | 7.75 | 5 | 11 |
| 1880 | 19 | 8.25 | 7 | 9.50 |
| 1881 | 20 | 6 | 4 | 8 |
| 1882 | 20 | 6.42 | 5.50 | 7 |
| 1883 | 17.75 | 5.50 | 5 | 7 |
| 1884 | 14 | 6.63 | 5 | 7 |
| 1885 | 15 | 6.40 | 5 | 7 |
| 1886 | 16 | 6.50 | 5 | 7 |
| 1887 | 18.25 | 6 | 5 | 7 |
| 1888 | 15 | 6.50 | 5 | 7.50 |
| 1889 | 17.93 | 5.95 | 5 | 7 |
| 1890 | 15.66 | 6.58 | 5 | 7 |
| 1891 | 16.28 | 6.88 | 5 | 7.50 |
| 1892 | 16.87 | 6.50 | 5 | 7 |
| 1893 | 17.54 | 6.55 | | |
| 1894 | 17.14 | 5.89 | | |
| 1895 | 12.50 | 5.95 | | |
| 1896 | 14.55 | 5 | | |
| 1897 | 15 | 4.98 | | |
| 1898 | 10 | 4.50 | | |
| 1899 | 10 | 4.50 | | |

*a* Rates in currency reduced to their equivalents in gold.

*Miscellaneous commodities, New York to Chicago by rail.*

AVERAGE RATES FOR LESS THAN CARLOAD QUANTITIES, IN CENTS PER 100 POUNDS.

[From Bulletin No. 15, Miscellaneous Series, Division of Statistics.]

| Year. | Furniture. | Agricultural implements. | Lead. | Bagging. | Crockery and earthenware. | Coffee. | Starch. | Sugar. | Molasses. | Rice. | Soap, Castile and fancy. | Soap, Common. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1867 *a* | 137 | 137 | 60 | 117 | 117 | 117 | 117 | 60 | 60 | 60 | 117 | 93 |
| 1868 *a* | 122 | 122 | 56 | 103 | 103 | | 87 | | | 56 | 103 | 56 |
| 1869 *a* | 99 | 99 | 54 | 92 | | | 75 | | | 54 | 92 | 54 |
| 1870 *a* | 113 | 113 | 61 | 98 | | | 78 | | | | 98 | 60 |
| 1871 *a* | 81 | 81 | 39 | 71 | 49 | 36 | 58 | 36 | 46 | 46 | 71 | 46 |
| 1872 *a* | 105 | 105 | 43 | 93 | 81 | 43 | 72 | 43 | 55 | 51 | 93 | 55 |
| 1873 *a* | 69 | | 31 | 62 | 31 | 31 | 50 | 31 | 40 | 31 | 62 | 40 |
| 1874 *a* | 81 | | 37 | 74 | 37 | 37 | 62 | 37 | 49 | 37 | 74 | 49 |
| 1875 *a* | 53 | | 25 | 48 | 29 | 24 | 40 | 24 | 41 | 25 | 48 | 33 |
| 1876 *a* | 39 | | 20 | 37 | 20 | 20 | 32 | 20 | 23 | 20 | 37 | 23 |
| 1877 *a* | 72 | | 33 | 56 | 33 | 33 | 50 | 33 | 40 | 33 | 65 | 40 |
| 1878 *a* | 77 | | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 62 | 41 |
| 1879 | 75 | | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 60 | 40 |
| 1880 | 75 | | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 60 | 40 |
| 1881 | 65 | | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 51 | 33 |
| 1882 | 56 | | 26 | 26 | 26 | 26 | 26 | 24 | 24 | 26 | 44 | 26 |
| 1883 | 75 | | 35 | 35 | 35 | 35 | 35 | 30 | 30 | 35 | 60 | 35 |
| 1884 | 75 | | 35 | 35 | 35 | 35 | 35 | 25 | 25 | 35 | 60 | 35 |
| 1885 | 56 | | 27 | 27 | 27 | 27 | 27 | 20 | 20 | 27 | 45 | 27 |
| 1886 | 75 | | 35 | 35 | 35 | 35 | 35 | 25 | 25 | 35 | 60 | 35 |
| 1887 | 75 | | 35 | 46 | 35 | 35 | 35 | 33 | 33 | 35 | 64 | 35 |
| 1888 | 73 | 49 | 35 | 49 | 35 | 35 | 35 | 35 | 35 | 35 | 63 | 35 |
| 1889 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 65 | 35 |
| 1890 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 65 | 35 |
| 1891 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 49 | 35 |
| 1892 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1893 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1894 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1895 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1896 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1897 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1898 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 1899 | 75 | 50 | 35 | 50 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |

*a* Rates in currency reduced to their equivalents in gold.

*Miscellaneous commodities, New York to Chicago by rail*—Continued.

AVERAGE RATES FOR CARLOADS, IN CENTS PER 100 POUNDS.

| Year. | Furniture. | Agricultural implements. | Lead. | Bagging. | Crockery and earthenware. | Coffee. | Starch. | Sugar. | Molasses. | Rice | Soap. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Castile and fancy. | Common. |
| 1867 *a* | 137 | 137 | 60 | 117 | 117 | 117 | 117 | 60 | 60 | 60 | 117 | 93 |
| 1868 *a* | 122 | 122 | 56 | 103 | 103 | ------ | 87 | ------ | ------ | 56 | 103 | 56 |
| 1869 *a* | 99 | 99 | 54 | 92 | ------ | ------ | 75 | ------ | ------ | 54 | 92 | 54 |
| 1870 *a* | 113 | 113 | 61 | 98 | ------ | ------ | 78 | ------ | ------ | ------ | 98 | 60 |
| 1871 *a* | 81 | 81 | 39 | 71 | 49 | 36 | 58 | 36 | 46 | 46 | 71 | 46 |
| 1872 *a* | 105 | 105 | 43 | 93 | 81 | 43 | 72 | 43 | 55 | 51 | 93 | 55 |
| 1873 *a* | 69 | 54 | 31 | 62 | 31 | 31 | 50 | 31 | 40 | 31 | 62 | 40 |
| 1874 *a* | 81 | 49 | 37 | 74 | 37 | 37 | 62 | 37 | 49 | 37 | 74 | 49 |
| 1875 *a* | 53 | 33 | 25 | 48 | 29 | 24 | 40 | 24 | 41 | 25 | 48 | 33 |
| 1876 *a* | 39 | 23 | 20 | 37 | 20 | 20 | 32 | 20 | 23 | 20 | 37 | 23 |
| 1877 *a* | 72 | 39 | 33 | 56 | 33 | 33 | 50 | 33 | 40 | 33 | 65 | 40 |
| 1878 *a* | 77 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 62 | 41 |
| 1879 | 75 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 60 | 40 |
| 1880 | 75 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 60 | 40 |
| 1881 | 65 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 51 | 33 |
| 1882 | 56 | 26 | 26 | 26 | 26 | 26 | 26 | 24 | 24 | 26 | 44 | 26 |
| 1883 | 75 | 36 | 35 | 35 | 35 | 35 | 35 | 30 | 30 | 35 | 60 | 35 |
| 1884 | 75 | 36 | 35 | 35 | 35 | 35 | 35 | 25 | 25 | 35 | 60 | 35 |
| 1885 | 56 | 27 | 27 | 27 | 27 | 27 | 27 | 20 | 20 | 27 | 45 | 27 |
| 1886 | 75 | 35 | 35 | 35 | 35 | 35 | 35 | 25 | 25 | 35 | 60 | 35 |
| 1887 | 67 | 31 | 27 | 35 | 31 | 27 | 27 | 25 | 29 | 35 | 64 | 31 |
| 1888 | 63 | 30 | 25 | 35 | 30 | 25 | 25 | 25 | 30 | 25 | 63 | 30 |
| 1889 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 25 | 30 | 25 | 65 | 30 |
| 1890 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 25 | 30 | 25 | 65 | 30 |
| 1891 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 25 | 30 | 25 | 44 | 26 |
| 1892 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1893 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1894 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1895 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1896 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1897 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1898 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |
| 1899 | 65 | 30 | 25 | 35 | 30 | 25 | 25 | 24 | 30 | 25 | 25 | 25 |

*a* Rates in currency reduced to their equivalents in gold.

*Miscellaneous commodities, New York to Chicago by rail*—Continued.

AVERAGE RATES, REGARDLESS OF QUANTITY SHIPPED, IN CENTS PER 100 POUNDS.

| Year. | Dry goods. | Cotton piece goods. | Boots and shoes. | Tea. | Drugs. |
|---|---|---|---|---|---|
| 1867 a | 137 | 137 | 137 | 137 | 137 |
| 1868 a | 122 | 122 | 122 | 122 | 122 |
| 1869 a | 99 | 99 | 99 | 99 | 99 |
| 1870 a | 113 | 113 | 113 | 113 | 113 |
| 1871 a | 81 | 81 | 81 | 81 | 81 |
| 1872 a | 105 | 105 | 105 | 105 | 105 |
| 1873 a | 69 | 69 | 69 | 69 | 69 |
| 1874 a | 81 | 81 | 81 | 81 | 81 |
| 1875 a | 53 | 53 | 53 | 53 | 53 |
| 1876 a | 39 | 39 | 39 | 39 | 39 |
| 1877 a | 72 | 72 | 72 | 72 | 72 |
| 1878 a | 77 | 77 | 77 | 77 | 77 |
| 1879 | 75 | 75 | 75 | 75 | 75 |
| 1880 | 75 | 75 | 75 | 75 | 75 |
| 1881 | 65 | 65 | 65 | 65 | 65 |
| 1882 | 56 | 56 | 56 | 56 | 56 |
| 1883 | 75 | 75 | 75 | 75 | 75 |
| 1884 | 75 | 75 | 75 | 75 | 75 |
| 1885 | 56 | 56 | 56 | 56 | 56 |
| 1886 | 75 | 66 | 75 | 75 | 75 |
| 1887 | 75 | 50 | 75 | 75 | 75 |
| 1888 | 73 | 49 | 73 | 73 | 73 |
| 1889 | 75 | 50 | 75 | 75 | 75 |
| 1890 | 75 | 50 | 75 | 75 | 75 |
| 1891 | 75 | 50 | 75 | 75 | 75 |
| 1892 | 75 | 50 | 75 | 75 | 75 |
| 1893 | 75 | 50 | 75 | 75 | 75 |
| 1894 | 75 | 50 | 75 | 75 | 75 |
| 1895 | 75 | 50 | 75 | 75 | 75 |
| 1896 | 75 | 50 | 75 | 75 | 75 |
| 1897 | 75 | 50 | 75 | 75 | 75 |
| 1898 | 75 | 50 | 75 | 75 | 75 |
| 1899 | 75 | 50 | 75 | 75 | 75 |

*a* Rates in currency reduced to their equivalents in gold.

*Live stock and dressed meats, Chicago to New York by rail.*

AVERAGE RATES, IN CENTS PER 100 POUNDS.

[From Bulletin No. 15, Miscellaneous Series, Division of Statistics.]

| Year. | Cattle. | Hogs. | Sheep. | Horses and mules. | Dressed beef. | Dressed hogs. | |
|---|---|---|---|---|---|---|---|
| | | | | | | Refrigerator cars. | Common cars. |
| 1872 *a* | | | | | 81 | | |
| 1873 *a* | | | | | 83 | | |
| 1874 *a* | | | | | 85 | | |
| 1875 *a* | | | | | 72 | | |
| 1876 *a* | | | | | 62 | | |
| 1877 *a* | | | | | 72 | | |
| 1878 *a* | | | | | 79 | | |
| 1879 | 47 | 45 | 61 | 60 | 82 | | |
| 1880 | 55 | 43 | 65 | 60 | 88 | | |
| 1881 | 35 | 31 | 61 | 60 | 56 | | |
| 1882 | 36 | 29 | 53 | 60 | 57 | | |
| 1883 | 40 | 32 | 50 | 60 | 64 | | |
| 1884 | 31 | 28 | 44 | 60 | 51 | | |
| 1885 | 31 | 26 | 43 | 60 | 54 | | |
| 1886 | 33 | 30 | 42 | 60 | 61 | 53 | 48 |
| 1887 | 33 | 32 | 40 | 60 | 62 | 59 | 54 |
| 1888 | 22 | 26 | 31 | 60 | 46 | 46 | 44 |
| 1889 | 25 | 30 | 30 | 60 | 47 | 47 | 45 |
| 1890 | 23 | 28 | 30 | 60 | 39 | 39 | 39 |
| 1891 | 27 | 30 | 30 | 60 | 45 | 45 | 45 |
| 1892 | 28 | 28 | 30 | 60 | 45 | 45 | 45 |
| 1893 | 28 | 20 | 30 | 60 | 45 | 45 | 45 |
| 1894 | 28 | 30 | 30 | 60 | 45 | 45 | 45 |
| 1895 | 28 | 30 | 30 | 60 | 45 | 45 | 45 |
| 1896 | 28 | 30 | 30 | 60 | 45 | 45 | 45 |
| 1897 | 28 | 30 | 30 | 60 | 45 | 45 | 45 |
| 1898 | 28 | 30 | 30 | 60 | 45 | 45 | 45 |
| 1899 | *b* 25 | 25 | 25 | 60 | 40 | 40 | 40 |

*a* Rates in currency reduced to their equivalents in gold.
*b* Rates did not go into effect until February 1, 1899. Until that time the 1898 rates governed.

*Meats packed, Cincinnati to New York by rail.*

AVERAGE RATES, IN CENTS PER 100 POUNDS.

[Compiled from reports of Cincinnati Chamber of Commerce.]

[From Bulletin No.15, Miscellaneous Series, Division of Statistics.]

| Year. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | The year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1868 *a* | 56.3 | 53.0 | 53.8 | 45.4 | 43.0 | 42.8 | 42.0 | 41.2 | 46.1 | 51.8 | 55.8 | 55.5 | 48.80 |
| 1869 *a* | 55.3 | 49.3 | 41.9 | 37.6 | 35.9 | 36.2 | 36.7 | 37.3 | 40.2 | 42.2 | 46.6 | 46.9 | 42.11 |
| 1870 *a* | 49.5 | 41.8 | 44.4 | 44.2 | 43.6 | 40.0 | 38.5 | 38.2 | 43.6 | 44.3 | 45.8 | 49.7 | 43.59 |
| 1871 *a* | 49.7 | 49.3 | 45.6 | 40.7 | 40.4 | 36.8 | 37.8 | 40.0 | 40.2 | 46.3 | 53.8 | 54.9 | 44.59 |
| 1872 *a* | 55.0 | 54.4 | 54.5 | 49.5 | 48.4 | 46.4 | 39.4 | 39.3 | 45.5 | 50.7 | 53.1 | 53.5 | 49.07 |
| 1873 *a* | 53.2 | 52.6 | 51.9 | 50.9 | 48.8 | 42.9 | 43.2 | 41.6 | 40.8 | 43.6 | 43.7 | 44.3 | 46.51 |
| 1874 *a* | 44.9 | 43.9 | 40.1 | 30.9 | 32.3 | 35.9 | 36.4 | 36.5 | 36.5 | 35.2 | 33.4 | 31.8 | 36.48 |
| 1875 *a* | 29.3 | 28.8 | 28.6 | 28.7 | 28.5 | 21.4 | 21.8 | 22.0 | 21.6 | 25.3 | 28.8 | 32.9 | 26.47 |
| 1876 *a* | 37.2 | 37.0 | 35.4 | 29.9 | 22.2 | 22.2 | 22.3 | 22.5 | 22.7 | 22.8 | 22.9 | 24.8 | 26.91 |
| 1877 *a* | 32.7 | 35.4 | 31.5 | 27.7 | 27.1 | 30.7 | 31.3 | 27.6 | 28.1 | 29.5 | 32.1 | 32.1 | 30.47 |
| 1878 *a* | 32.3 | 32.4 | 27.9 | 24.9 | 23.8 | 20.8 | 20.6 | 24.4 | 28.6 | 28.9 | 29.6 | 33.0 | 27.26 |
| 1879 | 33.0 | 30.4 | 26.2 | 21.0 | 21.0 | 18.3 | 21.5 | 26.6 | 30.5 | 33.3 | 37.9 | 39.0 | 28.19 |
| 1880 | 39.0 | 39.0 | 39.0 | 34.5 | 30.5 | 30.5 | 30.5 | 30.5 | 30.5 | 30.5 | 31.5 | 35.0 | 33.41 |
| 1881 | 35.0 | 35.0 | 35.0 | 30.5 | 30.5 | 25.7 | 21.5 | 21.5 | 21.5 | 21.5 | 21.5 | 21.5 | 26.73 |
| 1882 | ...... | 21.5 | 24.3 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 30.5 | 25.85 |
| 1883 | 30.5 | 30.5 | 30.5 | 29.2 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.7 | 30.5 | 27.83 |
| 1884 | 30.5 | 30.5 | 23.3 | 17.5 | 17.5 | 18.4 | 23.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 24.22 |
| 1885 | 24.4 | 21.5 | 20.0 | 20.6 | 18.5 | 17.5 | 17.5 | 21.5 | 21.5 | 21.5 | 22.8 | 26.0 | 21.10 |
| 1886 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 27.7 | 26.14 |
| 1887 | 30.5 | 30.5 | 30.5 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 27.12 |
| 1888 | 28.0 | 28.5 | 26.3 | 26.0 | 26.0 | 26.0 | 19.9 | 17.3 | 15.5 | 18.8 | 21.5 | 23.6 | 23.11 |
| 1889 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.00 |
| 1890 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 24.8 | 20.0 | 20.0 | 20.0 | 20.0 | 23.89 |
| 1891 | 20.0 | 24.3 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 25.36 |
| 1892 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 25.7 | 21.5 | 21.5 | 21.5 | 21.5 | 21.5 | 21.5 | 23.70 |
| 1893 | 21.5 | 23.7 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 25.43 |
| 1894 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.00 |
| 1895 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.00 |
| 1896 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.00 |
| 1897 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.00 |
| 1898 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.00 |
| 1899 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 21.5 | 21.5 | 21.5 | 24.83 |

*a* Rates in currency reduced to their equivalents in gold; average currency values of gold for specific months used in making reductions.

*Grain, Chicago to New York.*

AVERAGE RATES, IN CENTS PER BUSHEL.

[From Bulletin No. 15, Miscellaneous Series, Division of Statistics.]

| Year. | Wheat. | | | | Corn. | |
|---|---|---|---|---|---|---|
| | Via lake and rail. | | Via all rail. | | Via lake and rail. | Via all rail. |
| | As reported by New York Produce Exchange. | As reported by Chicago Board of Trade. | As reported by New York Produce Exchange. | As reported by Chicago Board of Trade. | As reported by Chicago Board of Trade. | As reported by Chicago Board of Trade. |
| 1870 *a* | 19.15 | 19.58 | 28.98 | 26.11 | 19.32 | 24.37 |
| 1871 *a* | 22.38 | 22.76 | 27.75 | 28.47 | 21.24 | 26.57 |
| 1872 *a* | 24.91 | 26.25 | 29.80 | 31.13 | 23.67 | 29.06 |
| 1873 *a* | 23.64 | 21.63 | 29.17 | 27.26 | 20.19 | 25.42 |
| 1874 *a* | 15.20 | 15.37 | 25.81 | 23.61 | 12.48 | 22.03 |
| 1875 *a* | 12.71 | 12.09 | 20.97 | 20.89 | 11.34 | 19.50 |
| 1876 *a* | 10.58 | 10.19 | 14.80 | 15.12 | 9.68 | 14.12 |
| 1877 *a* | 15.08 | 14.75 | 19.37 | 19.56 | 13.42 | 18.03 |
| 1878 *a* | 11.31 | 11.99 | 17.56 | 17.56 | 10.45 | 16.39 |
| 1879 | 13.30 | 13.13 | 17.30 | 17.74 | 12.20 | 14.56 |
| 1880 | 15.70 | 15.80 | 19.90 | 19.80 | 14.43 | 17.48 |
| 1881 | 10.40 | 10.49 | 14.40 | 14.40 | 9.42 | 13.40 |
| 1882 | 10.90 | 10.91 | 14.60 | 14.47 | 10.28 | 13.50 |
| 1883 | 11.50 | 11.63 | 16.50 | 16.20 | 11.00 | 15.12 |
| 1884 | 9.95 | 10.00 | 13.12 | 13.20 | 8.50 | 12.32 |
| 1885 | 9.02 | 9.02 | 14.00 | 13.20 | 8.01 | 12.32 |
| 1886 | 12.00 | 12.00 | 16.50 | 15.00 | 11.20 | 14.00 |
| 1887 | 12.00 | 12.00 | *b* 15.74 | 15.75 | 11.20 | 14.70 |
| 1888 | 11.00 | 11.14 | *b* 14.50 | 14.50 | 10.26 | 13.54 |
| 1889 | *b* 8.70 | 8.97 | 15.00 | 15.00 | 8.19 | 12.60 |
| 1890 | 8.50 | 8.52 | 14.31 | 14.30 | 7.32 | 11.36 |
| 1891 | 8.53 | 8.57 | 15.00 | 15.00 | 7.53 | 14.60 |
| 1892 | 7.55 | 7.59 | 14.23 | 13.80 | 7.21 | 12.96 |
| 1893 | 8.44 | 8.48 | 14.70 | 14.63 | 7.97 | 13.65 |
| 1894 | 7.00 | 7.00 | 12.88 | 13.20 | 6.50 | 12.32 |
| 1895 | 6.95 | 6.96 | 12.17 | 11.89 | 6.40 | 10.29 |
| 1896 | 7.32 | 6.61 | 12.00 | 12.00 | 6.15 | 10.50 |
| 1897 | 7.37 | 7.42 | 12.32 | 12.50 | 6.92 | 11.43 |
| 1898 | *c* 9.50 | 4.91 | 11.55 | 12.00 | 4.41 | 9.80 |
| 1899 | 6.63 | 6.63 | 11.13 | 11.60 | 5.83 | 10.08 |

*a* Rates in currency reduced to their equivalents in gold.

*b* Averages based upon officially published tariffs; actual rate lower.

*c* Averages based upon officially published tariffs; actual rate lower. The lake and rail rate for 1898 actually averaged about 4.96 cents.

*Average freight rates, in cents per ton per mile.*

[From Bulletin No. 15, Miscellaneous Series, Division of Statistics.]

| Year. | Fitchburg R. R. | Boston and Albany R. R. | New York Central and Hudson River R. R. | Erie R. R. | Lake Shore and Michigan Southern Rwy. | Pennsylvania R. R. | Pittsburg, Fort Wayne and Chicago Rwy. | Chesapeake and Ohio Rwy. | Illinois Central R. R. | Chicago, Rock Island and Pacific Rwy. | Chicago, Milwaukee and St. Paul Rwy. | Chicago and Alton R. R. | Union Pacific Rwy. | Louisville and Nashville R. R. | All railways in the United States. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1870*a* | 3.635 | 1.851 | 1.590 | 1.125 | 1.269 | 1.268 | 1.229 | 4.101 | 1.953 | 2.316 | 2.380 | 1.963 | 3.596 | 2.513 | 1.889 |
| 1871*a* | ...... | 1.869 | 1.457 | 1.282 | 1.244 | 1.211 | 1.276 | 4.445 | 2.077 | 2.369 | 2.289 | 1.968 | 2.419 | 2.298 | 1.789 |
| 1872*a* | 3.504 | 1.800 | 1.422 | 1.362 | 1.227 | 1.304 | 1.264 | 3.643 | 1.923 | 2.229 | 2.177 | 1.789 | 2.390 | 2.053 | 1.846 |
| 1873*a* | 3.289 | 1.707 | 1.571 | 1.267 | 1.164 | 1.258 | 1.220 | 1.909 | 1.916 | 2.002 | 2.173 | 1.864 | 2.153 | 1.930 | 1.613 |
| 1874*a* | 3.903 | 1.641 | 1.319 | 1.184 | 1.065 | 1.164 | 1.134 | 1.354 | 1.881 | 1.871 | 2.137 | 1.916 | 1.949 | 1.940 | 1.520 |
| 1875*a* | 3.624 | 1.346 | 1.119 | 1.061 | .887 | .989 | .970 | 1.299 | 1.692 | 1.688 | 1.833 | 1.649 | 2.164 | 1.687 | 1.421 |
| 1876*a* | 2.218 | 1.139 | .929 | .972 | .722 | .841 | .827 | 1.061 | 1.587 | 1.693 | 1.798 | 1.438 | 2.211 | 1.638 | 1.217 |
| 1877*a* | 1.955 | 1.136 | .954 | .898 | .813 | .954 | 1.024 | 1.035 | 1.719 | 1.563 | 1.949 | 1.361 | 2.135 | 1.382 | 1.286 |
| 1878*a* | 1.582 | 1.113 | .919 | .960 | .724 | .914 | .867 | .985 | 1.616 | 1,539 | 1.762 | 1.254 | 2.236 | 1.635 | 1.296 |
| 1879 | 1.299 | 1.100 | .793 | .779 | .641 | .823 | .754 | .860 | 1.523 | 1.429 | 1.704 | 1.054 | 1.991 | 1.528 | 1.153 |
| 1880 | 1.36 | 1.207 | .879 | .836 | .750 | .918 | ...... | .866 | 1.543 | 1.209 | 1.749 | 1.206 | ...... | 1.594 | 1.232 |
| 1881 | 1.26 | 1.038 | .783 | .805 | .617 | .857 | .745 | .892 | 1.522 | 1.220 | 1.702 | 1.241 | 2.178 | 1.503 | 1.188 |
| 1882 | 1.17 | 1.064 | .738 | .749 | .628 | .874 | .752 | .753 | 1.417 | 1.281 | 1.481 | 1.253 | 2.102 | 1.349 | 1.102 |
| 1883 | 1.19 | 1.197 | .915 | .786 | .728 | .881 | .787 | .722 | 1.433 | 1.170 | 1.391 | 1.128 | 1.913 | 1.323 | 1.205 |
| 1884 | 1.09 | 1.093 | .834 | .719 | .652 | .804 | .673 | .672 | 1.368 | 1.097 | 1.293 | 1.008 | 1.557 | 1.344 | 1.136 |
| 1885 | 1.06 | .944 | .688 | .656 | .553 | .695 | .577 | .550 | 1.307 | 1.043 | 1.278 | 1.009 | 1.420 | 1.159 | 1.011 |
| 1886 | 1.07 | 1.101 | .765 | .659 | .639 | .755 | .692 | .541 | 1.157 | 1.071 | 1.168 | .961 | 1.266 | 1.079 | .999 |
| 1887 | 1.13 | 1.107 | .782 | .687 | .670 | .730 | .717 | .537 | 1.087 | 1.012 | 1.089 | .946 | 1.213 | 1.075 | .984 |
| 1888 | 1.116 | 1.099 | .753 | .716 | .861 | .723 | .660 | .541 | 1.068 | .964 | 1.020 | .973 | 1.170 | 1.049 | 1.001 |
| 1889 | 1.015 | 1.030 | .712 | .644 | .632 | .685 | .69 | .538 | .839 | .971 | 1.067 | .525 | 1.166 | .998 | .922 |
| 1890 | .995 | 1.105 | .730 | .665 | .644 | .661 | .69 | .561 | .942 | .995 | .995 | .898 | 1.138 | .972 | .941 |
| 1891 | .991 | 1.089 | .740 | .636 | .630 | .656 | .70 | .525 | .934 | 1.039 | 1.003 | .980 | 1.131 | .968 | .895 |
| 1892 | .925 | 1.057 | .699 | .614 | .602 | .647 | .67 | .518 | .908 | 1.055 | 1.026 | .973 | 1.080 | .948 | .898 |
| 1893 | .923 | 1.006 | .701 | .631 | .599 | .620 | .68 | .511 | .845 | 1.039 | 1.026 | .949 | 1.033 | .917 | .878 |
| 1894 | .895 | .944 | .733 | .621 | .587 | .606 | .65 | .478 | .839 | .989 | 1.037 | .974 | .970 | .876 | .860 |
| 1895 | .878 | .969 | .726 | .604 | .567 | .565 | .64 | .425 | .808 | 1.084 | 1.075 | .994 | .971 | .831 | .839 |
| 1896 | .864 | .942 | .668 | .606 | .551 | .563 | .66 | .425 | .745 | 1.017 | 1.003 | .925 | .957 | .806 | .806 |
| 1897 | .870 | 918 | .679 | .610 | .538 | .561 | .60 | .419 | .671 | .958 | 1.008 | .891 | .962 | .791 | .798 |
| 1898 | .844 | .839 | .606 | .575 | .530 | .521 | .57 | .369 | .695 | .966 | .972 | .866 | .950 | .743 | .753 |

*a* Rates in currency reduced to their equivalents in gold.

*Average rates, in cents per passenger per mile.*

[From Bulletin No. 15, Miscellaneous Series, Division of Statistics.]

| Year. | Fitchburg R. R. | Boston and Albany R. R. | New York Central and Hudson River R. R. | Erie R. R. | Lake Shore and Michigan Southern Rwy. | Pennsylvania R. R. | Pittsburg, Fort Wayne and Chicago Rwy. | Chesapeake and Ohio Rwy. | Illinois Central R. R. | Chicago, Rock Island and Pacific Rwy. | Chicago, Milwaukee and St. Paul Rwy. | Chicago and Alton R. R. | Union Pacific Rwy. | Louisville and Nashville R. R. | All railways in the United States. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1870 *a* | 1.945 | 2.343 | 1.770 | 2.470 | 2.204 | 2.167 | 2.282 | 3.979 | 3.290 | 3.426 | 3.273 | ...... | 4.301 | 3.194 | 2.392 |
| 1871 *a* | 2.010 | 2.517 | 1.920 | 2.396 | 2.503 | 2.322 | ...... | 4.037 | 3.358 | 3.435 | 3.322 | ...... | 3.775 | 3.340 | 2.632 |
| 1872 *a* | 1.923 | 2.275 | 1.863 | 1.904 | 2.321 | 2.379 | ...... | 3.992 | 3.034 | 3.229 | 3.404 | ...... | 3.730 | 3.240 | 2.521 |
| 1873 *a* | 1.820 | 2.176 | 1.799 | 1.927 | 2.221 | 2.317 | ...... | 3.686 | 3.097 | 3.131 | 3.099 | ...... | 3.541 | 3.102 | 2.486 |
| 1874 *a* | 1.984 | 2.229 | 1.929 | 2.088 | 2.214 | 2.349 | 2.301 | 3.542 | 2.966 | 3.063 | 2.995 | 2.949 | 3.394 | 3.412 | 2.544 |
| 1875 *a* | 1.910 | 2.180 | 1.885 | 1.955 | 2.088 | 2.259 | 2.407 | 3.231 | 2.882 | 2.687 | 2.690 | 2.755 | 2.878 | 3.219 | 2.378 |
| 1876 *a* | 1.864 | 2.099 | 1.693 | 1.859 | 1.846 | 1.819 | 1.830 | 3.322 | 2.804 | 2.626 | 2.805 | 2.614 | 2.974 | 3.018 | 2.183 |
| 1877 *a* | 1.947 | 2.174 | 1.953 | 1.772 | 2.182 | 2.185 | 2.192 | 3.786 | 2.942 | 2.772 | 2.994 | 2.798 | 3.140 | 3.167 | 2.458 |
| 1878 *a* | 1.969 | 2.217 | 1.978 | 2.158 | 2.255 | 2.277 | 2.258 | 3.738 | 3.122 | 2.933 | 3.029 | 2.795 | 3.226 | 3.345 | 2.573 |
| 1879 | 1.888 | 2.137 | 2.044 | 2.090 | 2.221 | 2.253 | 2.228 | 3.630 | 3.066 | 2.971 | 2.908 | 2.417 | ...... | 3.444 | 2.484 |
| 1880 | 1.885 | 2.096 | 1.999 | 2.041 | 2.135 | 2.222 | 2.156 | 2.959 | 2.514 | 2.806 | 2.868 | 2.076 | ...... | 3.476 | 2.442 |
| 1881 | 1.820 | 1.970 | 1.862 | 2.016 | 1.988 | 2.152 | 1.895 | 2.989 | 2.164 | 2.666 | 2.856 | 1.828 | 3.341 | 3.168 | 2.446 |
| 1882 | 1.715 | 1.993 | 1.808 | 1.948 | 2.156 | 2.249 | 2.024 | 2.605 | 2.388 | 2.505 | 2.579 | 1.951 | 3.300 | 2.706 | 2.391 |
| 1883 | 1.790 | 2.088 | 1.986 | 1.673 | 2.196 | 2.297 | 2.193 | 2.373 | 2.424 | 2.504 | 2.516 | 2.141 | 3.128 | 2.614 | 2.402 |
| 1884 | 1.651 | 1.908 | 1.942 | 2.189 | 2.170 | 2.258 | 2.222 | 2.379 | 2.225 | 2.572 | 2.553 | 1.900 | 2.952 | 2.342 | 2.323 |
| 1885 | 1.833 | 1.838 | 1.419 | 1.756 | 2.058 | 1.950 | 1.569 | 2.270 | 2.211 | 2.466 | 2.563 | 2.026 | 2.749 | 2.103 | 2.216 |
| 1886 | 1.756 | 1.853 | 1.845 | 1.890 | 2.098 | 2.114 | 2.130 | 2.131 | 2.208 | 2.420 | 2.415 | 2.023 | 2.135 | 2.436 | 2.142 |
| 1887 | 1.89 | 1.880 | 1.989 | 2.039 | 2.260 | 2.125 | 2.255 | 2.074 | 2.268 | 2.328 | 2.538 | 2.062 | 2.301 | 2.394 | 2.245 |
| 1888 | 1.978 | 1.976 | 1.967 | 1.851 | 2.280 | 2.111 | 2.10 | 2.025 | 2.197 | 2.312 | 2.445 | 2.123 | 2.248 | 2.429 | 2.349 |
| 1889 | 1.957 | 1.869 | 1.932 | 1.722 | 2.286 | 2.076 | 2.18 | 1.709 | 1.927 | 2.285 | 2.415 | 2.128 | 2.155 | 2.370 | 2.165 |
| 1890 | 1.915 | 1.858 | 1.910 | 1.584 | 2.254 | 2.094 | 2.25 | 2.056 | 2.022 | 2.149 | 2.359 | 2.004 | 2.045 | 2.403 | 2.167 |
| 1891 | 1.869 | 1.818 | 1.905 | 1.601 | 2.105 | 2.070 | 2.23 | 2.155 | 2.073 | 2.322 | 2.408 | 2.205 | 2.059 | 2.483 | 2.142 |
| 1892 | 1.916 | 1.828 | 1.887 | 1.589 | 2.183 | 2.028 | 2.00 | 2.181 | 2.101 | 2.308 | 2.464 | 2.043 | 2.104 | 2.448 | 2.126 |
| 1893 | 1.869 | 1.835 | 1.832 | 1.551 | 2.195 | 1.968 | 1.98 | 1.989 | 1.999 | 2.095 | 2.414 | 1.981 | 1.987 | 2.432 | 2.108 |
| 1894 | 1.851 | 1.794 | 1.857 | 1.509 | 2.069 | 1.993 | 2.00 | 1.905 | 1.925 | 1.891 | 2.191 | 1.776 | 1.758 | 2.365 | 1.986 |
| 1895 | 1.819 | 1.770 | 1.837 | 1.560 | 2.215 | 1.971 | 2.06 | 1.980 | 1.995 | 2.146 | 2.411 | 2.119 | 1.962 | 2.318 | 2.040 |
| 1896 | 1.769 | 1.752 | 1.838 | 1.641 | 2.148 | 1.950 | 1.88 | 1.952 | 1.979 | 2.108 | 2.375 | 2.117 | 2.075 | 2.187 | 2.019 |
| 1897 | 1.811 | 1.754 | 1.842 | 1.543 | 2.108 | 1.958 | 2.02 | 1.980 | 1.979 | 2.153 | 2.289 | 2.116 | 2.101 | 2.254 | 2.022 |
| 1898 | 1.826 | 1.750 | 1.806 | 1.548 | 2.032 | *b*1.953 | 2.02 | 1.943 | 1.938 | 2.092 | 2.362 | 2.058 | 1.945 | 2.152 | 1.973 |

*a* Rates in currency reduced to their equivalents in gold.
*b* Excludes ferry earnings at Jersey City, N. J.

# INDEX.

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